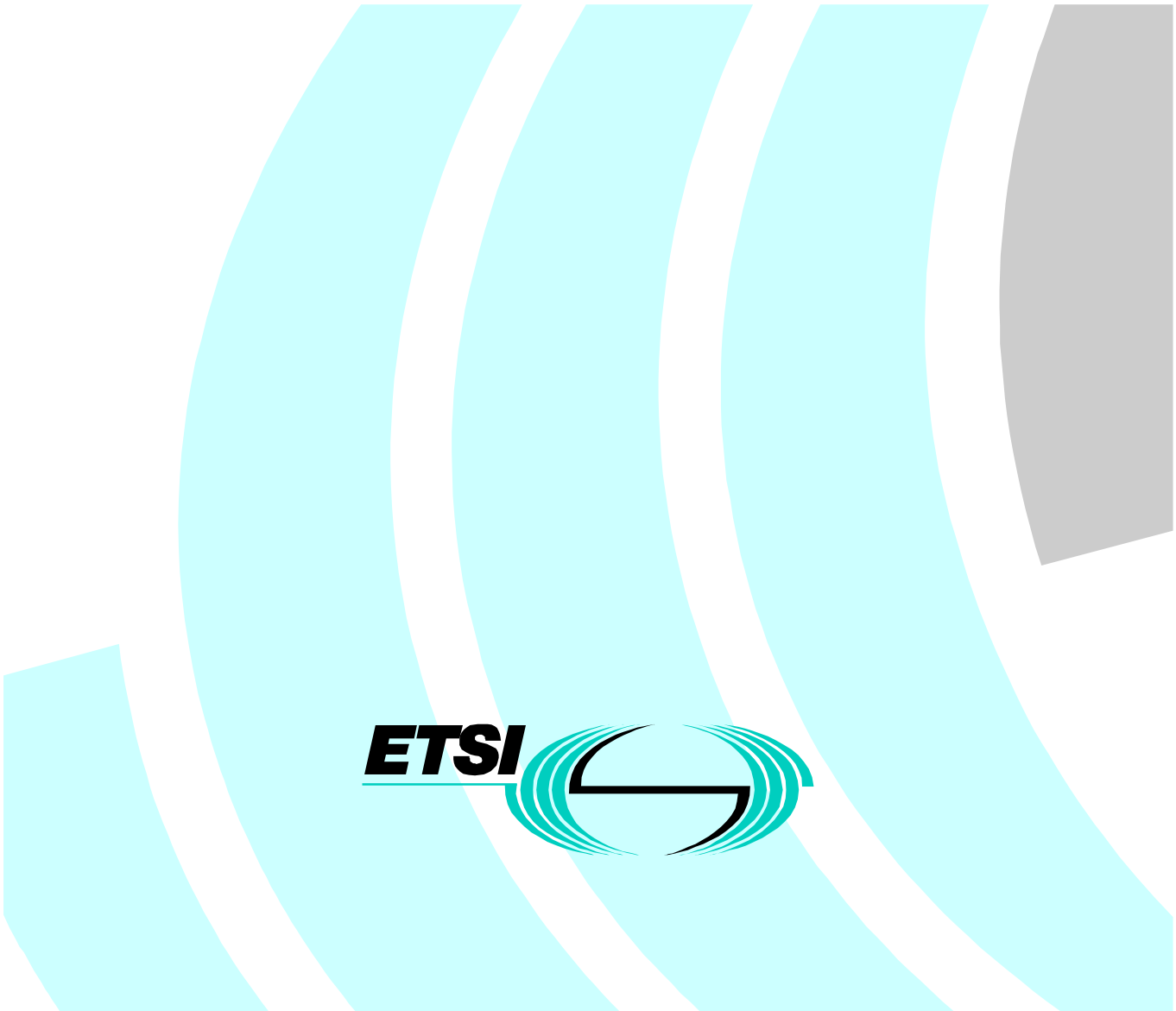
ETSI TS 101 377-4-7 V1.1.1 (2001-03)

Technical Specification

GEO-Mobile Radio Interface Specifications;
Part 4: Radio interface protocol specifications;
Sub-part 7: Mobile radio interface Layer 3 Specifications;
GMR-2 04.008



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Contents

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IPRs:

Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,715,365	US
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,754,974	US
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,226,084	US
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,701,390	US
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,826,222	US

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 377 V1.1.1	Ericsson Mobile Communication	Improvements in, or in relation to, equalisers	GB	GB 2 215 567	GB
TS 101 377 V1.1.1	Ericsson Mobile Communication	Power Booster	GB	GB 2 251 768	GB
TS 101 377 V1.1.1	Ericsson Mobile Communication	Receiver Gain	GB	GB 2 233 846	GB
TS 101 377 V1.1.1	Ericsson Mobile Communication	Transmitter Power Control for Radio Telephone System	GB	GB 2 233 517	GB

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 377 V1.1.1	Hughes Network Systems		US	Pending	US

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	2.4-to-3 KBPS Rate Adaptation Apparatus for Use in Narrowband Data and Facsimile Communication Systems	US	US 6,108,348	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Cellular Spacecraft TDMA Communications System with Call Interrupt Coding System for Maximizing Traffic ThroughputCellular Spacecraft TDMA Communications System with Call Interrupt Coding System for Maximizing Traffic Throughput	US	US 5,717,686	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Enhanced Access Burst for Random Access Channels in TDMA Mobile Satellite System	US	US 5,875,182	
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System	US	US 5,974,314	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System	US	US 5,974,315	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System with Mutual Offset High-argin Forward Control Signals	US	US 6,072,985	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System with Spot Beam Pairing for Reduced Updates	US	US 6,118,998	US

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The contents of the present document are subject to continuing work within TC-SES and may change following formal TC-SES approval. Should TC-SES modify the contents of the present document it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 1.m.n

where:

- the third digit (n) is incremented when editorial only changes have been incorporated in the specification;
- the second digit (m) is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

The present document is part 4, sub-part 7 of a multi-part deliverable covering the GEO-Mobile Radio Interface Specifications, as identified below:

Part 1: "General specifications";

Part 2: "Service specifications";

Part 3: "Network specifications";

Part 4: "Radio interface protocol specifications";

Sub-part 1: "GMR-2 Mobile Earth Station-Network Interface; General Aspects and Principles; GMR-2 04.001";

Sub-part 2: "GMR-2 Mobile Earth Station-Network Interface; Channel Structures and Access capabilities; GMR-2 04.003";

Sub-part 3: "Layer 1 General requirements; GMR-2 04.004";

Sub-part 4: "Data Link Layer General Aspects; GMR-2 04.005";

Sub-part 5: "GMR-2 Mobile Earth Station - Network Interface; Data Link (DL) layer Specifications; GMR-2 04.006";

Sub-part 6: "Mobile Radio Interface Signalling Layer 3; General Aspects; GMR-2 04.007";

Sub-part 7: "Mobile radio interface Layer 3 Specifications; GMR-2 04.008";

Sub-part 8: "Point-to-Point Short Message Services; GMR-2 04.011";

Sub-part 9: "Performance requirements on the mobile radio interface; GMR-2 04.013";

Sub-part 10: "Rate Adaptation on the Mobile Earth Station (MES) - Gateway System Interface; GMR-2 04.021";

Sub-part 11: "Call Waiting (CW) and Call Holding (HOLD) Supplementary Services; GMR-2 04.083";

Sub-part 12: "Multiparty Supplementary Services (MPTY); GMR-2 04.084";

Sub-part 13: "Technical Realisation of the Early Flag Technique; GMR-2 04.201";

Sub-part 14: "Call Barring Supplementary Services; GMR-2 02.088";

Part 5: "Radio interface physical layer specifications";

Part 6: "Speech coding specifications".

Introduction

GMR stands for GEO (Geostationary Earth Orbit) Mobile Radio interface, which is used for mobile satellite services (MSS) utilizing geostationary satellite(s). GMR is derived from the terrestrial digital cellular standard GSM and supports access to GSM core networks.

Due to the differences between terrestrial and satellite channels, some modifications to the GSM standard are necessary. Some GSM specifications are directly applicable, whereas others are applicable with modifications. Similarly, some GSM specifications do not apply, while some GMR specifications have no corresponding GSM specification.

Since GMR is derived from GSM, the organisation of the GMR specifications closely follows that of GSM. The GMR numbers have been designed to correspond to the GSM numbering system. All GMR specifications are allocated a unique GMR number as follows:

GMR-n xx.zyy

where :

xx.0yy (z=0) is used for GMR specifications that have a corresponding GSM specification. In this case, the numbers xx and yy correspond to the GSM numbering scheme.

xx.2yy (z=2) is used for GMR specifications that do not correspond to a GSM specification. In this case, only the number xx corresponds to the GSM numbering scheme and the number yy is allocated by GMR.

n denotes the first (n=1) or second (n=2) family of GMR specifications.

A GMR system is defined by the combination of a family of GMR specifications and GSM specifications as follows:

- If a GMR specification exists it takes precedence over the corresponding GSM specification (if any). This precedence rule applies to any references in the corresponding GSM specifications.

NOTE: Any references to GSM specifications within the GMR specifications are not subject to this precedence rule. For example, a GMR specification may contain specific references to the corresponding GSM specification.

- If a GMR specification does not exist the corresponding GSM specification may or may not apply. The applicability of the GSM specifications are defined in GMR-n 01.201.

1 Scope

The present document specifies the procedures used at the radio interface (Reference Point Um, see GSM 04.02 [11]) for Call Control (CC), Mobility Management (MM) and Radio Resource (RR) management.

These procedures are defined in terms of messages exchanged over the control channels of the radio interface. The control channels are described in GMR-2 04.003 [12].

The structured functions and procedures of this protocol and the relationship with other layers and entities are described in general terms in GMR-2 04.007 [16].

1.1 General

The procedures currently described in the present document are for the call control of circuit-switched connections, mobility management and radio resource management.

GSM 04.10 [17] contains functional procedures for support of supplementary services.

NOTE: "Layer 3" includes the functions and protocols described in the present document.
The terms "Data Link Layer" and "Layer 2" are used interchangeably to refer to the layer immediately below Layer 3.

1.2 Application to the Interface Structures

The Layer 3 procedures apply to the interface structures defined in GMR-2 04.003 [12]. They use the functions and services provided by Layer 2 defined in GMR-2 04.005 [14] and GMR-2 04.006 [15]. GMR-2 04.007 [16] gives the general description of Layer 3 including procedures, messages format and error handling.

1.3 Structure of Layer 3 Procedures

A building block method is used to describe the Layer 3 procedures.

The basic building blocks are "elementary procedures" provided by the protocol control entities of the three sublayers, i.e., Radio Resource Management, Mobility Management and Connection Management sublayers.

Complete Layer 3 transactions consist of specific sequences of elementary procedures. The term "structured procedure" is used for these sequences.

1.4 Use of Logical Channels

The logical control channels are defined in GMR-2 05.002 [23]. In the following those control channels are considered which carry signalling information or specific types of user packet information:

a) Satellite Eighth Rate Standalone Dedicated Control Channel (S-SDCCH/E);

b) Satellite Full Rate Fast Associated Control Channel (S-FACCH/F);

c) Satellite Half Rate Fast Associated Control Channel (S-FACCH/H);

d) Satellite Quarter Rate Fast Associated Control Channel (S-FACCH/Q);

e) Satellite Eighth Rate Fast Associated Control Channel (S-FACCH/E);

f) Satellite Slow, S-TCH/F Associated Control Channel (S-SACCH/TF);

g) Satellite Slow, S-TCH/H Associated Control Channel (S-SACCH/TH);

h) Satellite Slow, S-TCH/Q Associated Control Channel (S-SACCH/TQ);

i) Satellite Slow, S-TCH/E Associated Control Channel (S-SACCH/TE);

j) Satellite Slow, S-SDCCH/F Associated Control Channel (S-SACCH/CF);

k) Satellite Slow, S-SDCCH/H Associated Control Channel (S-SACCH/CH);

l) Satellite Slow, S-SDCCH/Q Associated Control Channel (S-SACCH/CQ);

m) Satellite Slow, S-SDCCH/E Associated Control Channel (S-SACCH/CE);

n) Satellite Broadcast Control Channel (S-BCCH);

o) Satellite High Margin Broadcast Control Channel (S-HBCCH);

p) Satellite High Margin Synchronization Channel (S-HMSCH);

q) Satellite Synchronization Channel (S-SCH);

r) Satellite Random Access Channel (S-RACH);

s) Satellite Paging Channel (S-PCH) (not implemented at present in GMR-2;

t) Satellite Access Grant Channel (S-AGCH);

u) Satellite High Power Alerting Channel (S-HPACH).

Two service access points are defined on signalling Layer 2 which are discriminated by their Service Access Point Identifiers (SAPI) (see GMR-2 04.006 [15]):

i) SAP 0: Supports the transfer of signalling information including user-user information;

ii) SAP 3: Supports the transfer of user short messages.

Layer 3 selects the service access point, the logical control channel and the mode of operation of Layer 2 (acknowledged, unacknowledged or random access, see GMR-2 04.005 [14] and GMR-2 04.006 [15]) as required for each individual message.

1.5 Overview of Control Procedures

1.5.1 List of Procedures

The following procedures are specified in the present document:

1) Clause 4 specifies elementary procedures for Radio Resource management:
   a) System information broadcasting (clause 4.2.2);
   b) Radio resources connection establishment (clause 4.3):
      i) Immediate assignment procedure (clause 4.3.1);
      ii) Paging procedure (clause 4.3.2).
   c) Radio resources connection transfer phase (clause 4.4):
      i) Measurement report procedure (clause 4.4.1.2);
      ii) Intraspotbeam change of channels (clause 4.4.3);
      iii) Channel mode change procedure (clause 4.4.6);
      iv) Ciphering mode setting procedure (clause 4.4.7).
   d) Radio resources connection release (clause 4.5).

2) Clause 5 specifies elementary procedures for Mobility Management:
   a) Mobility management common procedures (clause 5.3);
      i) Authentication procedure (clause 5.3.2);
      ii) Identification procedure (clause 5.3.3).
   b) Mobility management specific procedures (clause 5.4):
      i) Location updating procedure (clause 5.4.1);
      ii) Periodic updating (clause 5.4.2);
      iii) Generic location updating procedure (clause 5.4.4).
   c) Connection management sublayer service provision:
      i) Mobility management connection establishment (clause 5.5.1);
      ii) Mobility management connection information transfer phase (clause 5.5.2);
      iii) Mobility management connection release (clause 5.5.3).
3) Clause 6 specifies elementary procedures for circuit switched Call Control comprising the following elementary procedures:
   a) Mobile originating call establishment (clause 6.2.1);
   b) Mobile terminating call establishment (clause 6.2.2);
   c) Signalling procedures during the active state (clause 6.3):
      i) DTMF protocol control procedure (clause 6.3.3);
   d) Call clearing initiated by the MES (clause 6.4.3);
   e) Call clearing initiated by the network (clause 6.4.4);
   f) Miscellaneous procedures:
      i) In-band tones and announcements (clause 6.5.1);
      ii) Status enquiry procedures (clause 6.5.3).

The elementary procedures can be combined to form structured procedures. Examples of such structured procedures are given in clause 8. This part of the Technical Specification is only provided for guidance to assist implementations.

Clause 9 specifies actions to be taken on various error conditions.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, subsequent revisions do apply.

[1] GMR-2 01.004 (ETSI TS 101 377-1-1): "GEO-Mobile Radio Interface Specifications; Part 1: General specifications; Sub-part 1: Abbreviations and Acronyms; GMR-2 01.004".

[2] GMR-2 02.002 (ETSI TS 101 377-2-9): "GEO-Mobile Radio Interface Specifications; Part 2: Service specifications; Sub-part 9: Bearer Services (BS) supported by a GMR-2 Public Satellite Mobile Network (PSMN);GMR-2 02.002".

[3] GMR-2 02.003 (ETSI TS 101 377-2-1): "GEO-Mobile Radio Interface Specifications; Part 2: Service specifications; Sub-part 1: Teleservices supported by a GMR-2 Public Satellite Mobile Network (PSMN); GMR-2 02.003".

[4] GMR-2 02.009 (ETSI TS 101 377-2-3): "GEO-Mobile Radio Interface Specifications; Part 2: Service specifications; Sub-part 3: Security Aspects; GMR-2 02.009".

[5] GSM 02.40 (ETSI ETS 300 512 Edition 2): "Digital cellular telecommunications system (Phase 2); Procedures for call progress indications (GSM 02.40 version 4.5.0)".

[6] GMR-2 03.001 (ETSI TS 101 377-3-1): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 1: Network Functions; GMR-2 03.001".

[7] GMR-2 03.003 (ETSI TS 101 377-3-3): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 3: Numbering, Addressing and Identification; GMR-2 03.003".

[8] GSM 03.14 (ETSI ETS 300 532): "European digital cellular telecommunications system (Phase 2); Support of Dual Tone Multi-Frequency signalling (DTMF) via the GSM system (GSM 03.14 version 4.1.1)".

[9] GMR-2 03.020 (ETSI TS 101 377-3-10): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 10: Security related Network Functions; GMR-2 03.020".

[10] GMR-2 03.022 (ETSI TS 101 377-3-11): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 11: Functions Related to Mobile Earth Station (MES) in idle Mode; GMR-2 03.022".

[11] GSM 04.02 (ETSI ETS 300 551): "European digital cellular telecommunications system (Phase 2); GSM Public Land Mobile Network (PLMN) access reference configuration (GSM 04.02 version 4.0.4)".

[12] GMR-2 04.003 (TS 101 377-4-2): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 2: GMR-2 Mobile Earth Station-Network Interface; Channel Structures and Access capabilities; GMR-2 04.003".

[13] GMR-2 04.004 (ETSI TS 101 377-4-3): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 3: Layer 1 General requirements; GMR-2 04.004".

[14] GMR-2 04.005 (ETSI TS 101 377-4-4): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 4: Data Link Layer General Aspects; GMR-2 04.005".

[15] GMR-2 04.006 (ETSI TS 101 377-4-5): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 5: GMR-2 Mobile Earth Station - Network Interface; Data Link (DL) layer Specifications; GMR-2 04.006".

[16] GMR-2 04.007 (ETSI TS 101 377-4-6): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 6: Mobile Radio Interface Signalling Layer 3; General Aspects; GMR-2 04.007".

[17] GSM 04.10 (ETSI ETS 300 558 Edition 2): "Digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3; Supplementary services specification; General aspects (GSM 04.10 version 4.10.0)".

[18] GSM 04.11 (ETSI ETS 300 559 Edition 4): "Digital cellular telecommunications system (Phase 2); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface (GSM 04.11 version 4.10.0)".

[19] GSM 04.80 (ETS 300 564 Edition 3): "Digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3; Supplementary services specification; Formats and coding (GSM 04.80 version 4.11.1)".

[20] GSM 04.81 (ETSI ETS 300 565): "European digital cellular telecommunications system (Phase 2); Line identification supplementary services; Stage 3 (GSM 04.81 version 4.4.1)".

[21] GMR-2 04.083 (ETSI TS 101 377-4-11): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 11: Call Waiting (CW) and Call Holding (HOLD) Supplementary Services; GMR-2 04.083".

[22] GMR-2 04.084 (ETSI TS 101 377-4-12): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 12: Multiparty Supplementary Services (MPTY); GMR-2 04.084".

[23] GMR-2 05.002 (ETSI TS 101 377-5-2): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 2: Multiplexing and Multiple Access on the Radio Path; GMR-2 05.002".

[24] GMR-2 05.003 (ETSI TS 101 377-5-3): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 3: Channel Coding.; GMR-2 05.003".

[25] GMR-2 05.005 (ETSI TS 101 377-5-5): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 5: Radio Transmission and Reception; GMR-2 05.005".

[26] GMR-2 05.008 (ETSI TS 101 377-5-6): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 6: Radio Subsystem Link Control; GMR-2 05.008".

[27] GMR-2 05.010 (ETSI TS 101 377-5-7): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 7: Radio Subsystem Synchronisation; GMR-2 05.010".

[28] GSM 07.01 (ETSI ETS 300 582 Edition 4): "Digital cellular telecommunications system (Phase 2); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS) (GSM 07.01 version 4.10.0)".

[29] GSM 08.08 (ETSI ETS 300 590 Edition 6): "Digital cellular telecommunications system (Phase 2); Mobile-services Switching Centre - Base Station System (MSC - BSS) interface; Layer 3 specification (GSM 08.08 version 4.12.1)".

[30] GSM 09.07 (ETSI ETS 300 604 Edition 7): "Digital cellular telecommunications system (Phase 2); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) (GSM 09.07 version 4.13.1)".

[31] ISO/IEC 646 (1991): "Information technology - ISO 7-bit coded character set for information interchange".

[32] ISO/IEC 6429 (1992): "Information technology - Control functions for coded character sets".

[33] ISO 8348 AD2 (1996): "Information technology - Open Systems Interconnection - Network Service Definition".

[34] ITU T Recommendation E.163: "Numbering Plan for the International Telephone Service - Telephone Network and ISDN".

[35] ITU T Recommendation E.164: "The international public telecommunication numbering plan".

[36] ITU T Recommendation E.212: "The international identification plan for mobile terminals and mobile users".

[37] ITU-T Recommendation F.69 (1994): "The international telex service - Service and operational provisions of telex destination codes and telex network identification codes".

[38] ITU T Recommendation I.330: "ISDN numbering and addressing principles".

[39] ITU T Recommendation I.440 (1993): "Digital Subscriber Signalling System No. 1 (DSS1) - ISDN user-network interface data link layer - General aspects".

[40] ITU T Recommendation I.450 (1993): "Digital Subscriber Signalling System No. 1 (DSS1) - ISDN user-network interface layer 3 - General aspects".

[41] ITU-T Recommendation I.500 (1993): "General structure of the ISDN interworking Recommendations".

[42] ITU T Recommendation T.50: "Information technology - 7-bit coded character set for information interchange".

[43] ITU T Recommendation Q.931: "ISDN user-network interface layer 3 specification for basic call control".

[44] ITU T Recommendation V.21: "300 bits per second duplex modem standardized for use in the general switched telephone network".

[45] ITU T Recommendation V.22: "1 200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[46] ITU T Recommendation V.22bis: "2 400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[47] ITU T Recommendation V.23: "600/1 200-baud modem standardized for use in the general switched telephone network".

[48] ITU T Recommendation V.26ter: "2 400 bits per second duplex modem using the echo cancellation technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".

[49] ITU T Recommendation V.32: "A family of 2-wire, duplex modems operating at data signalling rates of up to 9 600 bit/s for use on the general switched telephone network and on leased telephone-type circuits".

[50] ITU T Recommendation V.110: "Support by an ISDN of data terminal equipments with V-series type interfaces".

[51] ITU T Recommendation X.21: "Interface between Data Terminal Equipment and Data Circuit-terminating Equipment for synchronous operation on public data networks".

[52] ITU T Recommendation X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[53] ITU T Recommendation X.28: "DTE/DCE interface for a start-stop mode Data Terminal Equipment accessing the Packet Assembly/Disassembly facility (PAD) in a public data network situated in the same country".

[54] ITU T Recommendation X.30: "Support of X.21, X.21 bis and X.20 bis based Data Terminal Equipments (DTEs) by an Integrated Services Digital Network (ISDN)".

[55] ITU T Recommendation X.31: "Support of packet mode terminal equipment by an ISDN".

[56] ITU T Recommendation X.32: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and accessing a Packet-Switched Public Data Network through a public switched telephone".

[57] ITU T Recommendation X.75 (1996): "Packet-switched signalling system between public networks providing data transmission services".

[58] ITU T Recommendation X.121: "International numbering plan for public data networks".

[59] ETSI ETS 300 102-1 (Edition 1): "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".

[60] ETSI ETS 300 102-2 (Edition 1): "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control; Specification Description Language (SDL) diagrams".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

Idle mode: in this mode, the MES is not allocated any dedicated channel; it listens to the S-HPACH, the S-BCCH and/or S-HBCCH

Main S-DCCH: in RR connected mode, only two channels are used as S-DCCH, one being a S-SACCH, the other being a S-SDCCH or a S-FACCH; the S-SDCCH or S-FACCH is called here "The main S-DCCH":

- a channel is activated if it can be used for transmission, in particular for signalling, at least with UI frames. On the S-SACCH, whenever activated, it must be ensured that a contiguous stream of Layer 2 frames is sent;
- a S-TCH is connected if circuit mode user data can be transferred. A S-TCH cannot be connected if it is not activated. A S-TCH which is activated but not connected is used only for signalling, i.e., as a S-DCCH;
- the Data Link of SAPI 0 on the main S-DCCH is called the main signalling link. Any message specified to be sent on the main signalling link is sent in acknowledged mode except when otherwise specified;
- the term "to establish" a link is a short form for "to establish the multiframe mode" on that Data Link. It is possible to send UI frames on a Data Link even if it is not established as soon as the corresponding channel is activated. Except when otherwise indicated, a Data Link layer establishment is done without an information field

Random values: in a number of places in the present document, it is mentioned that some value must take a "random" value in a given range, or more generally, with some statistical distribution. Such cases interest only the Mobile Earth Station (MES):

- it is required that there is a low probability that two MESs in the same conditions (including the case of two MESs of the same type from the same manufacturer) will choose the same value. Moreover, it is required that, if it happens that two MESs in similar conditions choose the same value, the probability of their choices being identical at the next occasion is the same as if their first choices had been different;

- the meaning of such a specification is that any statistical test for these values, done on a series of similar events, will obtain a result statistically compatible with the specified distribution. This shall hold even in the cases where the tests are conducted with a subset of possible events, with some common parameters. Moreover, basic tests of independence of the values within the series shall pass;

- data against which correlation with the values shall not be found are the protocol state, or the IMSI, or identities or other unrelated information broadcast by the network, or the current TDMA frame number

RR connected mode: in this mode, the MES is allocated at least two dedicated channels, only one of them being a S-SACCH

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ARFCN Absolute Radio Frequency Channel Number

Other abbreviations used in the present document are listed in GMR-2 01.004 [1].

4 Radio resource management procedures

4.1 Overview

4.1.1 General

Radio Resource management procedures include the functions related to the management of the common transmission resources, e.g., the physical channels and the Data Link connections on control channels.

The general purpose of Radio Resource procedures is to establish, maintain and release RR connections that allow a point-to-point dialogue between the network and a MES. This includes the spotbeam selection/reselection. Moreover, Radio Resource management procedures include the reception of the uni-directional S-BCCH and S-CCCH when no RR connection is established. This permits automatic spotbeam selection/reselection.

4.1.2 Services provided to upper layers

4.1.2.1 Idle mode

The RR procedures include (on the Mobile Earth Station side) those for automatic spotbeam selection/reselection. The RR entity indicates to upper layers the unavailability of a S-BCCH/S-CCCH and the spotbeam change when decided by the RR entity. Upper layers are advised of the S-BCCH broadcast information when a new spotbeam has been selected, or when a relevant part of this information changes.

4.1.2.2 Establishment and release of a RR connection

A RR connection is a physical point-to-point bi-directional connection, and includes a SAPI 0 Data Link connection operating in multiframe mode on the main S-DCCH.

The upper layer can require the establishment of a RR connection. Only one RR connection can be established for a MES at one time.

The upper layer can require the release of a RR connection.

4.1.2.3 RR connected mode

When a RR connection is established, RR procedures provide the following services:

a) establishment/release of multiframe mode on Data Link layer connections other than SAPI 0, on the main S-DCCH or on the S-SACCH;

b) transfer of messages on any Data Link layer connection;

c) indication of temporary unavailability of transmission (suspension, resuming);

d) indication of loss of RR connection;

e) setting/change of the transmission mode on the physical channels, including change of type of channel, change of the coding/decoding/transcoding mode and setting of ciphering;

f) allocation/release of additional channels (for S-TCH half, quarter or eighth rate configuration).

4.1.3 Services required from data link and physical layers

The RR sublayer uses the services provided by the Data Link layer as defined in Technical Specification GMR-2 04.005 [14].

Moreover, the RR sublayer directly uses services provided by the physical layer such as S-BCCH searching, as defined in Technical Specification GMR-2 04.004 [13].

4.1.4 Change of dedicated channels

4.1.4.1 Change of dedicated channels using SAPI = 0

In case a change of dedicated channels is required using a dedicated assignment procedure, the RR sublayer will request the Data Link layer to suspend multiple frame operation before the MES leaves the old channel. When the channel change has been completed, Layer 3 will request the Data Link layer to resume multiple frame operation again. The Layer 2 suspend/resume procedures are described in GMR-2 04.005 [14] and GMR-2 04.006 [15].

These procedures are specified in such a way that a loss of a Layer 3 message cannot occur on the radio interface. However, MM and CM messages sent from the MES to the network may be duplicated by the Data Link layer if a message has been transmitted but not yet completely acknowledged before the MES leaves the old channel (see GMR-2 04.006 [15]).

As the RR sublayer is controlling the channel change, a duplication of RR messages does not occur. However, there are some procedures for which a duplication is possible, e.g., DTMF procedures. For all MM and CM procedures using SAPI = 0, the request messages sent by the MES contain a sequence number in order to allow the network to detect duplicated messages, which are then ignored by the network. The procedures for sequenced transmission on Layer 3 are described in clause 4.1.4.3.

4.1.4.2 Change of dedicated channels using other SAPIs than 0

For SAPIs other than 0, the Data Link procedures described in GMR-2 04.006 [15] do not provide any guarantee against message loss or duplication.

Therefore, if an application uses a SAPI other than 0, and if this application is sensitive to message loss or duplication, then it has to define its own protection mechanism. No general protection mechanism is provided by the Layer 3 defined in the present document.

NOTE: Support of special mechanisms against the loss or duplication of messages is not a requirement of the MSC.

4.1.4.3 Sequenced Message Transfer Operation

MM and CM messages using SAPI = 0 sent from the MES to the network can be duplicated by the Data Link layer in the following case:

A channel change of dedicated channels is required (assignment procedure) and the last Layer 2 frame has not been acknowledged by the peer Data Link layer before the MES leaves the old channel.

In this case, the MES does not know whether the network has received the message correctly. Therefore, the MES has to send the message again after the new dedicated channel is established (see GMR-2 04.006 [15]).

The network must be able to detect the duplicated received message. Therefore, each MM and CM message using SAPI = 0 must be marked with a send sequence number.

4.1.4.3.1 Variables and Sequence Numbers

4.1.4.3.1.1 Send State Variable V(SD)

The RR sublayer of the MES shall have one associated send state variable V(SD) ("Send Duplicated") for sending MM and CM messages using SAPI =0. The send state variable denotes the sequence number of the next in sequence numbered message to be transmitted. The value of the send state variable shall be incremented by one with each numbered message transmission. Arithmetic operations on V(SD) are performed modulo 2.

4.1.4.3.1.2 Send Sequence Number N(SD)

Only MM and CM messages using SAPI = 0 contain the send sequence number N(SD). At the time when such a message is designated for transmission, the value of N(SD) for the message to be transferred is set equal to the value of the send state variable V(SD) (see GMR-2 04.007 [16]).

4.1.4.3.2 Procedures for the initiation, transfer execution and termination of the sequenced message transfer operation

4.1.4.3.2.1 Initiation

The sequenced message transfer operation is initiated by establishing a RR connection. The send state variable V(SD) is set to 0.

4.1.4.3.2.2 Transfer Execution

The network must compare the send sequence numbers of pairs of subsequent messages. In case the send sequence numbers of two subsequent messages are not identical, no duplication has occurred. In case the send sequence numbers are identical, the network must ignore one of these messages.

4.1.4.3.2.3 Termination

The sequenced message transfer operation is terminated by the RR connection release procedure.

4.1.5 Procedure for Service Request and Contention Resolution

Upon seizure of the assigned dedicated channel, the MES establishes the main signalling link on this channel by sending a Layer 2 SABM frame containing a Layer 3 service request message. The Data Link layer will store this message to perform the contention resolution. The service request message will be returned by the network in the UA frame.

The Data Link layer in the MES compares the content of the information field (i.e., the Layer 3 service request message) received in the UA frame with the stored message and leaves the channel in case they do not match. This procedure resolves contentions in the case where several MESs have accessed at the same random access slot and with the same random reference and one has succeeded due to capture. The full description of the procedure is given in GMR-2 04.006 [15].

The purpose of the service request message is to indicate to the network which service the MES is requesting. This then allows the network to decide how to proceed (e.g., to authenticate or not).

The service request message must contain the identity of the MES and may include further information which can be sent without encryption.

The Layer 3 service request message is typically one of the following:

a) CM SERVICE REQUEST

b) LOCATION UPDATING REQUEST

c) PAGING RESPONSE

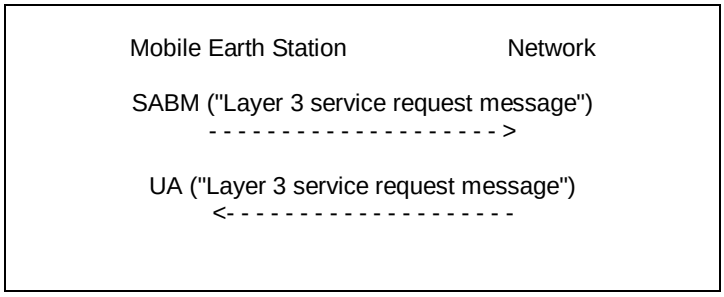

Figure 4.1: Service request and contention resolution

4.2 Idle mode procedures

4.2.1 MES side

In idle mode, the MES listens to the S-BCCH and to the paging sub-channel for the paging group the MES belongs to and measures the radio propagation for connection with other spotbeams.

Measurements are used to assess the need of a spotbeam change as specified in Technical Specification GMR-2 05.008 [26]. When the decision to change spotbeams is made, the MES switches to the S-BCCH of the new beam. The broadcast information is then checked to verify the allowance to camp on this beam (see clause 4.2.2). If allowed, the spotbeam change is confirmed, and the broadcast information is then treated for Mobility Management actions (see clause 5). Similarly, physical contexts are updated (list of neighboring spotbeam frequencies, thresholds for some actions, etc., see Technical Specification GMR-2 05.008 [26] and clause 4.2.2 of the present document).

4.2.2 Network Side

4.2.2.1 System Information Broadcasting

The Satellite Broadcast Control Channel (S-BCCH) and the Satellite High Margin Broadcast Control Channel (S-HBCCH) are the logical channels used to broadcast system information messages from the network to the MES. System information messages provide information about the network as well as spotbeam specific information.

The GMR-2 system uses the following system information messages: Type 2, Type 3, Type 9, Type 10, Type 8 and Type 7.

A Type 2 message contains information on surrounding neighbor spotbeams (LARFCN, CO, FSG and FO) and access control parameters. See clause 10.1.32.

A Type 3 message contains information on the current spotbeam LAI, control channel description, spotbeam options, spotbeam selection and reselection parameters and access control parameters. See clause 10.1.34.

A Type 9 message contains information on common control channel configuration, forward epoch delay, HPA/HMS configuration and access control parameters. See clause 10.1.41.

A Type 10 message contains the current spotbeam Location Area Code (LAC), surrounding neighbor beam pair LACs, Beam Pair Location update timer setting and access control parameters. See clause 10.1.42.

Type 8 messages are used to create an active frequency list. The active frequency list provides the common control channel frequencies for all 140 spotbeams. Each Type 8 message can list 20 frequencies. Therefore, seven Type 8 messages are required to create the complete active frequency list. See clause 10.1.40.

Type 8 messages are also used to create a pending frequency list. The pending frequency list is used when the network changes control channel frequencies for spotbeams. The list provides the spotbeam number and the new common control channel frequency. Each Type 8 message can change up to ten spotbeam frequencies. Therefore, fourteen Type 8 messages are required to change every frequency in a 140 spotbeam system. See clause 10.1.40.

The MES determines whether a particular Type 8 message is part of an active or pending frequency list by the value of the "Frequency List Type" in the Satellite Frequency List IE clause 11.5.2.52.

A Type 7 message is used to create a multi-satellite frequency list. A multi-satellite frequency list can specify up to seven frequencies of a neighboring satellite. The satellite visibility field in the Channel Request message allows reporting a maximum of two satellites. Therefore, there may be up to two Type 7 messages or two multi-satellite frequency lists. See clause 10.1.39.

The S-BCCH and S-HBCCH occupy frames on the common control channel of each spotbeam as shown in GMR-2 05.002 [23], figure 9.0.2a and specified in GMR-2 05.002 [23], Table 7.0.5a.

The same system information messages shall always be broadcast on the S-BCCH and the S-HBCCH. Type 8 System Information messages shall always be broadcast on the S-HBCCH. If the S-BCCHext is active, then the same Type 8 messages shall be broadcast on the S-BCCHext as on the S-HBCCH. If any Type 7 System Information messages are active, then the same Type 7 messages shall be broadcast on the S-BCCHext as on the S-HBCCH. The repeat length of the S-BCCH is one control multiframe (102 TDMA frames) and therefore system information messages are broadcast rapidly on the S-BCCH. Listening to the S-BCCH is the fastest way for the MES to obtain system information messages. However, bursts sent over the S-BCCH are transmitted at nominal power level and thus the MES must be in advantaged mode to receive these bursts and successfully decode them

The repeat length of the S-HBCCH is 27 control multiframes. Therefore the broadcast of system information messages on the S-HBCCH is much slower than on the S-BCCH. However, bursts on the S-HBCCH are transmitted at a higher power level than the S-BCCH so that MESs in disadvantaged mode can receive and successfully decode system information messages.

The Type 2, 3, 9 and 10 messages contain the information MESs need to determine how to make and receive calls and are therefore the most important to the MES. As a result, system information messages Type 2, 3, 9 and 10 are always broadcast on S-BCCH and the S-HBCCH. The Type 7 and 8 system information message contain frequency information that MESs do not always need. Therefore system information messages Type 7 and 8 are not always broadcast on the S-BCCH. However, Type 8 messages are always broadcast on the S-HBCCH and Type 7 messages may be broadcast if a multi-satellite frequency list(s) exists.

4.2.2.1.1 Broadcast of System Information Messages on the S-BCCH

The S-BCCH is divided into two parts: the S-BCCHnorm and the S-BCCHext.

The S-BCCHnorm is always active and is used to transmit Type 2, 3, 9, and 10 messages. The S-BCCHnorm occupies the two blocks on the common control channel TN_0 as specified in GMR-2 05.002 [23], Table 9.0.5a. Since, the repeat cycle of the S-BCCHnorm is one control multiframe (102 TDMA frames) and the same message is transmitted in each of the two blocks occupied by the S-BCCHnorm, it takes one control multiframe to transmit one System Information message.

The S-BCCHext is used to transmit the Type 7 and/or 8 messages. The use of the S-BCCHext is configurable on a spotbeam basis by the NCC operator. The SB-BCCHext-Res parameter (clause 11.5.2.3) is used to configure the use of the S-BCCHext and to indicate to the MES how the S-BCCHext is configured. The possibilities are:

- S-BCCHext not in use;
- S-BCCHext in use with Type 7 messages only;
- S-BCCHext in use with Type 8 messages only;
- S-BCCHext in use with Type 7 and 8 messages.

When in use, the S-BCCHext occupies the two blocks specified in GMR-2 05.002 [23], Table 9.0.5a. Since, the repeat cycle of the S-BCCHext is one control multiframe (102 TDMA frames) and the same message is transmitted in each of the two blocks occupied by the S-BCCHext, it takes one control multiframe to transmit one System Information message.

GMR-2 05.002 [23], Table 8.3.1 specifies the order in which system information messages are sent on the S-BCCHnorm. That order is Type 2, 3, 9 and 10 System Information messages. It takes four control multiframes to transmit the set of Type 2, 3, 9 and 10 messages.

GMR-2 05.002 [23], Table 8.3.1 specifies the order in which system information messages Type 8 and Type 7 can be sent on the S-BCCHext. That order is seven Type 8 messages and one Type 7 message. If Type 7 messages are not used, then nothing shall be transmitted in the Type 7 slot on the S-BCCHext.

When the S-BCCHext is used, as a minimum, the NCC shall transmit the Active Frequency list on the S-BCCHext. If the Multi-Satellite Frequency lists are active, then a list shall be transmitted in the cycle. If a pending list exists, then the pending list shall replace the Active list in the eight-control frame cycle.

4.2.2.1.2 Broadcast of System Information Messages on the S-HBCCH

For system information messages sent on the S-HBCCH, the network uses the H-BCCH Version Number message (see clause 10.1.48) to indicate to the MES which message type is to follow. That is, for system information messages sent on the S-HBCCH, the MES shall have the ability to distinguish the message type at the message block level. The H-BCCH Version Number message indicates to the MES the system information message type (using the "SIM type" parameter) and a version number ("Sequence Number" parameter) associated with the System Information Message. The H-BCCH Version Number message of 10 bits and the System Information Message of 184 bits are encoded as one transmitted message on the S-HBCCH logical channel. For details see GMR-2 05.003 [24].

The H-BCCH Version Number Message allows the MES to skip decoding the attached System Information Message if the sequence number in the Version Number Message is the same as what the MES had decoded before.

The NCC shall maintain a unique sequence number in the H-BCCH Version Number message for each of the following categories of System Information Messages:

1) Type 2 (a version number for each spotbeam);
2) Type 3 (a version number for each spotbeam);
3) Type 9 (a version number for each spotbeam);
4) Type 10 (a version number for each spotbeam);
5) Active Frequency List: seven Type 8 messages (one version number for all seven Type 8 messages);

6) Pending Frequency List: up to fourteen Type 8 messages (one version number for all 14 Type 8 messages);

7) Multi-satellite Frequency Lists: one Type 7 message per satellite, up to two satellites per any geographical area (a version number for each Type 7 message).

The NCC shall choose the appropriate value for the "SIM type" parameter in the H-BCCH Version Number message (see clause 10.1.44) to identify the subsequent System Information Message type. The NCC shall increment the sequence number in the H-BCCH Version Number message to indicate changes to the System Information message content.

The NCC shall broadcast System Information messages in blocks of six S-HBCCH repeat cycles or six message blocks on the S-HBCCH as follows:

1) Type 2;

2) Type 3;

3) Type 9;

4) Type 10;

5) Type 7 or Type 8 depending on the list;

6) Type 7 or Type 8 depending on the list.

where the S-HBCCH repeat cycle or message block is 27 control multiframes long (2754 TDMA frames).

TYPE 2, 3, 9 and 10 messages are transmitted on the first four S-HBCCH repeat cycles, since these system information messages contain the most important information.

The fifth and sixth message blocks shall be used to transmit the active, pending and/or mutli-satellite frequecy lists. As a minimum the NCC shall send the active frequency list, seven Type 8 messages. If the Multi-Satellite Frequency list(s) is active, then a list(s) shall be transmitted in the cycle. If there is no Multi-Satellite Frequency List or it is inactive (i.e., no Type 7 System Information messages to send), the NCC shall always send Type 8 messages on the fifth and sixth message blocks on the S-HBCCH. If a pending list exists, then the pending list shall replace the Active list. Table 4.2.1 indicates the amount of time it takes to transmit various combinations of active, multi-satellite and/or pending frequency lists on the S-HBCCH.

Table 4.2.1: System information message cycle times on the S-HBCCH

Number of system information messages	Cycle time (min)	Comment
7	4.4	One Active List
9	5.8	One Active list and 2 Multi-sat lists
14	8.8	One Active list and 7 Pending lists
16	10.2	One Active list , 7 Pending lists, and 2 Multi-sat lists or 14 Pending lists and 2 Multi-sat lists
23	14.6	Active list, 14 Pending lists,and 2 Multi-sat lists

For example, a sequence of system information messages including one active frequency list (seven Type 8 messages) and one multi-satellite list (one Type 7) takes four sets of six S-HBCCH cycles and is ordered as follows.

On the first set of six S-HBCCH cycles, the system information messages are sent as follows:

1) Type 2;

2) Type 3;

3) Type 9;

4) Type 10;

5) first Type 8;

6) second Type 8.

On the second set of six S-HBCCH cycles, the System Information messages are sent in the following order:

1) Type 2;

2) Type 3;

3) Type 9;

4) Type 10;

5) third Type 8;

6) fourth Type 8.

On the third set of six S-HBCCH cycles, the System Information messages are sent in the following order:

1) Type 2;

2) Type 3;

3) Type 9;

4) Type 10;

5) Fifth Type 8;

6) Sixth Type 8.

On the fourth set of six S-HBCCH cycles, the System Information messages are sent in the following order:

1) Type 2;

2) Type 3;

3) Type 9;

4) Type 10;

5) seventh Type 8;

6) Type 7.

NOTE: In this example, if there are no Type 7 messages to send then Type 8 messages shall be sent on the S-HBCCH. Note that, the S-HBCCH broadcast is asynchronous with respect to the Hyperframe cycle of the control channel multiframe.

4.2.2.2 Paging

The network is only required to send a valid Layer 3 message on a paging sub-channel, when there is a page request required.

4.3 RR connection establishment

4.3.1 RR connection establishment initiated by the MES: Immediate assignment procedure

The purpose of the immediate assignment procedure is to establish an RR connection between the MES and the network.

The immediate assignment procedure can only be initiated by the RR entity of the MES. Initiation is triggered by request from the MM sublayer to establish an RR connection or by the RR entity in response to a PAGING REQUEST message. Upon such a request:

a) if access to the network is allowed (as defined in clause 4.3.1.1), the RR entity of the MES initiates the immediate assignment procedure as defined in clause 4.3.1.2;

b) otherwise, it rejects the request.

The request from the MM sublayer to establish an RR connection specifies an establishment cause. Similarly, the request from the RR entity to establish a RR connection in response to a PAGING REQUEST Type 1 message specifies one of the establishment causes "answer to paging."

4.3.1.1 Permission to Access the Network

All Mobile Earth Stations with an inserted SIM are members of one out of ten access classes numbered 0 to 9. The access class number is stored in the SIM. In addition, MESs may be members of one or more out of 3 special access classes (access classes 13 to 15), this is also held on the SIM card.

The system information messages on the S-BCCH broadcast the list of authorized access classes and authorized special access classes in the system information messages, and whether emergency calls are allowed in the spotbeam to all MESs or only to the members of authorized special access classes.

If the establishment cause for the request of the MM sublayer is not "emergency call," access to the network is allowed if and only if the MES is a member of at least one authorized:

a) access class; or

b) special access class.

If the establishment cause for the request of the MM sublayer is "emergency call," access to the network is allowed if and only if:

a) emergency calls are allowed to all MESs in the spotbeam; or

b) the MES is a member of at least one authorized special access class.

4.3.1.2 Initiation of the Immediate Assignment Procedure

The RR entity of the MES initiates the immediate assignment procedure by scheduling the sending on the S-RACH and leaving idle mode (in particular, the MES shall ignore PAGING REQUEST messages). It then sends maximally M + 1 CHANNEL REQUEST messages on the S-RACH in a way such that:

a) the number of S-RACH slots belonging to the MESs S-RACH between initiation of the immediate assignment procedure and the first CHANNEL REQUEST message (excluding the slot containing the message itself) is a random value drawn randomly for each new initial assignment initiation with uniform probability distribution in the set {0, 1...., max (T,8) - 1};

b) the number of S-RACH slots belonging to the MES's S-RACH between two successive CHANNEL REQUEST messages (excluding the slots containing the messages themselves) is a random value drawn randomly for each new transmission with uniform probability distribution in the set {S, S + 1....,S +T - 1};

Here, T is the value of the parameter "Tx-integer" (the number of S-RACH slots over which transmission is spread as defined in clause 11.5.2.29) broadcast on the S-BCCH.M is the value of the parameter "max retrans" broadcast on the S-BCCH.

S is a parameter depending on the S-CCCH configuration and on the value of Tx-integer as defined in Table 4.3.1. The values of S specified in Table 4.3.1 are given in terms of S-RACH slot as a function of Tx-integer and the number of frames per S-RACH slot. The number of frames per S-RACH slot is specified by the S-RACH configuration parameter of the CCS configuration parameter (clause 11.5.2.45) broadcast within Type 9 System Information message for each spot beam.

After sending the first CHANNEL REQUEST message, the MES shall start listening to the S-BCCH; it shall also listen to the S-AGCH on the proper forward TN. The forward TN is determined by using the HPA_Group (GMR-2 05.002 [23]), finding the TN that the MES monitors for the S-HPACH and choosing the TN in GMR-2 05.002 [23], Table 5.3.4 in the "S-CCCH Forward TN" column that appears in the same row as the S-HPACH TN in the "S-HPACH Forward TN column" in GMR-2 05.002 [23], Table 5.3-4.

If the User Terminal has not received a response from the network on the S-AGCH and has sent M + 1 CHANNEL REQUEST messages, the RR entity of the MES starts timer T3126. At expiration of timer T3126, the immediate assignment procedure is aborted; if the immediate assignment procedure was triggered by a request from the MM sublayer, a random access failure is indicated to the MM sublayer.

Table 4.3.1: Values of parameter S

TX-integer	Parameter S in S-RACH slots (S-RACH Slot Length in frame periods)								Minimum Time (sec)
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
3,8,14,50	162	108	81	65	54	47	41	36	1.50
4,9,16	216	144	108	87	72	62	54	48	2.00
5,10,20	270	180	135	108	90	78	68	60	2.50
6,11,25	324	216	162	130	108	93	81	72	3.00
7,12,32	378	252	189	152	126	108	95	84	3.50

4.3.1.3 Answer from the network

4.3.1.3.1 Receipt of a CHANNEL REQUEST message

The network may allocate a dedicated channel to the MES by sending an IMMEDIATE ASSIGNMENT message in unacknowledged mode on the S-AGCH on the TN group as defined in GMR-2 05.002 [23], Table 5.3.4. The IMMEDIATE ASSIGNMENT message may be sent in any S-AGCH block on the TN group. The type of channel allocated is S-SDCCH. Timer T3101 is then started on the network side.

NOTE: There is only one type of immediate assignment message used that contains assignment information for one MES only.

The IMMEDIATE ASSIGNMENT message contains:

a) The description of the assigned channel;

b) The information field of the CHANNEL REQUEST message and the frame number of the frame in which the CHANNEL REQUEST message was received;

c) The initial timing advance.

On receipt of an IMMEDIATE ASSIGNMENT message corresponding to one of its 3 last CHANNEL REQUEST messages, the MES stops T3126 (if running), stops sending CHANNEL REQUEST messages, switches to the assigned channels, sets the channel mode to signalling only and activates the assigned channels. It then establishes the main signalling link with an SABM containing an information field (see clause 4.1.5).

4.3.1.3.2 Assignment rejection

If no channel is available for assignment, the network may send to the MES an IMMEDIATE ASSIGNMENT REJECT message in unacknowledged mode on the S-AGCH on the TN group as defined in GMR-2 05.002 [23], Table 5.3.4. The IMMEDIATE ASSIGNMENT REJECT message may be sent in any S-AGCH block on the TN group. This message contains the request reference and a wait indication.

On receipt of an IMMEDIATE ASSIGNMENT REJECT message corresponding to one of its 3 last CHANNEL REQUEST messages, the MES stops sending CHANNEL REQUEST messages, starts timer T3122 with the indicated value, ("wait indication" information element), starts T3126 if it has not already been started, and listens to the forward S-CCCH until T3126 expires. During this time, additional IMMEDIATE ASSIGNMENT REJECT messages are ignored, but any immediate assignment corresponding to any other of its 3 last CHANNEL REQUEST messages make the MES follow the procedure in clause 4.3.1.2. If no such immediate assignment is received, the MES returns to idle mode (listening to its paging channel). The MES is not allowed to make a new attempt to establish a non-emergency RR connection in the same spotbeam until T3122 expires. Provided that an IMMEDIATE ASSIGNMENT REJECT message has not been received for an emergency RR connection attempt, the MES may attempt to establish an RR connection for an emergency call in the same spotbeam before T3122 has expired.

The Wait Indication lE (i.e., T3122) relates to the spotbeam from which it was received.

After T3122 expiration, no CHANNEL REQUEST message shall be sent as a response to a page until a PAGING REQUEST message for the MES is received.

4.3.1.4 Assignment completion

The immediate assignment procedure is terminated on the network side when the main signalling link is established. Timer T3101 is stopped and the MM sublayer on the network side is informed that an RR connection exists. On the MES side, the procedure is terminated when the establishment of the main signalling link is confirmed. The MM sublayer is informed that an RR connection exists.

4.3.1.5 Abnormal Cases

If a lower layer failure occurs on the MES side on the new channel before the successful establishment of the main signalling link, the allocated channels are released; the subsequent behavior of the MES depends on the type of failure and previous actions:

a) If the failure is due to information field mismatch in the contention resolution procedure, see clause 4.1.5, and no repetition as described in this clause has been performed, the immediate assignment procedure shall be repeated;

b) If the failure is due to any other reason or if a repetition triggered by a contention resolution failure has been performed. The MES returns to idle mode (RR connection establishment failure), transactions in progress are aborted and spotbeam reselection then may take place.

If the information available in the MES, after the reception of an IMMEDIATE ASSIGNMENT message does not satisfactorily define a channel, an RR connection establishment failure has occurred.

On the network side, if timer T3101 elapses before the main signalling link is established, the newly allocated channels are released and the request is forgotten. Note that the network has no means to distinguish repeated attempts from initial attempts from a MES.

4.3.2 Paging procedure

The network can initiate the establishment of an RR connection by the paging procedure. Such a procedure can only be initiated by the network. See figure 4.3.2.

4.3.2.1 Paging initiation by the network

MESs are assigned to either the S-HPACH or S-PCH paging channels. Fixed MESs which can become mobile or handheld are assigned to the S-HPACH. Fixed terminals which can never become mobile or handheld are assigned to the S-PCH. Hence, the S-PCH is reserved for paging of a fixed MES in a point-to-point network. Since such a network is a future application of the S-PCH, the network and the MES are not required to implement the S-PCH functionality.

There are only two type of paging message available:

- PAGING REQUEST - HPACH IMSI, on the S-HPACH
- PAGING REQUEST - Type 1 on the S-PCH

4.3.2.1.1 S-HPACH logical channel use

The network initiates the paging procedure by broadcasting a paging request message on the appropriate paging subchannel, and starts timer T3113. The paging subchannel is specified in GMR-2 05.002 [23].

The MES is required to receive and analyze the paging messages sent on the paging subchannel corresponding to its paging subgroup, as specified in GMR-2 05.002 [23].

MESs assigned to the S-HPACH shall have the capability to decode and ignore the PAGING REQUEST - Type 1 messages when present on the S-PCH as specified in GMR-2 05.002 [23].

MESs assigned to the S-HPACH shall ignore the Page Mode IE, clause 11.5.2.26 in the Immediate Assignment, clause 10.1.18 and in the Immediate Assignment Reject, clause 10.1.20.

4.3.2.1.2 S-PCH logical channel use

[Reserved]

4.3.2.1.3 Paging process

The paging process is used by the network to notify MESs of incoming calls. The gateway MSC initiates the paging procedure by sending a paging message to the GSC. The GSC passes the message to the NCC and the NCC sends a paging message (PAGING REQUEST message) to the MES. When the MES receives the page from the NCC, what happens next depends on whether the MES is in advantaged or disadvantaged mode. If the MES is in advantaged mode, then the MES may respond immediately by initiating the immediate assignment procedure. If the MES is in disadvantaged mode, then the user must get the MES in advantaged mode (for example, by extending the antenna and/or going outside). Once the transition to advantaged mode is successful, the MES can initiate the immediate assignment procedure and call set up may proceed.

The gateway MSC shall initiate a page sequence in the NCC by sending a page request message to the GSC. The GSC shall then pass this message to the NCC. The gateway MSC shall use two timers, TPAG and Thpa, to control its part of the paging process. The NCC shall be capable of transmitting a unique paging sequence in every spotbeam in the system. A paging sequence shall consist of 5 or less separate page attempts transmitted from the NCC to an MES. The number of page attempts shall be NCC configurable.

The amount of time between each page attempt from the NCC shall be configurable by the network operator. To facilitate this, the NCC shall use five T3113 timers, each timer associated with a page attempt.

The NCC shall transmit each page attempt with a distinct pre-configured power level.

The NCC shall provide the capability for the Network Operator to reduce the power level of each page attempt in the paging sequence during periods of high satellite usage.

The NCC shall have the capability to provide an overload indication to other elements in the ground network.The parameter HPA Timer represents the amount of time the user has to respond to a page request. The NCC shall transmit the value of HPA on the S-BCCH using the HPA/HMS IEI, clause 11.5.2.47. The value of HPA Timer should be set equal to the value of the T3113 timer associated with the last NCC page attempt. The remaining T3113 timers should be set to values less than the last T3113 timer (ie, less than the value of HPA_Timer), so that the MES does not abandon the paging process prematurely. Table 4.3.2 and figure 4.3.3 shows the required setting for HPA Timer for the case of two page attempts.

The MES shall have the capability to know how long it has to respond to a page. When the MES receives a page from the NCC it shall set a "page response" timer to the value of HPA Timer and start a count down. The "page response" timer shall be stopped when the MES sends the Channel Request (Answer to Paging) message to the NCC. If the MES receives another page from the NCC before being able to respond to any page in the paging sequence (i.e., a second, third, fourth or fifth page attempt) the MES shall reset the "page response" timer to the value of HPA Timer and start the count down again. If the "page response" timer expires, the MES shall indicate to the user that the paging process has been terminated by the network and return to idle mode.

Table 4.3.2 summarizes the parameters used by the paging process.

Table 4.3.2: Summary of the Paging Process Parameters

Parameter	Description	Element	Range
TPAG	MSC Paging Timer. When this timer expires the MSC starts Thpa.	MSC	0 seconds to 10 seconds
Thpa	MSC High Penetration Alerting timer. This timer is an extended paging timer used to give the user time to get the MES in advantaged mode if necessary	MSC	0 seconds to-120 seconds
T3113a T3113b T3113c T3113d T3113e	NCC Paging timers. Amount of time the NCC waits before sending another page attempt. If it is the last page attempt then it is the remaining HPA Timer time, if any, the MES has to respond to the page request (which is equal to the value of HPA Timer).	NCC	0 seconds to 130 seconds
HPA Timer	Parameter broadcast on the S-BCCH that tells the user how long it has to respond to the last page request (clause 11.5.2.47). HPA Timer = duration of the last T3113 timer.	NCC	0 seconds to 130 seconds
Number of Paging Attempts	Number of Paging Attempts	NCC	1-5 attempts

The NCC shall be capable of processing the Channel Request message response to the page starting from the first page attempt until the expiration of the T3113 timer associated with the last page attempt. The NCC shall be capable of processing the Channel Request message response to the page starting from the first page attempt until the expiration of the T3113 timer associated with the last page attempt.

When the NCC sends the first page to the MES, the T3113a timer is started. The T3113a timer is stopped if the NCC receives a channel request message in response to the page. If the T3113a timer expires however, the NCC sends another page to the MES (assuming that the paging process is configured to use at least two page attempts), starts the T3113b timer and waits for a response from the MES to either page attempt. The NCC continues in this fashion until it receives a response to a page attempt or the timer associated with the last page attempt expires.

The NCC shall terminate the paging process when the T3113 timer associated with the last page attempt expires. If the NCC receives a channel request in response to a page after the last T3113 timer has expired, the NCC shall ignore the channel request message.

The gateway MSC shall be capable of processing the SABM message response to the page starting from when the page request message is sent until the expiration of Thpa.

When the MSC sends a page request message, the MSC shall start timer TPAG. If TPAG expires, the MSC shall start timer Thpa. When the MSC receives an SABM message in response to a page, the MSC shall stop the TPAG or Thpa timer, whichever one is counting down, and proceed with the call.

The gateway shall clearthe call if Thpa expires.

The MSC timers, TPAG and Thpa, and the NCC T3113 timers must be set in a coordinated fashion. The sum of the MSC timers shall be set slightly greater than the sum of the NCC timers, i.e.,
TPAG + Thpa > T3113a + T3113b + T3113c + T3113d + T3113e. This relationship ensures that the MSC Thpa will not timeout before the NCC T3113 timer associated with the last page attempt to allow for the time it takes for the network to complete the assignment of an S-SDCCH, i.e., the time between when the MES sends the channel request message response (on the S-RACH) to the NCC and when the MES sends the SABM response (on the assigned S-SDCCH) to the gateway.

The time relationships between the NCC and MSC paging timers and the parameter HPA Timer are illustrated in figure 4.3.1 for the case of two page attempts.

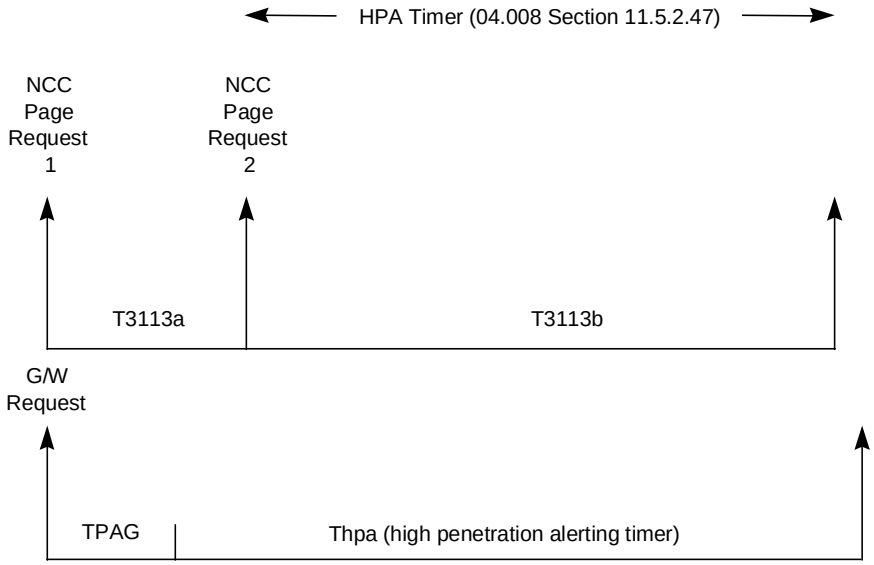

Figure 4.3.1: Relationship of Timers Used for the Paging Process When Two Page Attempts are Used

4.3.2.2 Paging response

When the MES receives a page from the NCC, the MES shall initiate the immediate assignment procedure as specified in clause 4.3.1 within 0,7 second, exclusive of user interaction time. The establishment of the main signalling link is then initiated by use of an SABM with information field containing the PAGING RESPONSE message (see clause 4.1.5). The MM sublayer in the MES is informed that a RR connection exists.

Upon receipt of the CHANNEL REQUESTmessage the network stops the T3113 timer. The MM sublayer in the network is informed that a RR connection exists.

The following describes typical paging sequences.

The normal paging sequence occurs when each step in the Paging Process is successful and takes less than TPAG seconds as shown in figure 4.3.2.

The gateway MSC initiates the Mobile Earth Station (MES) paging procedure by sending a PAGING message to the GSC and starts the timer, TPAG. The GSC then sends a PAGE COMMAND message to the NCC. The NCC initiates paging by broadcasting a Paging Request message in the appropriate S-HPACH block, and starts timer T3113a. When the MES receives the page, the MES will initiate the immediate assignment procedure with a CHANNEL REQUEST message response on the S-RACH. Upon receipt of CHANNEL REQUEST message, the network stops timer T3113a, and sends a CHANNEL REQUIRED message to the GSC. The GSC makes an S-SDCCH assignment, sends the assignment to the NCC in an IMMEDIATE ASSIGNMENT COMMAND message, and starts timer T3101. The NCC sends an Immediate Assignment message to the MES. When the MES receives this message it tunes to the assigned channel and initiates the main signalling link by sending an SABM message with information field containing the Paging Response message. Upon receipt of the message, the TCE responds with a Layer 2 UA message which confirms that the main signalling link is established with the network.

Upon receipt of the PAGING RESPONSE message, the GSC stops timer T3101 since a radio resource connection exists between the network and the MES. The GSC sends the Layer 3 information in the PAGING RESPONSE message to the MSC. Upon receipt, the MSC stops the TPAG and proceeds with the call.

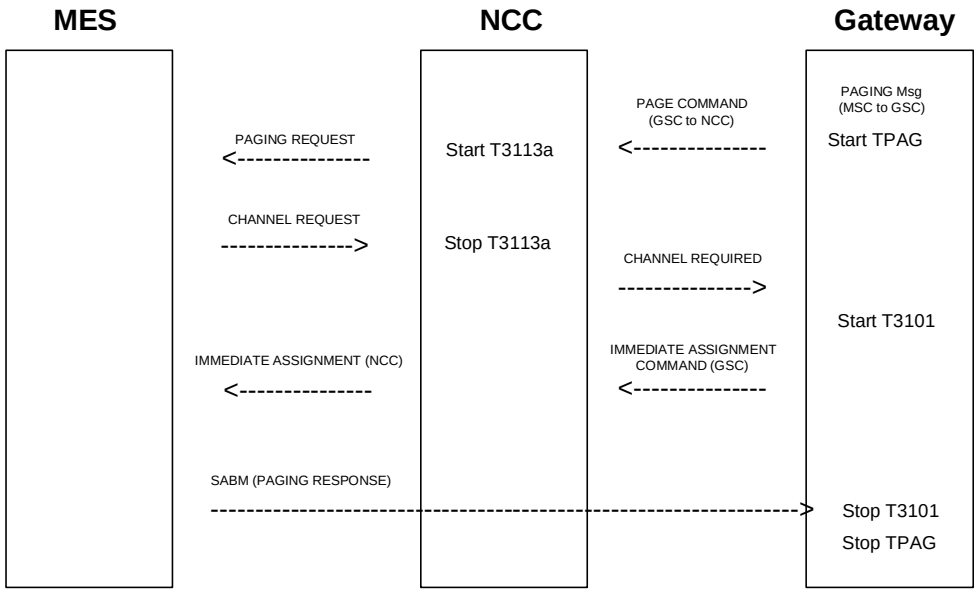

Figure 4.3.2: Normal Paging Sequence

A case where the response to the page is longer than TPAG seconds is shown in figure 4.3.3. This sequence is exactly the same as figure 4.3.2 except that TPAG expires and Thpa is started. When TPAG expires, the MSC starts Thpa and the Voice Prompt to the calling party to inform them that the network is performing extend paging. When the MSC receives the PAGING RESPONSE message, it stops timer Thpa, stops the voice prompt, and starts the connection process with the MES.

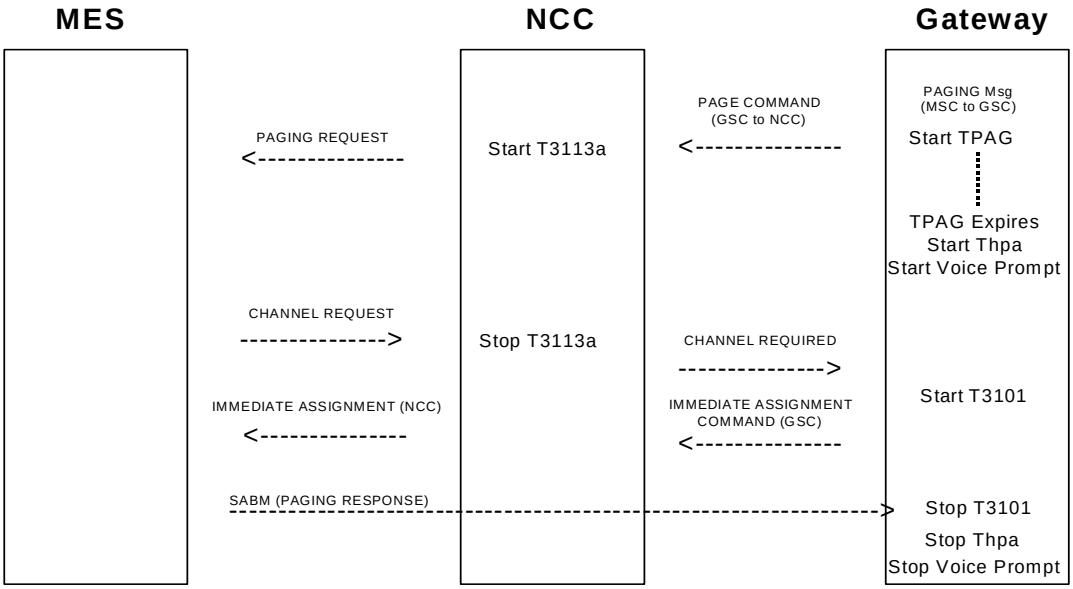

Figure 4.3.3: Normal Paging Sequence With Delay

The normal paging sequences shown in figures 4.3.2 and 4.3.3 occur when each step in the paging sequence is successful. In reality, a number of occurrences in an operational system can cause changes in the paging sequence. A repeated paging sequence is shown in figure 4.3.4 using two paging attempts.

If a PAGING REQUEST message is sent and timer T3113a expires in the NCC without receipt of a valid CHANNEL REQUEST message, the NCC repeats the PAGING REQUEST message.

If the MES is in disadvantaged mode, the MES may receive and decode paging messages from the NCC, however it cannot respond immediately. The MES signals the user that action is required to transition to advantaged mode (such as extending the antenna and/or going outside) before sending the CHANNEL REQUEST message. The reliance on operator interaction may cause the MES CHANNEL REQUEST message to reach the NCC after the timer T3113a expires. In this case, the PAGING REQUEST message is repeated and timer T3113b is started. If the CHANNEL REQUEST message is received by the NCC before T3113b expires, the NCC is able to successfully interpret the message as a response to the page and will respond as shown in figure 4.3.4. If not, the NCC is unable to correlate the message with the page because the paging process has been terminated and ignores the CHANNEL REQUEST message.

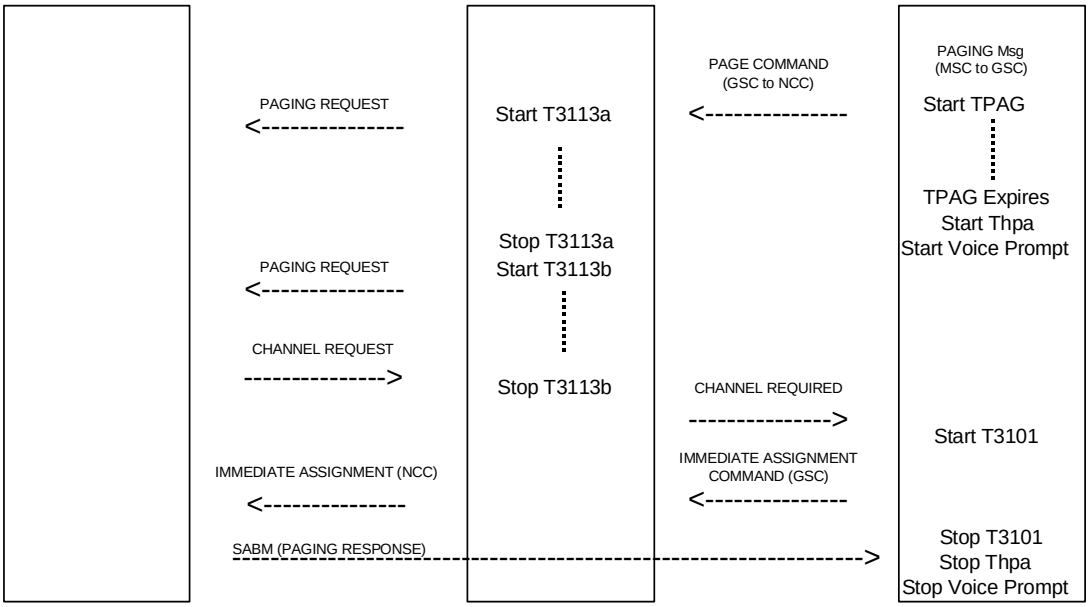

Figure 4.3.4: Repeated Paging Sequence

When the MES is unable to respond to a paging request message, the timers in the NCC and MSC expire and the NCC and MSC terminate the paging process. This sequence is shown in figure 4.3.5. There is no exchange of messages between the NCC and the MSC to communicate that they have terminated the paging process. That is, when Thpa expires, the MSC stops the voice prompt and terminates the paging process. The MSC assumes the NCC has also terminated the paging process. When the last T3113 timer in the NCC expires, the NCC terminates the paging process and assumes the MSC has also terminated the process.

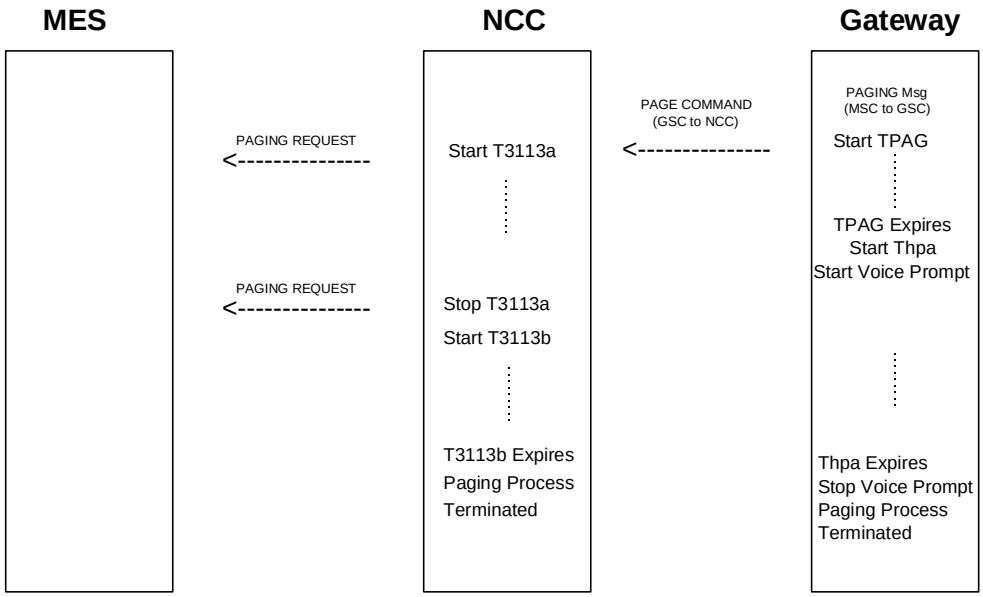

Figure 4.3.5: Paging Sequence With No MES Response

4.3.2.3 Abnormal cases

Lower layer failure occurring during the immediate assignment procedure is treated as specified for that procedure.

4.4 RR Connection Transfer Phase

4.4.1 S-SACCH procedures

4.4.1.1 General

In RR connected mode, the S-SACCH is used in signalling measurement results from the MES.

The S-SACCH has the particularity that continuous transmission must occur in both directions. For that purpose, in the MES to network direction, measurement result messages are sent at each possible occasion when nothing else has to be sent (see clause 4.4.1.2). Similarly, the SYSTEM INFORMATION TYPE 6 message is sent in the network to the MES in UI frames when nothing else has to be sent.

As specified in Technical Specification GMR-2 05.008 [26], problems occurring in the reception of S-SACCH frames are interpreted as a loss of communication and appropriate procedures are then triggered as specified in clause 4.5.2.

4.4.1.2 Measurement report

When in RR connected mode, the MES regularly sends MEASUREMENT REPORT messages to the network. These messages contain measurements results about reception characteristics from the current spotbeam. These measurement results are obtained as specified in Technical Specification GMR-2 05.008 [26]. These messages are sent on the satellite slow ACCH (S-SACCH), in unacknowledged mode. If no other message is scheduled on the S-SACCH at the instant when a Layer 2 frame is due to be sent, then the MES shall send a MEASUREMENT REPORT message in that frame. The interval between two successive Layer 2 frames containing MEASUREMENT REPORT messages shall not exceed one Layer 2 frame.

4.4.2 Transfer of messages and link layer service provision

When a RR connection is established, upper layers can send messages in multiframe or unacknowledged mode on SAPI 0. Moreover, upper layers have access to the full link layer services for SAPIs other than 0, with the exception of the error indication and local end release that are directly treated by the RR sublayer, as specified in particular places of clause 4.

4.4.3 Channel assignment procedure

An intraspotbeam change of channel can be requested by upper layers for changing the channel type, or decided by the RR sublayer, e.g., for an internal handover. This change may be performed through the dedicated channel assignment procedure. The purpose of the channel assignment procedure is to completely modify the physical channel configuration of the MES without change in synchronization while staying in the same spotbeam.

This procedure shall not be used for changing between dependent configurations, i.e., those sharing Radio Resource.

The channel assignment procedure happens only in RR connected mode. This procedure cannot be used in the idle mode; in this case the immediate assignment procedure is used.

The channel assignment procedure includes:

a) The suspension of normal operation except for RR management (Layer 3);

b) The release of the main signalling link, and of the other Data Links as defined in clause 4.1.4, and the disconnection of S-TCHs, if any;

c) The deactivation of previously assigned channels (Layer 1);

d) The activation of the new channels and their connection if applicable;

e) The triggering of the establishment of the Data Link connections for SAPI = 0.

The channel assignment procedure is always initiated by the network.

4.4.3.1 Channel assignment initiation

The network initiates the channel assignment procedure by sending an ASSIGNMENT COMMAND message to the MES on the main signalling link. It then starts timer T3107.

When sending this message on the network side, and when receiving it on the MES side, all transmission of signalling layer messages except for those RR messages needed for this procedure and for abnormal cases is suspended until resumption is indicated. These RR messages can be deduced from clauses 4.4.3 and 9.8 Radio Resource management.

Upon receipt of the ASSIGNMENT COMMAND message, the MES initiates a local end release of link layer connections, disconnects the physical channels, commands the switching to the assigned channels and initiates the establishment of lower layer connections (this includes the activation of the channels, their connection and the establishment of the main signalling links).

The ASSIGNMENT COMMAND message contains the description of the new configuration and the exact satellite ACCHs to be used and a power command. The power level defined in this power command shall be used by the MES for the initial power on the new channel(s). It shall not affect the power used on the old channel(s).

The ASSIGNMENT COMMAND message may contain a cipher mode setting lE. In that case, this mode has to be applied on the new channel. If no such information is present, the ciphering mode is the same as on the previous channel. In either case, the ciphering key shall not be changed. The ASSIGNMENT COMMAND message shall not contain a cipher mode setting lE that indicates "start ciphering" unless a CIPHERING MODE COMMAND message has been transmitted earlier in the RR connection. If such an ASSIGNMENT COMMAND message is received, it shall be regarded as erroneous, an ASSIGNMENT FAILURE with cause "Protocol error unspecified" message shall be returned immediately, and no further action taken.

4.4.3.2 Assignment completion

After the main signalling link is successfully established, the MES returns an ASSIGNMENT COMPLETE message, specifying cause "normal event," to the network on the main S-DCCH. The sending of this message on the MES side and its receipt on the network side allow the resumption of the transmission of signalling layer messages other than those belonging to RR management.

At the receipt of the ASSIGNMENT COMPLETE message, the network releases the previously allocated resources and stops timer T3107.

4.4.3.3 Abnormal cases

If the ASSIGNMENT COMMAND message instructs the MES to use a Channel Description or Mode that it does not support, then the MES shall return an ASSIGNMENT FAILURE message with cause "channel mode unacceptable," and the MES shall remain on the current channel(s) and uses the old Channel Description or Channel Mode.

If the ASSIGNMENT COMMAND message instructs the MES to use a frequency that it is not capable of, then the MES shall return an ASSIGNMENT FAILURE message with cause "frequency not implemented," and the MES shall remain on the current channel(s).

On the MES side, if a lower layer failure happens on the new channel before the ASSIGNMENT COMPLETE message has been sent, the MES deactivates the new channels, reactivates the old channels, reconnects the S-TCHs if any and triggers the establishment of the main signalling link. It then sends a ASSIGNMENT FAILURE message, cause "protocol error unspecified" on the main S-DCCH and resumes the normal operation, as if no assignment attempt had occurred. The operational parameters (e.g., ciphering mode) when returning on the old channel are those applied before the procedure.

When receiving the ASSIGNMENT FAILURE message, the network stops T3107. If a lower layer failure happens while attempting to connect back to the old channels, the radio link failure procedure is applied (see clause 4.5.2).

On the network side, if timer T3107 elapses before either the ASSIGNMENT COMPLETE message has been received on the new channels, an ASSIGNMENT FAILURE message is received on the old channels, or the MES has re-established the call, the old channels and the new channels are released and all contexts related to the connections with that MES are cleared.

On the network side, lower layer failure occurring on the old channels after the sending of the ASSIGNMENT COMMAND message are ignored. Lower layer failures occurring after the receipt of the SABM Frame on the new main signalling link are treated following the general rules (see clause 4.5.2).

4.4.4 Handover procedure

This clause does not apply to the GMR-2 system.

4.4.5 Frequency redefinition procedure

This clause does not apply to the GMR-2 system.

4.4.6 Channel mode modify procedure

Higher layers can request a change of the channel mode. The channel mode modify procedure allows the network to request the MES to change the channel mode for one channel. The channel mode covers the coding, decoding and transcoding mode used on the indicated channel.

This procedure is always initiated by the network.

4.4.6.1 Initiation of the channel mode modify procedure

The network initiates the procedure by sending a CHANNEL MODE MODIFY message to the MES. This message contains:

a) A channel description of the channel on which the CHANNEL MODE MODIFY message is sent; and

b) The new mode to be used on the channel.

4.4.6.2 Completion of mode change procedure

When it has received the CHANNEL MODE MODIFY message, the MES changes the mode for the indicated channel and then replies by a CHANNEL MODE MODIFY ACKNOWLEDGE message indicating the new channel mode.

4.4.6.3 Abnormal cases

No specific action for a lower layer failure is specified in this clause. If the MES does not support the indicated mode, it shall retain the old mode and return the associated channel mode information in the CHANNEL MODE MODIFY ACKNOWLEDGE message.

4.4.7 Ciphering mode setting procedure

The ciphering mode setting procedure is used by the network to set the ciphering mode, i.e., whether or not the transmission is ciphered, and if so, which algorithm to use. The procedure shall only be used to change from "not ciphered" mode to "ciphered" mode, or vice-versa, or to pass a CIPHERING MODE COMMAND message to the MES while remaining in the "not ciphered" mode. The ciphering mode setting procedure is always triggered by the network and it only applies to dedicated resources.

4.4.7.1 Ciphering mode setting initiation

The network initiates the ciphering mode setting procedure by sending a CIPHERING MODE COMMAND message to the MES on the main signalling link, indicating whether ciphering shall be used or not, and if yes, which algorithm to use. Additionally, the network may, by the use of the cipher response information element, request the MES to include its IMEISV in the CIPHERING MODE COMPLETE message. The new mode is applied for reception on the network side after the message has been sent.

4.4.7.2 Ciphering mode setting completion

Whenever the MES receives a valid CIPHERING MODE COMMAND message, it shall load the ciphering key stored on the SIM. A valid CIPHERING MODE COMMAND message is defined to be one of the following:

a) One that indicates "start ciphering" and is received by the MES in the "not ciphered" mode;

b) One that indicates "no ciphering" and is received by the MES in the "not ciphered" mode; or

c) One that indicates "no ciphering" and is received by the MES in the "ciphered" mode.

Other CIPHERING MODE COMMAND messages shall be regarded as erroneous, an RR STATUS message with cause "Protocol error unspecified" shall be returned, and no further action taken.

Upon receipt of the CIPHERING MODE COMMAND message indicating ciphering, the MES shall start transmission and reception in the indicated mode.

When the appropriate action on the CIPHERING MODE COMMAND has been taken, the MES sends back a CIPHERING MODE COMPLETE message. If the "cipher response" field of the cipher response information element in the CIPHERING MODE COMMAND message specified "IMEI must be included" the MES shall include its IMEISV in the CIPHERING MODE COMPLETE message.

Upon receipt of the CIPHERING MODE COMPLETE message or any other correct Layer 2 frame which was sent in the new mode, the network starts transmission in the new mode.

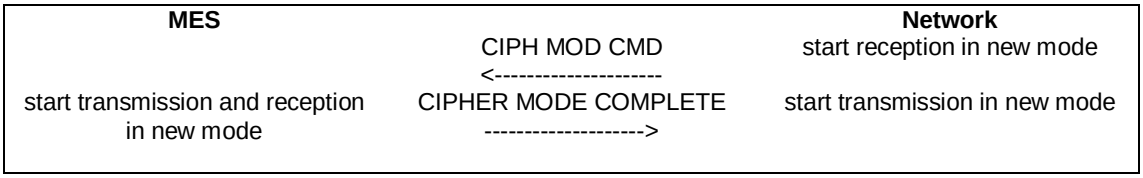

Figure 4.4.1: Ciphering Mode Setting Sequence

4.4.8 Additional channel assignment procedure

This clause does not apply to the GMR-2 system.

4.4.9 Partial channel release procedure

This clause does not apply to the GMR-2 system.

4.4.10 Classmark change procedure

This procedure allows the MES to indicate to the network a change in the classmark (e.g., due to addition of power amplification). The MES sends a CLASSMARK CHANGE message to the network. This message contains the new MES classmark 2 information element. There is no acknowledgement at Layer 2 when the user terminal is in a mobile-to-mobile single hop connection.

4.4.11 Classmark interrogation procedure

This procedure allows the network to request additional classmark information from the MES (e.g., if the information initially sent by the MES is not sufficient for network decisions). This procedure shall not be used after a mobile-to-mobile single hop connection is established through the satellite.

4.4.11.1 Classmark interrogation initiation

The network initiates the classmark interrogation procedure by sending a CLASSMARK ENQUIRY message to the MES on the main S-DCCH.

4.4.11.2 Classmark interrogation completion

On receipt of the CLASSMARK ENQUIRY message the MES sends a CLASSMARK CHANGE message to the network on the main S-DCCH. This message contains the MES classmark 2 information element.

4.5 RR connection release procedure

4.5.1 Normal release procedure

The release of the RR connection can be requested by upper layers. The purpose of this procedure is to deactivate all the dedicated channels in use. When the channels are released, the MES returns to the S-CCCH configuration, idle mode. The channel release procedure can be used in a variety of cases, including S-TCH release after a call release, and S-DCCH release when a dedicated channel allocated for signalling is released. The channel release procedure is always initiated by the network.

4.5.1.1 Channel Release Procedure Initiation

The network initiates the channel release by sending a CHANNEL RELEASE message to the MES on the main S-DCCH, starts timer T3109 and deactivates the S-SACCH. On receipt of a CHANNEL RELEASE message the MES starts timer T3110 and disconnects the main signalling link. When T3110 times out, or when the disconnection is confirmed, the MES deactivates all channels, considers the RR connection as released, and returns to idle mode.

NOTE: Data Links other than the main signalling link are disconnected by local end link release.

On the network side, when the main signalling link is disconnected, the network stops timer T3109 and starts timer T3111. When timer T3111 times out, the network deactivates the channels, they are then free to be allocated to another connection.

NOTE: The sole purpose of timer T3111 is to let some time to acknowledge the disconnection and to protect the channel in case of loss of the acknowledge frame.

If timer T3109 times out, the network deactivates the channels. They are then free to be allocated to another connection.

The CHANNEL RELEASE message will include an RR cause indication as follows:

a) #0 if it is a normal release, e.g., at the end of a call or at normal release of a S-DCCH;

b) #1 to indicate an unspecified abnormal release;

c) #2, #3 or #4 to indicate a specific release event;

d) #8 to indicate a network activated Local Transmit Disable. Upon receipt of a Local Transmit Disable cause, the MES shall provide a Local Transmit Disable indication to the User.

4.5.1.2 Abnormal cases

Abnormal cases are taken into account in the main part of the description of the procedure.

4.5.2 Radio link failure

The main part of these procedures concerns the "normal" cases, i.e., those without any occurrence of loss of communication means. A separate clause at the end of the description of each procedure treats the cases of loss of communication, called a radio link failure. In RR connected mode, in most of the cases the reaction of the User Terminal or the network is the same. Those reactions are described in this clause to avoid repetitions.

A radio link failure can be detected by several ways:

a) By analysis of reception at Layer 1, as specified in GMR-2 05.008 [26] and clause 4.4.1.1;

b) By a Data Link layer failure as specified in GMR-2 04.006 [15], on the main signalling link. A Data Link failure on any other Data Link shall not be considered as a radio link failure;

c) When a lower layer failure happens while the MES attempts to connect back to the old channels in a channel assignment procedure;

d) In some cases where timers are started to detect the lack of answer from the other party, described in clause 4.

The two first cases are known by the term "lower layer failure."

4.5.2.1 Mobile side

When a radio link failure is detected by the MES:

a) The MES shall perform a local end release on all signalling links unless otherwise specified;

b) The MES shall deactivate all channels;

c) The RR sublayer of the MES shall indicate an RR connection failure to the MM sublayer unless otherwise specified.

NOTE: Upper layers may decide on a re-establishment (see clause 6.5.4).

4.5.2.2 Network side

In RR connected mode, the reaction of the network to a lower layer failure depends on the context. Except when otherwise specified, it is to release the connection either with the channel release procedure as specified in clause 4.5.1, or with the following procedure. The network starts timer T3109 and deactivates the S-SACCH (and hence to stop transmission on the S-SACCH).

When a radio link failure has been detected, an indication is passed to the upper Mobility Management sublayer on the network side.

When timer T3109 expires, the network can regard the channels as released and free for allocation. This procedure relies on the fact that if a MES does not receive the S-SACCH for some time, it completely releases the channels (see GMR-2 05.008 [26]).

4.5.3 RR connection abortion

The MES aborts the RR connection by initiating a normal release of the main signalling link, performing local end releases on all other signalling links and disconnecting all traffic channels, if any.

4.6 Receiving a RR STATUS message by a RR entity.

If the RR entity of the MES receives a RR STATUS message, no transition and no specific action shall be taken as seen from the radio interface, i.e., local actions are possible. The actions to be taken on receiving a RR STATUS message in the network are an implementation dependent option (see also clause 9).

5 Elementary procedures for mobility management

5.1 General

This clause describes the procedures used for Mobility Management at the radio interface (Reference Point Um).

The main function of the Mobility Management sublayer is to support the mobility of MESs, such as informing the network of its present location and providing user identity confidentiality.

A further function of the MM sublayer is to provide connection management services to the different entities of the upper Connection Management (CM) sublayer (see GMR-2 04.007 [16]).

All the MM procedures described in this clause can only be performed if a RR connection has been established between the User Terminal and the Network. Else the MM sublayer has to initiate the establishment of a RR connection according to the procedures specified in clause 4.3.

5.1.1 Type of MM Procedures

Depending on how they can be initiated, three types of MM procedures can be distinguished:

1) MM common procedures:

   A MM common procedure can always be initiated while a RR connection exists. The procedures belonging to this type are:

   i) Initiated by the network:

   ii) Authentication procedure;

   iii) Identification procedure;

2) MM specific procedures:

   A MM specific procedure can only be initiated if no other MM specific procedure is running or no MM connection exists. The procedures belonging to this type are:

   a) normal location updating procedure;

   b) periodic updating procedure;

3) MM connection management procedures:

   These procedures are used to establish, maintain and release a MM connection between the MES and the Network, over which an entity of the upper CM layer can exchange information with its peer. A MM connection establishment can only be performed if no MM specific procedure is running. More than one MM connection may be active at the same time.

5.1.2 MM sublayer states

The description of the states for the MM subIayer is organized as follows. The main states for the MES side, related to the procedures, are described in clause 5.1.2.1.1. The MM IDLE state is subdivided in substates for the description of the behavior in idle mode (clause 5.1.2.1.2). This behavior depends on an update status, described in clause 5.1.2.2. The states for the network side are described in clause 5.1.2.3.

5.1.2.1 MM sublayer states in the MES

In this clause the possible states for the MM sublayer in the Mes is described. In figure 5.1.1 an overview of the MM sublayer protocol is given.

5.1.2.1.1 Main states

0 NULL
The MES is inactive (e.g., power down). Important parameters are stored. Only manual action by the user may transfer the MM sublayer to another state.

3 LOCATION UPDATING INITIATED
A location updating procedure has been started and the MM awaits a response from the network. The timer T3210 is running.

5 WAIT FOR OUTGOING MM CONNECTION
The MM connection establishment has been started, and the MM awaits a response from the network. The timer T3230 is running.

6 MM CONNECTION ACTIVE
The MM sublayer has a RR connection to its peer entity on the network side. One or more MM connections are active.

7 IMSI DETACH INITIATED

9 WAIT FOR NETWORK COMMAND
The MM sublayer has a RR connection to its peer entity in the network, but no MM connection is established. The MES is passive, awaiting further commands from the network. The timer T3240 may be running.

10 LOCATION UPDATE REJECTED
A location updating procedure has been rejected and RR connection release is awaited. The timer T3240 is running.

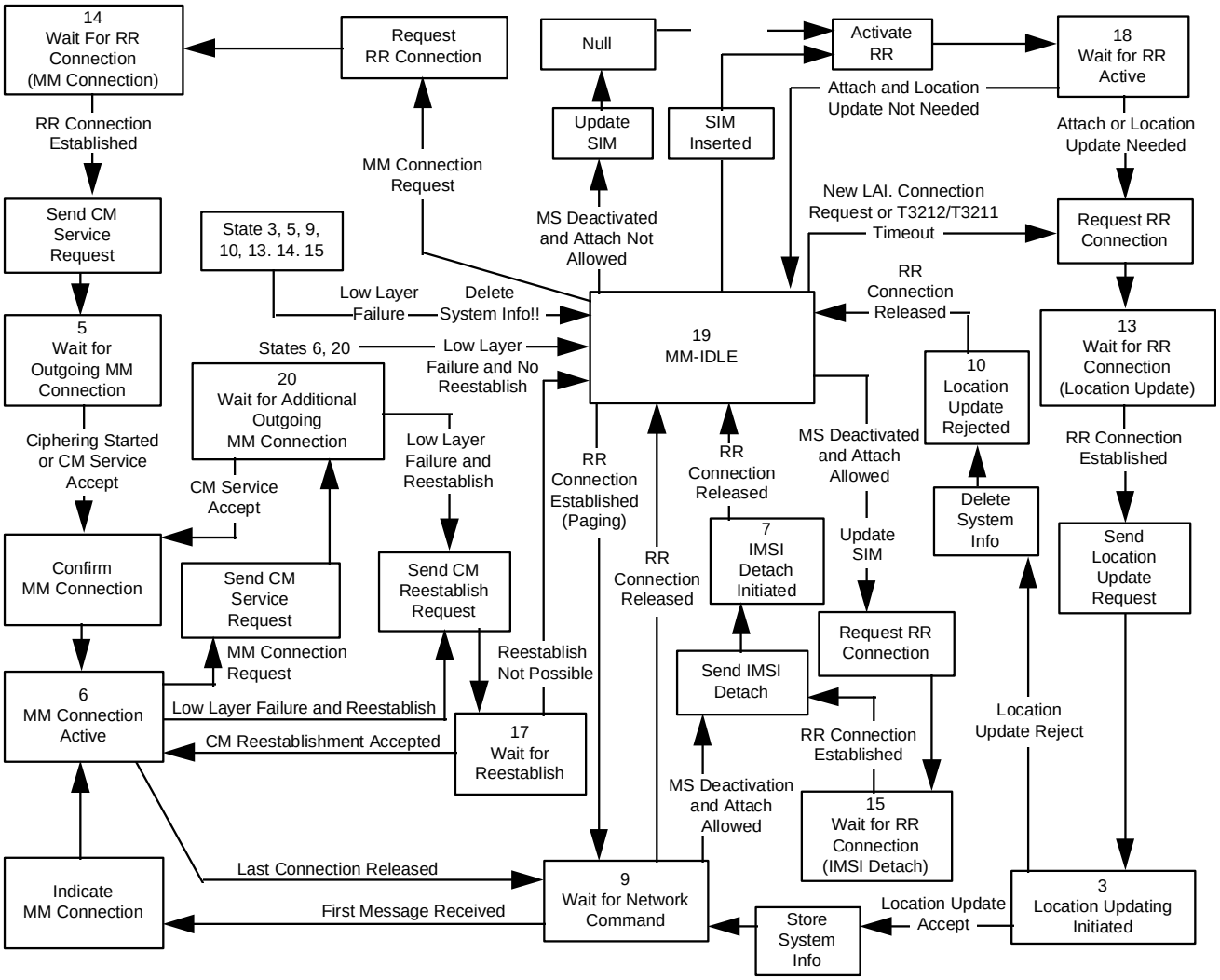

Figure 5.1.1: Overview mobility management protocol / MES side

13 WAIT FOR RR CONNECTION (LOCATION UPDATING)
The MM sublayer has requested RR connection establishment for starting the location updating procedure.

14 WAIT FOR RR CONNECTION (MM CONNECTION)
The MM sublayer has requested RR connection establishment for starting the MM connection establishment.

15 WAIT FOR RR CONNECTION (IMSI DETACH)

17 WAIT FOR REESTABLISH

18 WAIT FOR RR ACTIVE
The MM sublayer has requested activation of the RR sublayer.

19 MM IDLE
There is no MM procedure running and no RR connection exist. This is a compound state, and the actual behavior of the MES to Connection Management requests is determined by the actual substate as described hereafter.

20 WAIT FOR ADDITIONAL OUTGOING MM CONNECTION
The MM connection establishment for an additional MM connection has been started, and the MM awaits response from the network.

5.1.2.1.2 Substates of the MM idle state

For the description of the behaviour of the MES in the MM IDLE state is subdivided in several substates, also called the service states. The service state pertains to the whole MES (ME-MES alone if no SIM is inserted, or ME-MES plus SIM.). The service state depends on the update status (see clause 5.1.2.2) and on the selected spotbeam.

19.1 NORMAL SERVICE
Valid subscriber data are available, update status is U1, a spotbeam is selected that belongs to the LA where the subscriber is registered. In this state, all requests from the CM layers are treated normally.

19.2 ATTEMPTING TO UPDATE
Valid subscriber data are available, update status is U2 and a spotbeam is selected. Requests from upper layers are accepted. Emergency call requests are treated normally, otherwise the request triggers first a location updating attempt in the selected spotbeam, and then triggers the needed procedure only in case of successful location updating, otherwise the request is rejected

19.3 LIMITED SERVICE
Valid subscriber data are available, update status is U3, and a spotbeam is selected, which is known not to be able to provide normal service. Only emergency services are offered.

19.4 NO IMSI
No valid subscriber data (no SIM, or the SIM is not considered valid by the ME-MES), and a spotbeam is selected. No services are offered.

19.5 NO SPOTBEAM AVAILABLE
No spotbeam can be selected. This state is entered after a first intensive search failed (state 19.7). Spotbeams are searched at a low rhythm. No services are offered.

19.6 LOCATION UPDATE NEEDED
Valid subscriber data are available, and for some reason a location updating must be done as soon as possible, for instance update status is U1 but the selected spotbeam is not in the registered LA, or the timer has expired. This state is usually of no duration, but can last, e.g., in the case of access class blocking.

19.7 PLMN/PSMN SEARCH
The MES is searching for PLMNs, and the conditions for state 19.8 are not met. This state is ended when either a cell is selected (the new state is 19.1, 19.3 or 19.6), or when it is concluded that no cell is available for the moment (the new state is 19.5).

19.8 PLMN/ PSMN SEARCH, NORMAL SERVICE
Valid subscriber data are available, update status is U1, a cell is selected which belongs to the LA where the subscriber is registered, and the MES is searching for PLMNs. This state is ended when either a cell is selected (the new state is 19.1, 19.3 or 19.6), or when it is concluded that no cell is available for the moment (the new state is 19.5).

5.1.2.2 Update status

In parallel with the sublayer states described in clause 5.1.2.1 and which control the MM sublayer protocol, an update status exists. The update status pertains to a specific subscriber embodied by a SIM. This status is defined even when the subscriber is not activated (SIM removed or connected to a switched-off ME). It is stored in a non volatile memory in the SIM. The update status is changed only as a result of a location updating procedure attempt (with the exception of an authentication failure and of some cases of CM service rejection).

U1 UPDATED
The last location updating attempt was successful (correct procedure outcome, and the answer was acceptance from the network). With this status, the SIM contains also the LAl of the LA where the subscriber is registered, a ciphering key and ciphering key sequence number. The "Location update status" stored on the SIM be "updated."

U2 NOT UPDATED
The last location updating attempt made failed procedurally (no significant answer was received from the network, including the cases of failures or congestion inside the network) For this status, the SIM does not contain any valid LAI, ciphering key or ciphering key sequence number. For compatibility reasons, all these fields must be set to the "deleted" value at the moment the status is set to NOT UPDATED. However the presence of other values shall not be considered an error by the User Terminal. The "Location update status" stored on the SIM shall be "not updated."

U3 ROAMING NOT ALLOWED
The last location updating attempt ran correctly, but the answer from the network was negative (because of roaming or subscription restrictions). For this status, the SIM does not contain any valid LAI, ciphering key or ciphering key sequence number. For compatibility reasons, all these fields must be set to the "deleted" value at the moment the status is set to ROAMING NOT ALLOWED. However the presence of other values shall not be considered an error by the MES. The "Location update status" stored on the SIM shall be "Location Area not allowed."

5.1.2.3 MM sublayer states on the network side

1 IDLE
The MM sublayer is not active.

2 WAIT FOR RR CONNECTION
The MM sublayer has received a request for MM connection establishment from the CM layer. A RR connection to the MES is requested from the RR sublayer (i.e., paging is performed).

3 MM CONNECTION ACTIVE
The MM sublayer has a RR connection to a MES. One or more MM connections are active.

4 IDENTIFICATION INITIATED
The identification procedure has been started by the network. The timer T3270 is running.

5 AUTHENTICATION INITIATED
The authentication procedure has been started by the network. The timer T3260 is running.

6 TMSI REALLOCATION INITIATED

7 CIPHERING MODE INITIATED
The cipher mode setting procedure has been requested to the RR sublayer.

8 WAIT FOR MOBILE ORIGINATED MM CONNECTION
A CM SERVICE REQUEST message is received and processed, and the MM sublayer awaits the "opening message" of the MM connection.

9 WAIT FOR REESTABLISHMENT

5.2 Behaviour in MM IDLE state

The MM IDLE state is entered when none of the MM procedures are running and no RR connection exists. It is left when one of the MM procedures are triggered or an RR connection is established.

The specific behaviour in the MM IDLE state depends on the service state of the MES as described in clause 5.1.2.1.2. The service state depends in particular on the update status which is defined in clause 5.1.2.2.

How an appropriate service state is chosen after power on is described in clause 5.2.1, and the specific behavior of the MES in MM IDLE state is described in clause 5.2.2. The service state chosen when the MM IDLE state is returned to from any state except NULL state is described in clause 5.2.3.

It should be noted that transitions between the various MM idle states are caused by:

a) results of procedures on RR connected mode (see clause 5.2.3);

b) insertion or removal of the SIM;

c) spotbeam selection/reselection (see also GMR-2 03.022 [10]);

d) Loss of coverage.

How various MM procedures affect the service state and the update status is described in the detailed descriptions of the procedures in clauses 5.3 to 5.5.

5.2.1 Primary service state selection

5.2.1.1 Selection of the service state after power on.

When mobility management is activated after power-on, the service state is 19.7 PLMN/PSMN SEARCH. The detailed processing in this state is described in detail in GMR-2 03.022 [10] and GMR-2 05.008 [26], where procedures for power on and selection of PLMN/PSMN is described in detail. If the "Location update status" stored on the SIM is different from "updated," then the mobile shall act as if the "Location update status" stored on the SIM is "not updated."

The service state when the PLMN/PSMN SEARCH state is left depends on the outcome of the search and on the presence of the SIM:

a) If no spotbeam has been found, the state is NO SPOTBEAM AVAILABLE, until a spotbeam is found;

b) If no SIM is present the state is NO IMSI;

c) If the MES has been continuously activated since loosing coverage and then returns to coverage, and if the selected spotbeam is in the location area where the MES is registered and the timer T3212 has not expired, then the state is NORMAL SERVICE;

d) If the selected spotbeam is in the location area where the MES is registered and timer T3212 has not expired, then the state is NORMAL SERVICE;

e) If the MES is in automatic network selection mode and the selected spotbeam is in a forbidden PLMN or a forbidden LA, then the User Terminal enters the LIMITED SERVICE state;

f) If the MES is in manual network selection mode and no spotbeam has been found, then the MES enters the LIMITED SERVICE state;

g) Otherwise, the MES enters the LOCATION UPDATE NEEDED state.

5.2.1.2 Other cases

The state PLMN SEARCH is also entered in the following cases:

a) In state NO IMSI, a SIM is inserted;

b) In any state except NO IMSI, NO SPOTBEAM AVAILABLE and NORMAL SERVICE, after the user has asked for a PLMN selection/PSMN;

c) In any state except NO IMSI and NO SPOTBEAM AVAILABLE, coverage is lost;

d) National roaming is denied;

e) Optionally, when the MES is in the ATTEMPTING TO UPDATE state and is in Automatic Network Selection mode, after 3 minutes or after 6 unsuccessful LOCATION UPDATING REQUEST messages have been sent.

The service state when the PLMN/PSMN SEARCH is left depends on the outcome of the search and on the presence of the SIM as specified in clause 5.2.1.1.

5.2.2 Detailed description of the MES behaviour in MM IDLE state

In the MM IDLE state the MES shall behave according to the service state. In the following clauses the behaviour is described for the non-transient service states. It should be noted that after procedures in RR connected mode, e.g., location updating procedures, clause 5.2.3 applies which specifies the selection of the MM idle state. Furthermore when in sub-state NORMAL SERVICE, if a PLMN/PSMN selection is requested, the MES enters sub-state PLMN/PSMN SEARCH, NORMAL SERVICE.

5.2.2.1 Service state, NORMAL SERVICE

When in state MM IDLE and service state NORMAL SERVICE, the MES shall:

a) Perform normal location updating when a new location area is entered;

b) Perform location updating procedure at expiration of timer T3211 or T3213;

c) Perform periodic updating at expiration of timer T3212;

d) Support requests from the CM layer;

e) Respond to paging.

5.2.2.2 Service state, ATTEMPTING TO UPDATE.

When in state MM IDLE and service state ATTEMPTING TO UPDATE, the MES shall:

a) Perform location updating procedure at expiration of timer T3211 or T3213;

b) Perform normal location updating when a new spotbeam is entered or the location area identification of the serving spotbeam is changed;

c) Perform normal location updating at expiration of timer T3212;

d) Support request for emergency calls;

e) Use other request from CM layer as triggering of normal location updating procedure (if the location updating procedure is successful, then the request for MM connection is accepted, see clause 4.5.1);

f) Respond to paging (with IMSI).

5.2.2.3 Service state, LIMITED SERVICE

When in state MM IDLE and service state LIMITED SERVICE, the MES shall:

a) Not perform periodic updating;

b) Reject any requests from CM entities for MM connections except for emergency calls;

c) Perform normal location updating when a spotbeam is entered which may provide normal service (e.g., location area not in one of the forbidden LAl lists.);

d) Respond to paging (with IMSI).

5.2.2.4 Service state, NO IMSI

When in state MM IDLE and service state NO IMSI, the MES shall (see clause 4.2 of the present document, GMR-2 03.022 [10] and GMR-2 05.008 [26]):

a) Not start any normal location updating attempt;

b) Not perform periodic updating;

c) Reject any request from CM entities for MM connections;

d) Not respond to paging;

e) Only perform default spotbeam selection.

5.2.2.5 Service state, SEARCH FOR PLMN/PSMN, NORMAL SERVICE

When in state MM IDLE and service state SEARCH FOR PLMN/PSMN, NORMAL SERVICE, the MES shall:

a) If timer T3211 or T323 expires in this state perform a location updating procedure if and when back to NORMAL SERVICE state and if the spotbeam is not changed;

b) If timer T3212 expires in this state perform a periodic location updating procedure if and when back to NORMAL SERVICE state;

c) Support requests from the CM layer;

d) Listen as far as possible to paging, and respond.

5.2.2.6 Service state, SEARCH FOR PLMN/PSMN

When in state MM IDLE and service state SEARCH FOR PLMN/PSMN, the MES shall:

a) Not start any normal location updating attempt;

b) Not perform periodic updating;

c) Reject any request from CM entities for MM connections except emergency calls;

d) Not respond to paging.

5.2.3 Service state when back to state MM IDLE from another state

When returning to MM IDLE, e.g., after a location updating procedure, the MES selects the spotbeam as specified in GMR-2 03.022 [10]. With one exception, this is a normal spotbeam selection.

If this return to idle state is not subsequent to a location updating procedure terminated with reception of cause "National roaming not allowed in this location area" the service state depends on the result of the spotbeam selection procedure, on the update status of the MES, on the location data stored in the MES and on the presence of the SIM:

a) If no spotbeam has been found, the state is NO SPOTBEAM AVAILABLE, until a spotbeam is found;

b) If no SIM is present, or if the inserted SIM is considered invalid by the MES, the state is NO IMSI;

c) If the selected spotbeam is in the location area where the MES is registered, then the state is NORMAL SERVICE; it shall be noted that this also includes an abnormal case described in clause 5.4.4.9;

d) If the selected spotbeam is in a location area where the MES is not registered but in which the MES is allowed to attempt a location update, then the state is LOCATION UPDATE NEEDED;

e) If the selected spotbeam is in a location area where the MES is not allowed to attempt a location update, then the state is LIMITED SERVICE;

f) After some abnormal cases occurring during an unsuccessful location updating procedure, as described in clause 5.4.4.9, the state is ATTEMPTING TO UPDATE.

In case of a return from a location updating procedure to which was answered "National roaming not allowed in this location area," the service state PLMN/PSMN SEARCH is entered as specified in clause 5.2.1.2.

5.3 MM common procedures

As described above, a MM common procedure can be initiated at any time while a RR connection exists between the Network and the MES.

5.3.1 TMSI reallocation procedure

This clause does not apply to the GMR-2 system.

5.3.2 Authentication procedure

The purpose of the authentication procedure is twofold:

a) First to permit the network to check whether the identity provided by the MES is acceptable or not (see GMR-2 03.020 [9]);

b) Second to provide parameters enabling the MES to calculate a new ciphering key.

The cases where the authentication procedure should be used are defined in GMR-2 02.009 [4].

The authentication procedure is always initiated and controlled by the network.

5.3.2.1 Authentication request by the network

The network initiates the authentication procedure by transferring an AUTHENTICATION REQUEST message across the radio interface and starts the timer T3260. The AUTHENTICATION REQUEST message contains the parameters necessary to calculate the response parameters (see GMR-2 03.020 [9]). It also contains the ciphering key sequence number allocated to the key which may be computed from the given parameters.

5.3.2.2 Authentication response by the MES

The MES shall be ready to respond upon an AUTHENTICATION REQUEST message at any time whilst a RR connection exists. It shall process the challenge information and send back an AUTHENTICATION RESPONSE message to the network. The new ciphering key calculated from the challenge information shall overwrite the previous one and be stored on the SIM before the AUTHENTICATION RESPONSE message is transmitted. The ciphering key stored in the SIM shall be loaded in to the ME-MES when any valid CIPHERING MODE COMMAND is received during an RR connection (the definition of a valid CIPHERING MODE COMMAND message is given in clause 4.4.7.2). The ciphering key sequence number shall be stored together with the calculated key.

5.3.2.3 Authentication processing in the network

Upon receipt of the AUTHENTICATION RESPONSE message, the network stops the timer T3260 and checks the validity of the response (see GMR-2 03.020 [9]).

5.3.2.4 Ciphering key sequence number

The security parameters for authentication and ciphering are tied together in sets, i.e., from a challenge parameter RAND both the authentication response SRES and the ciphering key can be computed given the secret key associated to the IMSI.

In order to allow start of ciphering on a RR connection without authentication, the ciphering key sequence numbers are introduced. The sequence number is managed by the network in the way that the AUTHENTICATION REQUEST message contains the sequence number allocated to the key which may be computed from the RAND parameter carried in that message.

The MES stores this number with the key, and indicates to the network in the first message (LOCATION UPDATING REQUEST, CM SERVICE REQUEST, PAGING RESPONSE) which sequence number the stored key has. When the deletion of the sequence number is described this also means that the associated key shall be considered as invalid.

The network may choose to start ciphering with the stored key (under the restrictions given in GMR-2 02.009 [4]) if the stored sequence number and the one given from the MES are equal.

5.3.2.5 Unsuccessful authentication

If authentication fails, i.e., if the response is not valid, the Network assumes the IMSI was used.

If the IMSI has been used, or the network decides not to try the identification procedure, an AUTHENTICATION REJECT message should be transferred to the MES.

After having sent this message, all MM connections in progress (if any) are released and the network should initiate the RR connection release procedure described in clause 4.5.

Upon receipt of an AUTHENTICATION REJECT message, the MES shall set the update status in the SIM to ROAMING NOT ALLOWED, LAl and ciphering key sequence number, and consider the SIM invalid until switched-off or the SIM is removed.

If the IMSI provided by the MES is not known to the HLR, there will not be any sending of AUTHENTICATION REJECT message towards the mobile, but the call will be cut off using the CM SERVICE REJECT Message.

5.3.2.6 Abnormal cases

a) RR connection failure:
Upon detection of a RR connection failure before the AUTHENTICATION RESPONSE is received, the network shall release all MM connections (if any) and abort any ongoing MM specific procedure.

b) Expiration of timer T3260:
The authentication procedure is supervised on the Network side by the timer T3260. At expiration of this timer, the network may release the RR connection. In this case the network shall abort the authentication procedure and any ongoing MM specific procedure, release all MM connections if any, and initiate the RR connection release procedure described in clause 4.5.

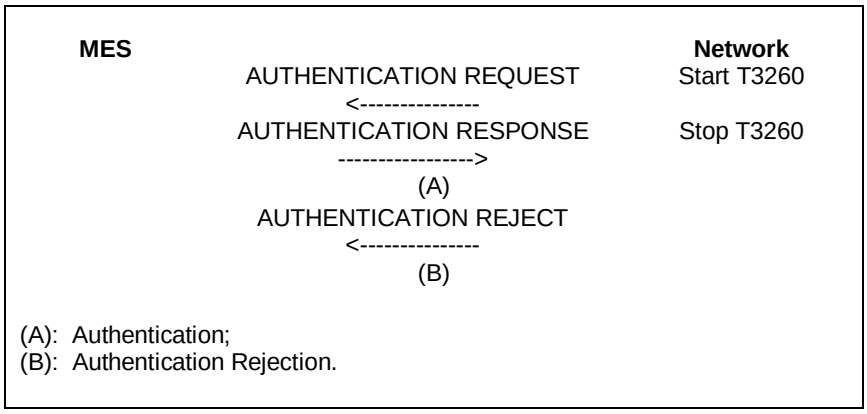

Figure 5.3.1: Authentication sequence

5.3.3 Identification procedure

The identification procedure is used by the Network to request a MES to provide specific identification parameters to the network.

The identification procedure is used to request the IMSI inside an inter VLR location update procedure, if the IMSI cannot be retrieved from the previous VLR

The identification procedure is also used to request the IMEI or IMEISV during an OC, a TC, or a SMS-MT when a system parameter is set.

5.3.3.1 Identity request by the network

The network initiates the identification procedure by transferring an IDENTITY REQUEST message to the User Terminal and starts the timer T3270. The IDENTITY REQUEST message specifies the requested identification parameters in the identity type information element.

5.3.3.2 Identification Response by the MES

The MES shall be ready to respond to an IDENTITY REQUEST message at any time while a RR connection exists.

Upon receipt of the IDENTITY REQUEST message the MES sends back an IDENTITY RESPONSE message. The IDENTITY RESPONSE message contains the identification parameters as requested by the network.

Upon receipt of the IDENTITY RESPONSE the network shall stop timer T3270.

5.3.3.3 Abnormal Cases

a) RR connection failure:
Upon detection of a RR connection failure before the IDENTITY RESPONSE is received, the network shall release all MM connections (if any) and abort any ongoing MM specific procedure.

b) Expiration of timer T3270:
The identification procedure is supervised by the network by the timer T3270. At expiration of the timer T3270, the network may release the RR connection. In this case, the network shall abort the identification procedure and any ongoing MM specific procedure, release all MM connections if any, and initiate the RR connection release procedure as described in clause 3.5.

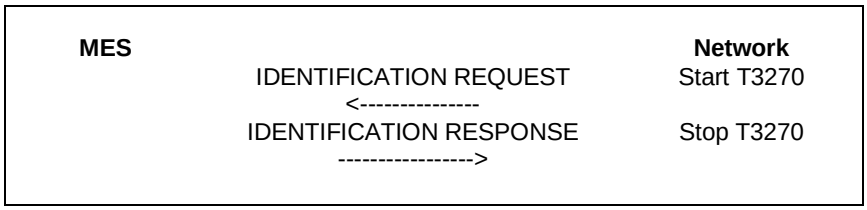

Figure 5.3.2: Identification sequence

5.3.4 IMSI detach procedure

This clause does not apply to the GMR-2 system

5.3.5 Abort procedure

This clause does not apply to the GMR-2 system

5.4 MM specific procedures

A MM specific procedure can only be started if no other MM specific procedure is running or no MM connection exists between the network and the MES. The end of the running MM specific procedure or the release of all MM connections have to be awaited before a new MM specific procedure can be started.

During the lifetime of a MM specific procedure, if a MM connection establishment is requested by a CM entity, this request will either be rejected or be delayed until the running MM specific procedure is terminated (this depends on the implementation).

Any MM common procedure may be initiated during a MM specific procedure.

Unless it has specific permission from the network (follow-on proceed), the MES side should await the release of the RR connection used for a MM specific procedure before a new MM specific procedure or MM connection establishment is started.

NOTE: The network side may use the same RR connection for MM connection management.

5.4.1 Location updating procedure

The location updating procedure is a general procedure which is used for the following purposes:

a) normal location updating (described in this clause);

b) periodic updating (see clause 5.4.2);

The normal location updating procedure is used to update the registration of the actual Location Area of a MES in the network. The location updating type information element in the LOCATION UPDATING REQUEST message shall indicate normal location updating. The conditions under which the normal location updating procedure is used by a MES in the MM IDLE state are defined for each service state in clause 5.2.2.

The normal location updating procedure shall also be started if the network indicates that the MES is unknown in the VLR as a response to MM connection establishment request.

To limit the number of location updating attempts made, where location updating is unsuccessful, an attempt counter is used. The attempt counter is reset when a MES is switched on or a SIM card is inserted.

Upon successful location updating, the MES sets the update status to UPDATED in the SIM, and stores the received Location Area Identification in the SIM. The attempt counter shall be reset.

The detailed handling of the attempt counter is described in clauses 5.4.4.6 to 5.4.4.9.

The Mobile Equipment shall contain a list of "forbidden location areas for national roaming," as well as a list of "forbidden location areas for regional provision of service." These lists shall be erased when the MES is switched off, when the SIM is removed, and periodically (with period in the range 12 hours to 24 hours). The location area identification received on the S-BCCH that triggered the location updating request shall be added to the suitable list whenever a location update reject message is received with the cause "National roaming not allowed in this location area" or with the cause "Location Area not allowed." The lists shall each accommodate 10 or more location area identifications. When the list is full and a new entry has to be inserted, the oldest entry shall be deleted.

The spotbeam selection processes in the different states are described in GMR-2 03.022 [10] and GMR-2 05.008 [26].

The location updating procedure is always initiated by the MES.

5.4.2 Periodic updating

Periodic updating may be used to notify periodically the availability of the MES to the network. Periodic updating is performed by using the location updating procedure. The location updating type information element in the LOCATION UPDATING REQUEST message shall indicate periodic updating.

The procedure is controlled by the timer T3212 in the MES. If the timer is not already started, the timer is started each time the MES enters the MM IDLE substate NORMAL SERVICE or ATTEMPTING TO UPDATE. The timer T3212 is stopped when the MES leaves the MM IDLE state.

The timer is stopped and reset to 0 when:

a) A LOCATION UPDATING ACCEPT or LOCATION UPDATING REJECT message is received;

b) The first MM message is received, or ciphering mode setting is completed in the case of MM connection establishment;

c) The MES has responded to paging and thereafter has received the first correct layer 3 message except RR message;

d) The timer has expired;

e) The MES is deactivated (i.e., equipment powered down or SIM removed).

When the timer reaches the T3212 time-out value, the location updating procedure is started.

The conditions under which the periodic location updating procedure is used by a MES in the MM IDLE state are defined for each service state in clause 5.2.2.

If the MES is in service state NO SPOTBEAM AVAILABLE, LIMITED SERVICE, PLMN/PSTN SEARCH or PLMN/PSTN SEARCH-NORMAL SERVICE when the timer expires, the location updating procedure is delayed until this service state is left. The (periodic) location updating procedure is not started if the S-BCCH information at the time the procedure is triggered indicates that periodic location shall not be used. The time-out value is broadcast in the SYSTEM INFORMATION TYPE 3 message on the S-BCCH, in the Control channel description lE (see clause 11.5.2.11).

The T3212 time-out value shall not be changed in the NO SPOTBEAM AVAILABLE, LIMITED SERVICE, PLMN/PSTN SEARCH and PLMN/PSTN SEARCH-NORMAL SERVICE states.

When a change of the T3212 time-out value has to be taken into account and the timer is running (at change of the serving spotbeam or, change of the broadcast value of T3212), the MES shall behave as follows:

- Let t1 be the new T3212 time-out value and let t be the current timer value at the moment of the change to the new T3212 time-out value; then the timer shall be restarted with the value t modulo t1.

When the MES is activated, or when a change of the T3212 time-out value has to be taken into account and the timer is not running, the MES shall behave as follows:

- Let t1 be the new T3212 time-out value, the new timer shall be started at a value randomly, uniformly drawn between 0 and t1.

5.4.3 IMSI attach procedure

This clause does not apply to the GMR-2 system.

5.4.4 Generic location updating procedure

5.4.4.1 Location updating initiation by the MES

Any timer used for triggering the location updating procedure (e.g., T3211, T3212) is stopped if running.

As no RR connection exists at the time when the location updating procedure has to be started, the MM sublayer within the MES will request the RR sublayer to establish a RR connection and enter state WAIT FOR RR CONNECTION (LOCATION UPDATE). The procedure for establishing an RR connection is described in clause 4.3.

The MES initiates the location updating procedure by sending a LOCATION UPDATING REQUEST message to the network, starts the timer T3210 and enters state LOCATION UPDATING INITIATED. The location updating type information element shall indicate what kind of updating is requested.

5.4.4.1a Network request for additional MES capability information

This clause does not apply to the GMR-2 system.

5.4.4.2 Identification request from the network

The network may initiate the identification procedure (see clause 5.3.3).

5.4.4.3 Authentication by the network

The authentication procedure (see clause 5.3.2) may be initiated by the network upon receipt of the LOCATION UPDATING REQUEST message from the MES. (See the cases defined in GMR-2 02.009 [4]).

The authentication procedure may be triggered by the VLR at each radio contact with the MES as specified in GSM 03.020 [9].

5.4.4.4 Ciphering mode setting by the network

The ciphering mode setting procedure (see clause 4.4.7) may be initiated by the network.

A system shall indicate in the VLR whether the location update procedure has to be systematically ciphered or not.

5.4.4.5 Attempt counter

To limit the number of location updating attempts made, where location updating is unsuccessful, an attempt counter is used. It counts the number of consecutive unsuccessful location update attempts.

The attempt counter is incremented when a location update procedure fails. The specific situations is specified in clause 5.4.4.9.

The attempt counter is reset when:

a) The MES is powered on;

b) A SIM is inserted;

c) Location update is successfully completed;

d) Location update completed with cause #11, #12 or #13 (see clause 5.4.4.7);

and in case of service state ATTEMPTING TO UPDATE:

a) A new location area is entered;

b) Expiration of timer T3212;

c) location update is triggered by CM sublayer requests.

The attempt counter is used when deciding whether to re-attempt a location update after time-out of timer T3211.

5.4.4.6 Location Updating Accepted by the Network

If the location updating is accepted by the Network a LOCATION UPDATING ACCEPT message is transferred to the MES.

If the Network wishes to prolong the RR connection to allow the MES to initiate MM connection establishment (for example if the MES has indicated in the LOCATION UPDATING REQUEST that it has a follow-on request pending), the network shall send "follow on proceed" in the LOCATION UPDATING ACCEPT and start timer T3255.

The MES receiving a LOCATION UPDATING ACCEPT message shall store the received location area identification LAl, stop timer T3210, reset the attempt counter and set the update status in the SIM to UPDATED.

If the LAl or PLMN identity contained in the LOCATION UPDATING ACCEPT message is a member of any of the "forbidden lists" then any such entries shall be deleted.

After that, the MES shall act according to the presence of the Follow-on proceed information element in the LOCATION UPDATING ACCEPT; if this element is present and the MES has a CM application request pending, it shall send a CM SERVICE REQUEST to the network and proceed as in clause 5.5.1.1. Otherwise, it shall start timer T3240 and enter state WAIT FOR NETWORK COMMAND.

The MES identity shall not be sent in the LOCATION UPDATING ACCEPT.

5.4.4.7 Location updating not accepted by the network

If the location updating cannot be accepted, the network sends a LOCATION UPDATING REJECT message to the MES. The MES receiving a LOCATION UPDATING REJECT message shall stop the timer T3210, store the reject cause, start T3240, enter state LOCATION UPDATING REJECTED await the release of the RR connection triggered by the network. Upon the release of the RR connection, the MES shall take the following actions depending on the stored reject cause:

2 (IMSI unknown in HLR);

3 (Illegal MES);

6 (Illegal ME-MES).

The MES shall set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to clause 4.1.2.2), and delete any stored LAl and ciphering key sequence number and shall consider the SIM as invalid until switch-off or the SIM is removed.

8 (Local Transmit Disable);

11 (PLMN not allowed);

12 (Location Area not allowed);

13 (National roaming not allowed in this location area).

The cause "PLMN not allowed" shall be sent to a MES belonging to a foreign PLMN or to another national PLMN, but not allowed to roam outside its HPLMN. This cause shall also apply to the case where the foreign PLMN is unknown to the network.

The MES shall delete any LAI and ciphering key sequence number stored in the SIM, reset the attempt counter, set the update status to ROAMING NOT ALLOWED (and store it in the SIM according to clause 5.1.2.2). The MES shall store the LAI or PLMN identity in the suitable forbidden list, i.e., in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for causes # 8 and #12, and in the list of "forbidden location areas for national roaming" for cause #13. In addition for cause #8, the MES shall provide a Local Transmit Disable indication to the User. Further, the MES will memorize if cause #13 was received, so as to perform a PLMN selection instead of a spotbeam selection when back to the MM IDLE state.

Other values are considered as abnormal cases and the specification of the MES behavior in those cases is given in clause 5.4.4.9.

5.4.4.8 Release of RR connection after location updating

When the Location updating procedure is finished (see clauses 5.4.4.6 and 5.4.4.7), the MES shall (except in the case where the MES has a follow-on CM application request pending and has received the follow-on proceed indication, see clause 5.4.4.6) set timer T3240 and enter the state WAIT FOR NETWORK COMMAND, expecting the release of the RR connection. The network may decide to keep the RR connection for network initiated establishment of a MM connection, or to allow for mobile initiated MM connection establishment.

Any release of the RR connection shall be initiated by the network according to clause 4.5. If the RR connection is not released within a given time controlled by the timer T3240, the MES shall abort the RR connection. In both cases, either after a RR connection release triggered from the network side or after a RR connection abort requested by the MES-side, the MES shall return to state MM IDLE.

At transition to state MM IDLE, substates NORMAL SERVICE or ATTEMPTING TO UPDATE, either timer T3212 or timer T3211 is started as described in clause 5.4.4.9.

5.4.4.9 Abnormal cases on the MES side

The different abnormal cases that can be identified are the following:

a) Access barred because of access class control.

The location updating procedure is not started. The MES stays in the current serving spotbeam and applies normal spotbeam reselection process. The procedure is started as soon as possible and if still necessary (when the barred state is ended or because of a spotbeam change);

b) The answer to random access is an IMMEDIATE ASSIGNMENT REJECT message.
The location updating is not started. The MES stays in the chosen spotbeam and applies normal spotbeam selection process. The waiting timer T3122 is reset when a spotbeam change occurs. The procedure is started as soon as possible after T3122 time-out if still necessary;

c) Random access failure
Timer T3213 is started. When it expires, the procedure is attempted again if still necessary

NOTE: As specified in GMR-2 05.008 [26], a spotbeam reselection then takes place with return to the spotbeam inhibited for 5 seconds. Typically the selection process will take the MES back to the spotbeam where the random access failed after 5 seconds.

If random access failure occurs for two successive random access attempts for location updating, the MES proceeds as specified below;

d) RR connection failure
The procedure is aborted and the MES proceeds as specified below. If a RR-connection failure indication is reported to the MSC via the BSSMAP "Clear request" message with cause "O&M intervention," a LOCATION UPDATE REJECT message shall be sent by the MSC. The radio resource shall be released regardless of the cause value;

e) T3210 time-out
The procedure is aborted, the RR connection is aborted and the MES proceeds as specified below;

f) RR release before the normal end of procedure
The procedure is aborted and the MES proceeds as specified below;

g) Location updating reject, other causes than those treated in clause 5.4.4.7. The MES waits for release of the RR connection as specified in clause 5.4.4.8, and then proceeds as specified below.

In cases d) to g) above, and for repeated failures as defined in c.) above, the MES proceeds as follows: Timer T3210 is stopped if still running. The RR Connection is aborted in case of timer T3210 time-out. The attempt counter is incremented. The next actions depend on the Location Area Identities (stored and received from the S-BCCH of the current serving spotbeam) and the value of the attempt counter:

i) the update status is UPDATED, and the stored LAI is equal to the one received on the S-BCCH from the current serving spotbeam and the attempt counter is smaller than 4. The MES shall keep the update status to UPDATED, the MM IDLE sub-state after the RR connection release is NORMAL SERVICE. The MES shall memorize the location updating type used in the location updating procedure. It shall start timer T3211 when the RR connection is released. When timer T3211 expires the location updating procedure is triggered again with the memorized location updating type.

ii) either the update status is different from UPDATED, or the stored LAI is different from the one received on the S-BCCH from the current serving spotbeam, or the attempt counter is greater or equal to 4.

iii) The MES shall delete any LAI, ciphering key sequence number stored in the SIM, set the update status to NOT UPDATED and enter the MM IDLE sub-state ATTEMPTING TO UPDATE when the RR connection is released (See clause 4.2.2.2 for the subsequent actions). If the attempt counter is smaller than 4, the MES shall memorize that timer T3211 is to be started when the RR connection is released, otherwise it shall memorize that timer T3212 is to be started when the RR connection is released.

5.4.4.10 Abnormal cases on the network side

a) RR connection failure:

   i) If a RR connection failure occurs during a common procedure integrated with the location updating procedure, the behavior of the network should be according to the description of that common procedure;

   ii) If a RR connection failure occurs when a common procedure does not exist, the location updating procedure towards the MES should be aborted.

b) Protocol error:
   See clause 9.

5.5 Connection management sublayer service provision

The concept of MM connection is introduced in this clause. This concept is mainly a descriptive tool: The establishment of an MM connection by the network and the release of an MM connection by the network or by the MES is always local, i.e., these purposes can be achieved without sending any MM messages over the air interface. (On the contrary, establishment of an MM connection by the MES requires the sending of MM messages over the air interface.)

The Mobility Management (MM) sublayer is providing connection management services to the different entities of the upper Connection Management (CM) sublayer (see GMR-2 04.007 [16]). It offers to a CM entity the possibility to use an MM connection for the exchange of information with its peer entity. An MM connection is established and released on request from a CM entity. Different CM entities communicate with their peer entity using different MM connections. Several MM connections may be active at the same time.

An MM connection requires an RR connection. All simultaneous MM connections for a given MES use the same RR connection.

In the following clauses, the procedures for establishing, re-establishing, maintaining, and releasing an MM connection are described, usually separately for the MES and the network side.

5.5.1 MM connection establishment

A maximum of 8 MM connections shall be supported at one time for a given MES.

5.5.1.1 MM connection establishment initiated by the MES

Upon request of a CM entity to establish an MM connection, the MM sublayer first decides whether to accept, delay, or reject this request:

1) A MM connection establishment may only be initiated by the MES when the following conditions are fulfilled:

   a) Its update status is UPDATED;

   b) The MM sublayer is in one of the states MM IDLE or MM CONNECTION ACTIVE.

2) An exception from this general rule exists for emergency calls (see clause 5.5.1.5). A further exception is defined in the following clause.

   a) If an MM specific procedure is running at the time the request from the CM sublayer is received, and the LOCATION UPDATING REQUEST message has been sent, the request will either be rejected or delayed, depending on implementation, until the MM specific procedure is finished and, provided that the network has not sent a "follow-on proceed" indication, the RR connection is released. If the LOCATION UPDATING REQUEST message has not been sent, the MES may include a "follow-on request" indicator in the message. The MES shall then delay the request until the MM specific procedure is completed, when it may be given the opportunity by the network to use the RR connection (see clause 5.4.4.6).

   b) If an MM specific procedure is running at the time the request from the CM sublayer is received, and a CHANNEL REQUEST message of type Location Updating has been sent (see clause 10.1.8.7), the MES may not include a "follow-on request" indicator in the LOCATION UPDATING REQUEST mesage.

3) In order to establish an MM connection, the MES proceeds as follows:

   a) If no RR connection exists, the MM sublayer requests the RR sublayer to establish an RR connection and enters MM sublayer state WAIT FOR RR CONNECTION (MM CONNECTION). This request contains an establishment cause and a CM SERVICE REQUEST message. When the establishment of an RR connection is indicated by the RR sublayer (this indication implies that the CM SERVICE REQUEST message has been successfully transferred via the air interface, see clause 4.2), the MM sublayer of the MES starts timer T3230, gives an indication to the CM entity that requested the MM connection establishment, and enters MM sublayer state WAIT FOR OUTGOING MM CONNECTION;

   b) If an RR connection is available, the MM sublayer of the MES sends a CM SERVICE REQUEST message to the network, starts timer T3230, gives an indication to the CM entity that requested the MM connection establishment, and enters:

      i) MM sublayer state WAIT FOR OUTGOING MM CONNECTION, if no MM connection is active;

      ii) MM sublayer state WAIT FOR ADDITIONAL OUTGOING MM CONNECTION, if at least one MM connection is active;

      iii) If an RR connection exists but the MES is in the state WAIT FOR NETWORK COMMAND, then any requests from the CM layer that are received will either be rejected or delayed until this state is left.

4) The CM SERVICE REQUEST message contains:

   a) Mobile identity according to clause 11.5.1.4;

   b) MES classmark 2;

   c) Ciphering key sequence number;

   d) CM service type identifying the requested type of transaction (e.g., MES originating call establishment, emergency call establishment, short message service and supplementary service activation).

Upon receiving a CM SERVICE REQUEST message, the network shall analyze its content. The type of semantic analysis may depend on other on going MM connection(s). Depending on the type of request and the current status of the RR connection, the network may start any of the MM common procedures and RR procedures.

The GSC may initiate the classmark interrogation procedure, for example, to obtain further information on the MESs encryption capabilities.

The network may invoke the authentication procedure (see clause 5.3.2) depending on the CM service type.

The network decides also if the ciphering mode setting procedure shall be invoked (see clause 4.4.7).

An indication from the RR sublayer that the ciphering mode setting procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the MES. The MM connection establishment is completed, timer T3230 shall be stopped, the CM entity that requested the MM connection shall be informed, and MM sublayer state MM CONNECTION ACTIVE is entered. The MM connection is considered to be active.

If the service request cannot be accepted, the network returns a CM SERVICE REJECT message to the MES.

The reject cause information element (see clause 11.5.3.6 and Annex G) indicates the reason for rejection. The following cause values may apply:

#4: IMSI unknown in VLR;

#6: Illegal ME;

#8: Local Transmit Disable

#17: Network failure;

#22: Congestion;

#32: Service option not supported;

#33: Requested service option not subscribed;

#34: Service option temporarily out of order.

If no other MM connection is active, the network may start the RR connection release (see clause 4.5) when the CM SERVICE REJECT message is sent.

If a CM SERVICE REJECT message is received by the MES, timer T3230 shall be stopped, the requesting CM sublayer entity informed. The MES shall then proceed as follows:

a) If the cause value is not #4 , #6 or #8, the MM sublayer returns to the previous state (the state where the request was received). Other MM connections shall not be affected by the CM SERVICE REJECT message.

b) If cause value #4 is received, the MES aborts any MM connection, deletes the LAI and ciphering key sequence number in the SIM, changes the update status to NOT UPDATED (and stores it in the SIM according to clause 5.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. If subsequently the RR connection is released or aborted, this will force the MES to initiate a normal location updating. Whether the CM request shall be memorized during the location updating procedure is a choice of implementation.

c) If cause value #6 is received, the MES aborts any MM connection, deletes the LAl and ciphering key sequence number in the SIM, changes the update status to ROAMING NOT ALLOWED (and stores it in the SIM according to clause 5.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. The MES shall consider the SIM as invalid until switch-off or the SIM is removed.

d) If cause value #8 is received, the MES aborts any MM conection, deletes the LAI and ciphering key sequence number stored in the SIM, changes the update status to ROAMING NOT ALLOWED (and stores it in the SIM according to clause 5.1.2.2) and stores the LAI in the list of "forbidden location areas for regional provision of service". In addition, the MES shall provide a Local Transmit Disable indication to the User.

5.5.1.2 Abnormal cases

MES side:

a) RR connection failure or IMSI deactivation:
If an RR connection failure occurs or the IMSI is deactivated during the establishment of an MM connection, the MM connection establishment is aborted, timer T3230 is stopped, and an indication is given to the CM entity that requested the MM connection establishment. This shall be treated as a rejection for establishment of the new MM connection, and the MM sublayer shall release all active MM connections;

b) T3230 expiration:
If T3230 expires (i.e., no response is given but a RR connection is available), the MM connection establishment is aborted and the requesting CM sublayer is informed. If no other MM connection exists, then the MES shall proceed as described in clause 4.5.3.1 for release of the RR connection. Otherwise, the MES shall return to the MM sublayer state where the request of an MM connection was received, i.e., to MM sublayer state MM CONNECTION ACTIVE. Other ongoing MM connections (if any) shall not be affected;

c) Reject cause values #95, #96, #97, #99, #100, #111 received:
The same actions as on timer expiration shall be taken by the MES;

d) Random access failure or RR connection establishment failure:
If the MES detects a random access failure or RR connection establishment failure during the establishment of an MM connection, it aborts the MM connection establishment and gives an indication to the CM entity that requested the MM connection establishment.

NOTE: Further actions of the MES depend on the RR procedures and MM specific procedures during which the abnormal situation has occurred and are described together with those procedures.

Network side:

a) RR connection failure:
The actions to be taken upon RR connection failure within a MM common procedure are described together with that procedure. A RR connection failure occurring outside such MM common procedures, shall trigger the release of all active MM connections if any;

b) Invalid message or message content:
Upon reception of an invalid initial message or a CM SERVICE REQUEST message with invalid content, a CM SERVICE REJECT message shall be returned with one of the following appropriate Reject cause indications:

95: Semantically incorrect message;
96: Mandatory information element error;
97: Message type non-existent or not implemented;
99: Information element non-existent or not implemented;
100: Conditional lE error;
111: Protocol error, unspecified.

These causes will result in the MSC discarding the CM SERVICE REQUEST message received. The CM SERVICE REJECT shall not be generated in the corresponding case.

If the CM SERVICE REQUEST message received contains the IMEI as the identity of the MES, however:

a) The cause "Semantically incorrect message" shall be returned in the CM SERVICE REJECT message by the MSC;

b) The cause "IMEI not accepted" shall be returned if the CM Service type indicated "Emergency call establishment."

When the CM SERVICE REJECT message has been sent, the network may start RR connection release if no other MM connections exist or if the abnormal condition also has influence on the other MM connections.

5.5.1.3 MM Connection Establishment Initiated by the Network

When a CM sublayer entity in the network requests the MM sublayer to establish a MM connection, the MM sublayer will request the establishment of an RR connection to the RR sublayer if no RR connection to the desired User Terminal exists. The MM sublayer is informed when the paging procedure is finished (see clause 5.3.2).

When an RR connection is established (or if it already exists at the time the request is received), the MM sublayer may initiate any of the MM common procedures (except IMSI detach). The GSC may request the RR sublayer to perform the RR classmark interrogation procedure, and the MSC may request the ciphering mode setting procedure.

When all MM and RR procedures are successfully completed which the network considers necessary, the MM sublayer will inform the requesting CM sublayer entity on the success of the MM connection establishment.

If an RR connection already exists and no MM specific procedure is running, the network may also establish a new MM connection by sending a CM message with a new PD/TI combination.

If the establishment of an RR connection is unsuccessful, or if any of the MM common procedures or the ciphering mode setting fail, this is indicated to the CM layer with an appropriate error cause.

If an RR connection used for a MM specific procedure exists to the MES, the CM request may be rejected or delayed depending on implementation. When the MM specific procedure has been completed, the network may use the same RR connection for the delayed CM request.

5.5.1.4 Abnormal cases

The behaviour upon abnormal events is described together with the relevant RR procedure or MM common procedure.

5.5.1.5 MM connection establishment for emergency calls

A MM connection for an emergency call may be established in all states of the mobility management sublayer which allow MM connection establishment for a normal originating call. In addition, establishment may be attempted in all service states where a spotbeam is selected (see clause 5.2.2). However, as a network dependent option, a MM connection establishment for emergency call may be rejected in some of the states. Similarly as an option, a CM SERVICE REQUEST message for emergency call establishment relating to a MES not allowed to roam in the MSC/VLR area may be accepted. If the IMSI provided by the MES in the CM SERVICE REQUEST (or in a subsequent IDENTITY RESPONSE) message is not known in the VLR but allows to derive the HLR address in order to get the authentication data, and if the authentication procedure is performed successfully, the emergency call request is accepted.

When a user requests an emergency call establishment, the MES will send a CM SERVICE REQUEST message to the network with a CM service type information element indicating emergency call establishment. If the network does not accept the emergency call request, e.g., because IMEI was used as identification and this capability is not supported by the network, the network will reject the request by returning a CM SERVICE REJECT message to the MES.

If the IMEI is provided as MES identity in the CM SERVICE REQUEST message, the error "IMEI not accepted" is returned in the CM-SERVICE-REJECT message.

If the MES is blacklisted, the reject cause shall be "Illegal ME-MES."

The reject cause information element indicates the reason for rejection. The following cause values may apply:

#3: "Illegal MES" (Illegal MS-MES at MSC);

#4: "IMSI unknown in VLR";

#5: "IMEI not accepted";

#6: "Illegal ME-MES";

#8: "Local Transmit Disable";

#17: "Network failure";

#22: "Congestion";

#32: "Service option not supported";

#34: "Service option temporarily out of order".

With the above defined exceptions, the procedures described for MM connection establishment in clauses 5.5.1.1 and 5.5.1.2 shall be followed.

NOTE: Normally, the MES will be identified by an IMSI. However, if none of these identifiers is available in the MES, then the MES shall use the IMEI for identification purposes. The network may in that case reject the request by returning a CM SERVICE REJECT message with reject cause: #5 "IMEI not accepted".

5.5.1.6 Call re-establishment

This clause does not apply to the GMR-2 system.

5.5.1.7 Forced release during MO MM connection establishment

If MESs CM layer initiated the MM connection establishment, but the CM layer wishes to abort the establishment prior to the completion of the establishment phase, the MES shall send a CM SERVICE ABORT message any time after the completion of the RR connection and not after the first CM message (e.g., SETUP) is sent.

If the first CM message has already been sent, the normal release procedure defined by the appropriate CM protocol applies and the CM SERVICE ABORT shall not be sent.

Sending of the CM SERVICE ABORT message is only allowed during the establishment of the first MM connection, where no other MM connection exists in parallel. If parallel MM connections exist already, a new connection establishment cannot be aborted and normal MM connection release according to clause 5.5.3 applies after MM connection establishment.

Upon transmission of the CM SERVICE ABORT message, the MES shall set timer T3240 and enter the state WAIT FOR NETWORK COMMAND, expecting the release of the RR connection.

Upon receipt of the CM SERVICE ABORT message, the network shall abort ongoing processes, release the appropriate resources, and unless another MM connection establishment is pending, initiate a normal release of the RR connection.

If the RR connection is not released within a given time controlled by timer T3240, the MES shall abort the RR connection. In both cases, either after a RR connection release triggered from the network side or after a RR connection abort requested by the MES side, the MES shall return to state MM IDLE, the service state depending upon the current update status as specified in clause 5.2.3.

5.5.2 MM connection information transfer phase

After the MM connection has been established, it can be used by the CM sublayer entity for information transfer. According to the protocol architecture described in GMR-2 04.007 [16], each CM entity will have its own MM connection. These different MM connections are identified by the protocol discriminator PD and, additionally, by the transaction identifier (TI).

All MM common procedures may be initiated at any time while MM connections are active. Except for Short Message Control, which uses a separate layer 2 low priority data link, no priority mechanism is defined between the CM, MM and RR sublayer messages.

A maximum of 8 MM-connections shall be supported in parallel.

5.5.2.1 Sending CM messages

A CM sublayer entity, after having been advised that a MM connection has been established, can request the transfer of CM messages. The CM messages passed to the MM sublayer are then sent to the other side of the interface with the PD and TI set according to the source entity.

5.5.2.2 Receiving CM messages

Upon receiving a CM message, the MM sublayer will distribute it to the relevant CM entity according to the PD value and TI value. However, if the received CM message is the first for the MM connection (identified by PD and TI), the MM sublayer will in addition indicate to the CM entity that a new MM connection has been established.

5.5.2.3 Abnormal cases

RR connection failure:

If the RR connection failure occurs during a RR or MM common procedure, the consequent actions are described together with that procedure.

In other cases the following applies:

MES:
The MM sublayer shall indicate to all CM entities associated with active MM connections that the MM connection is interrupted, the subsequent action of the MM sublayer (call re- establishment, see clause 5.5.1.6, or local release) will then depend on the decisions by the CM entities.

Network:
The MM sublayer shall locally release all active MM connections. As an option the network may delay the release of all or some of the MM connections to allow the MES to initiate call re-establishment.

5.5.3 MM connection release

An established MM connection can be released by the local CM entity. The release of the CM connection will then be done locally in the MM sublayer, i.e., no MM message are sent over the air interface for this purpose.

5.5.3.1 Release of associated RR connection

If all MM connections are released by their CM entities, the MES shall set timer T3240 and enter the state WAIT FOR NETWORK COMMAND, expecting the release of the RR connection.

In the network, if the last MM connection is released by its user, the MM sublayer may decide to release the RR connection by requesting the RR sublayer according to clause 4.5. The RR connection may be maintained by the network, e.g., in order to establish another MM connection.

If the RR connection is not released within a given time controlled by the timer T3240, the MES shall abort the RR connection. In both cases, either after a RR connection release triggered from the network side or after a RR connection abort requested by the MES-side, the MES shall return to MM IDLE state, the service state depending upon the current update status as specified in clause 5.2.3.

6 Elementary procedures for circuit-switched call control

6.1 Overview

6.1.1 General

This clause describes the call control (CC) protocol, which is one of the protocols of the Connection Management (CM) sublayer (see GMR-2 04.007 [16]).

Every MES must support the call control protocol. If a MES does not support any bearer capability at all, then it shall respond to a SETUP message with a RELEASE COMPLETE message as specified in clause 6.4.

In the call control protocol, more than one CC entity are defined. Each CC entity is independent from each other and shall communicate with the correspondent peer entity using its own MM connection. Different CC entities use different transaction identifiers.

With a few exceptions, the present document describes the call control protocol only with regard to two peer entities. The call control entities are described as communicating finite state machines which exchange messages across the radio interface and communicate internally with other protocol (sub)layers. This description in only normative as far as the consequential externally observable behaviour is concerned.

Certain sequences of actions of the two peer entities compose "elementary procedures" which are used as a basis for the description in this clause. These elementary procedures may be grouped into the following classes:

- Call establishment procedures;
- Call clearing procedures;
- Call information phase procedures;
- Miscellaneous procedures.

The terms "mobile originating" or "mobile originated" (MO) are used to describe a CALL INITIATED by the MES. The terms "mobile terminating" or "mobile terminated" (MT) are used to describe a CALL INITIATED by the Network.

Figure 6.1.1 gives an overview of the main states and transitions on the MES side.

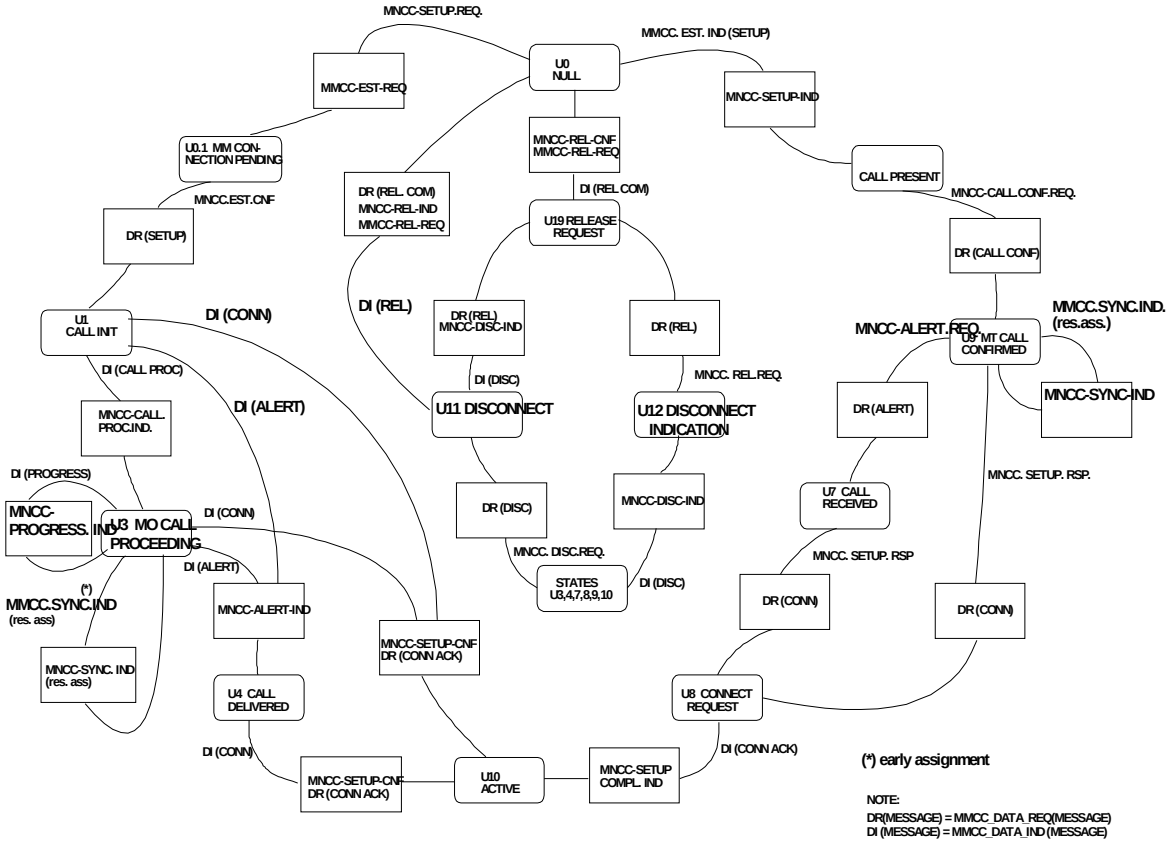

Figure 6.1.1: Overview of call control protocol / MES side

Figure 6.1.2 gives an overview of the main states and transitions on the network side.

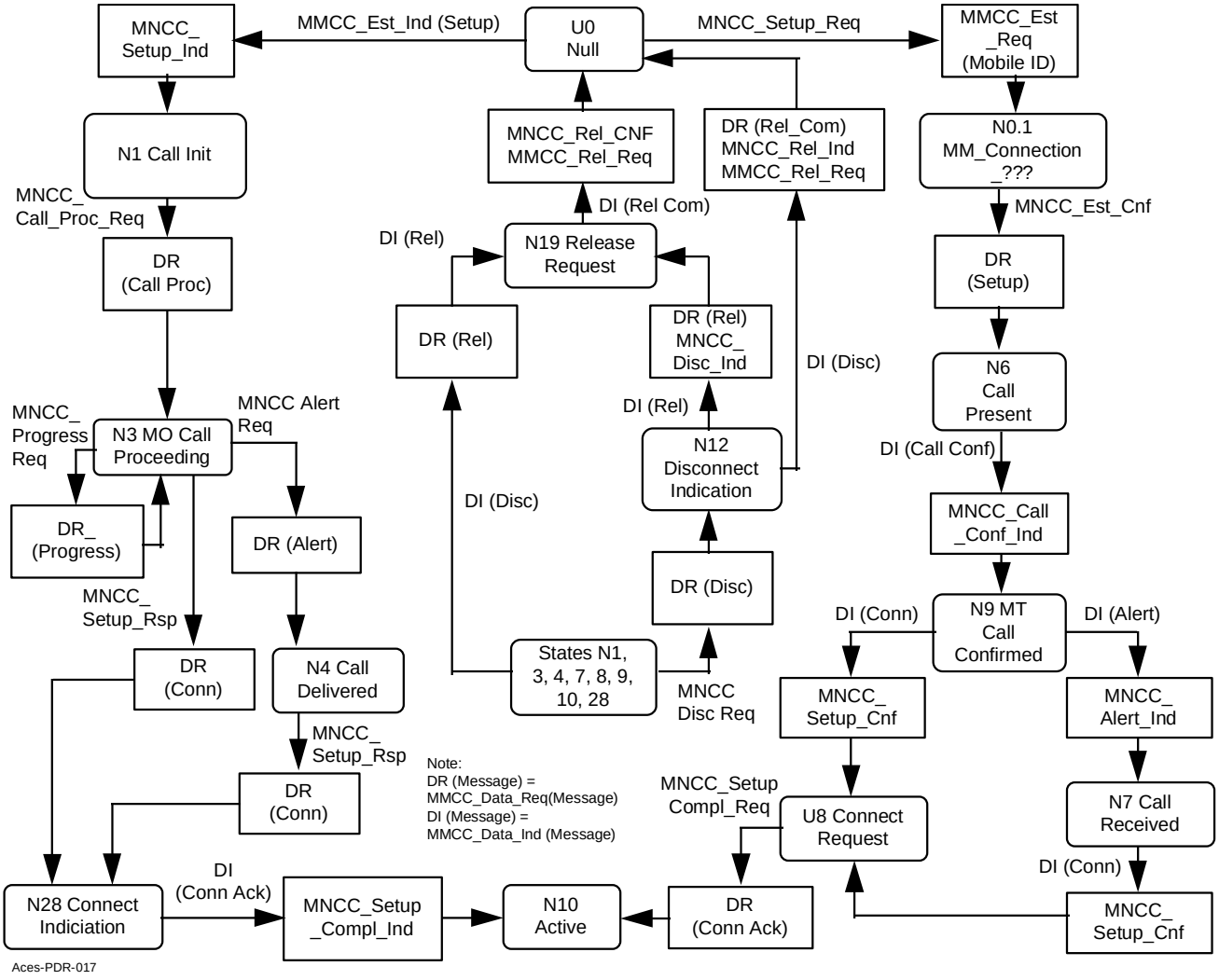

Figure 6.1.2: Overview of call control protocol / network side

6.1.2 Call control states

6.1.2.1 Call states at the user terminal side of the interface

The states which may exist on the MES side of the radio interface are defined in this clause.

NOTE: States U0.1, U26, and U27 are GSM/GMR specific. All other states are ITU-T defined.

6.1.2.1.1 Null (State U0)

No call exists.

6.1.2.1.2 MM CONNECTION PENDING (State U0.1)

This state exists for a mobile originating call, when the MES requests the establishment of a MM connection.

6.1.2.1.3 CALL INITIATED (State U1)

This state exists for a mobile originating call, when the MES requests call establishment from the network.

6.1.2.1.4 Mobile Originating Call Proceeding (State U3)

This state exists for a mobile originating call, when the MES has received acknowledgement that the network has received all call information necessary to effect call establishment.

6.1.2.1.5 Call Delivered (State U4)

This state exists for a mobile originating call, when the calling MES has received an indication that remote user alerting has been initiated.

6.1.2.1.6 Call Present (State U6)

This state exists for a mobile terminating call, when the MES has received a call establishment request but has not yet responded.

6.1.2.1.7 Call Received (State U7)

This state exists for a mobile terminating call, when the MES has indicated alerting but has not yet answered.

6.1.2.1.8 Connect Request (State U8)

This state exists for a mobile terminating call, when the MES has answered the call and is waiting to be awarded the call.

6.1.2.1.9 Mobile Terminating Call Confirmed (State U9)

This state exists for a mobile terminating call, when the MES has sent acknowledgement that the MES has received all call information necessary to effect call establishment.

6.1.2.1.10 Active (State U10)

This state exists for a mobile terminating call, when the MES has answered the call. This state exists for a mobile originating call when the MES has received an indication that the remote user has answered the call.

6.1.2.1.11 Disconnect Request (State U11)

This state exists when the MES has requested the network to clear the end-to-end connection (if any) and is waiting for a response.

6.1.2.1.12 Disconnect Indication (State U12)

This state exists when the MES has received an invitation to disconnect because the network has disconnected the end-to-end connection (if any).

6.1.2.1.13 Release Request (State U19)

This state exists when the MES has requested the network to release and is waiting for a response.

6.1.2.1.14 Mobile Originating Modify (State U26)

This state exists when the MES has sent a request to the network for a new mode but has not yet received an answer.

6.1.2.1.15 Mobile Terminating Modify (State U27)

This state exists when the MES has received a request from the network for a new mode and has not yet sent a response to this request.

6.1.2.2 Network Call States

The call states that may exist on the network side of the radio interface are defined in this clause.

NOTE: States N0.1, N26, N27, N28, N3, N4, N7, and N9 are GSM/GMR specific. All other states are ITU-T defined.

6.1.2.2.1 Null (State N0)

No call exists.

6.1.2.2.2 MM CONNECTION PENDING (State N0.1)

This state exists for a mobile terminating call, when the network requests the establishment of a MM connection.

6.1.2.2.3 CALL INITIATED (State N1)

This state exists for a mobile originating call, when the network has received a call establishment request but has not yet responded.

6.1.2.2.4 Mobile Originating Call Proceeding (State N3)

This state exists for a mobile originating call, when the network has sent acknowledgement that the network has received all call information necessary to effect call establishment.

6.1.2.2.5 Call Delivered (State N4)

This state exists for a mobile originating call, when the network has indicated that remote user alerting has been initiated.

6.1.2.2.6 Call Present (State N6)

This state exists for a mobile terminating call, when the network has sent a call establishment request but has not yet received a satisfactory response.

6.1.2.2.7 Call Received (State N7)

This state exists for a mobile terminating call, when the network has received an indication that the MES is alerting but has not yet received an answer.

6.1.2.2.8 Connect Request (State N8)

This state exists for a mobile terminating call, when the network has received an answer but the network has not yet awarded the call.

6.1.2.2.9 Mobile Terminating Call Confirmed (State N9)

This state exists for a mobile terminating call, when the network has received acknowledgement that the MES has received all call information necessary to effect call establishment.

6.1.2.2.10 Active (State N10)

This state exists for a mobile terminating call, when the network has awarded the call to the called MES. This state exists for a mobile originating call when the network has indicated that the remote user has answered the call.

6.1.2.2.11 (Not Used)

6.1.2.2.12 Disconnect Indication (State N12)

This state exists when the network has disconnected the end-to-end connection (if any) and has sent an invitation to disconnect the MES to network connection.

6.1.2.2.13 Release request (State N19)

This state exists when the network has requested the MES to release and is waiting for a response.

6.1.2.2.14 Mobile Originating Modify (State N26)

This state exists when the network has received a request from the MES for a new mode but has not yet sent a response.

6.1.2.2.15 Mobile Terminating Modify (State N27)

This state exists when the network has sent a request to the MES for a new mode but has not yet received an answer.

6.1.2.2.16 Connect Indication (State N28)

This state exists for a mobile originating call, when the network has indicated that the remote user has answered the call and the network is waiting for acknowledgement by the MES.

6.2 Call establishment procedures

Establishment of a call is initiated by request of upper layer in either the MES or the network. It consists of:

- The establishment of a CC connection between the MES and the Network;
- The activation of the codec or interworking function.

Whenever it is specified in clause 6 of the present document that the MES shall attach the user connection, this means that the MES shall activate the codec or interworking function as soon as an appropriate channel is available. The MES shall de-activate the codec or interworking function whenever an appropriate channel is no longer available. As soon as an appropriate channel is (again) available, the codec or interworking function shall be re-activated. If a new order to attach the user connection is received, the new order shall supersede the previous one.

A channel shall be considered as appropriate if it is consistent with the possibly negotiated bearer capability applicable for the actual phase of the call. It is an implementation option whether the MES shall consider a channel as not appropriate if the type of channel (full rate/half rate) is not according to the radio channel requirements in the bearer capability. If:

- The user connection has to be attached but no appropriate channel is available for a contiguous time of 30 seconds; or if
- The codec or interworking function is de-activated for a contiguous time of 30 seconds, then the MES may initiate call clearing.

Upon request of upper layers to establish a call, restricting conditions for the establishment of the call are examined. These restricting conditions concern the states of parallel CC entities and are defined elsewhere. If these restricting conditions are fulfilled, the call establishment is rejected. Otherwise, a CC entity in state U0 (NULL), is selected to establish the call. It initiates the establishment by requesting the MM sublayer to establish an MM connection.

6.2.1 Mobile originating call establishment

The call control entity of the MES initiates establishment of a CC connection by requesting the MM sublayer to establish a mobile originating MM connection and entering the MM CONNECTION PENDING state. There are two kinds of a mobile originating call: basic call and emergency call. The request to establish an MM connection shall contain a parameter to specify whether the call is a basic or an emergency call. This information may lead to specific qualities of services to be provided by the MM sublayers. Timer T303 is started when the CM SERVICE REQUEST message is sent.

While being in the MM CONNECTION PENDING state, the call entity of the MES may cancel the call prior to sending the first call control message according to the rules given in clause 5.5.1.7.

6.2.1.1 Call Initiation

Having entered the MM CONNECTION PENDING state, upon MM connection establishment, the call control entity of the MES sends a setup message to its peer entity. This setup message is:

- A SETUP message, if the call to be established is a basic call; or
- An EMERGENCY SETUP message, if the call to be established is an emergency call.

It then enters the CALL INITIATED state. This state is supervised by timer T303, which has already been started after entering the MM CONNECTION PENDING state.

The setup message shall contain all the information required by the network to process the call. In particular, the SETUP message shall contain the called party address information.

When the call control entity of the MES is in the CALL INITIATED state and if it receives:

a) A CALL PROCEEDING message, it shall proceed as described in clause 6.2.1.3;

b) An ALERTING message, it shall proceed as described in clause 6.2.1.5;

c) A CONNECT message, it shall proceed as described in clause 6.2.1.6;

d) A RELEASE COMPLETE message it shall proceed as described in clause 6.2.1.2.

Abnormal case:

Since timer T303 is used to supervise the two consecutive states MM CONNECTION PENDING and CALL INITIATED, the expiration of timer T303 leads to different actions depending on the respective state:

-If timer T303 elapses in the MM CONNECTION PENDING state, the MM connection in progress shall be aborted and the user shall be informed about the rejection of the call;

-If timer T303 elapses in the CALL INITIATED state before any of the CALL PROCEEDING, ALERTING, CONNECT or RELEASE COMPLETE messages has been received, the clearing procedure described in clause 6.4 is performed.

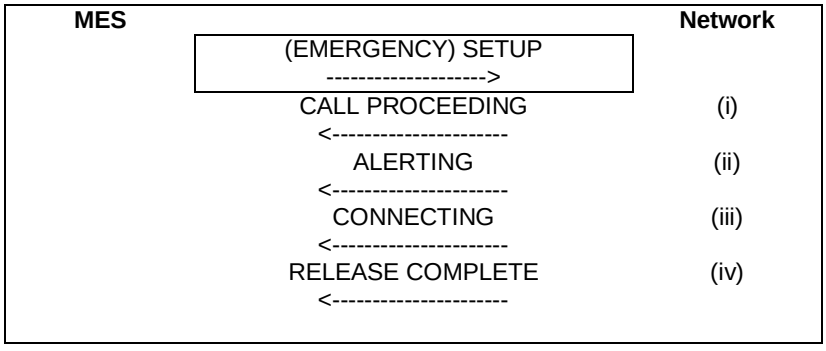

Figure 6.2.1: Mobile originated call initiation and possible subsequent responses

6.2.1.2 Receipt of a setup message

In the NULL state, upon receipt of a setup message (a SETUP message or an EMERGENCY SETUP message, see clause 6.2.1.1), the call control entity of the network enters the "CALL INITIATED" state. It shall then analyze the call information contained in the setup message:

a) If, following the receipt of the setup message, the call control entity of the network determines that the call information received from the MES is invalid (e.g., invalid number), then the network shall initiate call clearing as defined in clause 6.4 with one of the following cause values:

#1: "unassigned (unallocated) number";
#3: "no route to destination";
#22: "number changed";
#28: "invalid number format (incomplete number)".

b) If, following the receipt of the setup message, the call control entity of the network determines that a requested service is not authorized or is not available, it shall initiate call clearing in accordance with clause 6.4.2 with one of the following cause values:

#8: "operator determined barring";
#57: "bearer capability not authorized";
#58: "bearer capability not presently available";
#63: "service or option not available, unspecified";
#65: "bearer service not implemented".

c) Otherwise, the call control entity of the network shall either:

- Send a CALL PROCEEDING message to its peer entity to indicate that the call is being processed and enter the MOBILE ORIGINATING CALL PROCEEDING state;

- Send an ALERTING message to its peer entity to indicate that alerting has been started at the called user side and enter the CALL RECEIVED state;

- Send a CONNECT message to its peer entity to indicate that the call has been accepted at the called user side and enter the CONNECT REQUEST state.

The call control entity of the network may insert bearer capability information element(s) in the CALL PROCEEDING message to select options presented by the MES in the Bearer Capability information element(s) of the SETUP message. The bearer capability information element(s) shall contain the same parameters as received in the SETUP except those presenting a choice. Where choices were offered, appropriate parameters indicating the results of those choices shall be included.

The call control entity of the network having entered the MOBILE ORIGINATING CALL PROCEEDING state, the network may initiate the assignment of a traffic channel according to clause 6.2.1.9 (early assignment).

6.2.1.3 Receipt of a CALL PROCEEDING message

Having entered the CALL INITIATED state, when the call control entity of the MES receives a CALL PROCEEDING message, it shall stop timer T303 and start timer T310 unless:

- The CALL PROCEEDING message contains a progress indicator IE specifying progress description #1 or #2; or

- It has received a PROGRESS message containing a progress indicator IE specifying progress description #1 or #2 prior to the CALL PROCEEDING message;

and enter the MOBILE ORIGINATING CALL PROCEEDING state.

Abnormal case:

If timer T310 elapses before any of the ALERTING, CONNECT or DISCONNECT messages has been received, the MES shall perform the clearing procedure described in clause 6.4.

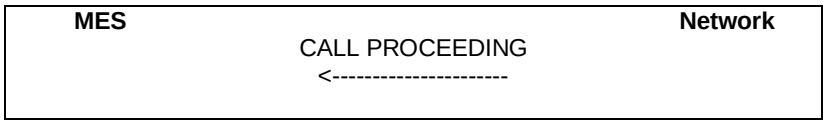

Figure 6.2.2: Call proceeding sequence at mobile originated call establishment

6.2.1.4 Notification of progressing mobile originated call

In this clause, the term "interworking" is used only in the meaning of interworking with a network other than PLMN or ISDN, not as interworking between PLMN and ISDN since this is the normal case. In this sense, PLMN and ISDN are seen within the same environment, called the PLMN/ISDN environment.

6.2.1.4.1 Notification of interworking in connection with mobile originated call establishment

During call establishment, the call may leave a PLMN/ISDN environment, e.g., because of interworking with another network, with a non-PLMN/ISDN user, or with non-PLMN/ISDN equipment within the called user's premises. The call may also return to a PLMN/ISDN environment. When such situations occur, the network may send a progress indicator information element to the calling MES either:

a) In an appropriate call control message, if a state change is required (e.g., ALERTING (values 1, 2, 8) or CONNECT);

b) In the PROGRESS message, values 1 and 8, if no state change is appropriate.

This progress indicator information element shall contain one of the following progress description values:

a) #1 "call is not end-to-end PLMN/ISDN; further call progress information may be available in- band";

b) #2 "destination address is non-PLMN/ISDN";

c) #8 In-Band Information or appropriate pattern now available.

See also clauses 6.5.1 and 6.5.6 for further reactions of the MES.

6.2.1.4.2 Call progress in the PLMN/ISDN environment

In order to inform the MES that the call is progressing in the PLMN/ISDN environment, the network may send a progress indicator information element to the calling MES either:

a) In an appropriate call control message, if a state change is required (e.g., ALERTING or CONNECT);

b) In the PROGRESS message, if no state change is appropriate.

This progress indicator information element shall contain progress description value #32 "Call is end-to-end ISDN/PLMN." See also clause 6.5.6 for further reactions of the MES.

6.2.1.5 Alerting

Having entered the MOBILE ORIGINATING CALL PROCEEDING state, upon receiving an indication that user alerting has been initiated at the called address, the call control entity of the network shall send an ALERTING message to its peer entity at the calling MES and enter the "CALL DELIVERED" state.

When the call control entity of the MES in the CALL INITIATED state or MOBILE ORIGINATING CALL PROCEEDING state receives an ALERTING message, then the call control entity of the MES shall stop timers T303 and T310 (if running) and shall enter the CALL DELIVERED state. In this state, for speech calls, an alerting indication should be given to the user. If the MES has not attached the user connection, then the MES shall internally generate an alerting indication. If the MES has attached the user connection, then the network is responsible for generating the alerting indication and the MES need not generate one.

Abnormal cases:

On the MES side, if timer T310 expires, the call control entity of the MES shall initiate call clearing as described in clause 6.4.

Figure 6.2.3: Call confirmation at mobile originating call establishment

6.2.1.6 Call connected

Upon receiving an indication that the call has been accepted, the call control entity of the network shall connect the traffic channel (including the connection of an interworking function, if required) and send a CONNECT message to its peer entity at the calling MES, start timer T313 and enter the CONNECT INDICATION state. This message indicates to the call control entity of the calling MES that a connection has been established through the network.

The call control entity of the MES in the CALL INITIATED state, in the MOBILE ORIGINATING CALL PROCEEDING state or in the CALL DELIVERED state, shall, upon receipt of a CONNECT message:

- Attach the user connection;
- Return a CONNECT ACKNOWLEDGE message;
- Stop any locally generated alerting indication (if applied);
- Stop timer T303 and T310 (if running);
- Enter the ACTIVE state.

Abnormal cases:

On the MES side, if timer T303 or T310 expires, the call control entity of the MES shall initiate call clearing as described in clause 6.4.

NOTE: The MES may have applied an additional internal alerting supervision which causes initiation of call clearing prior to the expiration of T303 or T310.

The call control of the network in the CONNECT INDICATION state, shall, upon receipt of a CONNECT ACKNOWLEDGE message:

- Stop timer T313 and enter the ACTIVE state.

Abnormal cases:

On the network side, if timer T313 elapses before a CONNECT ACKNOWLEDGE message has been received, the network shall perform the clearing procedure as described in clause 6.4.

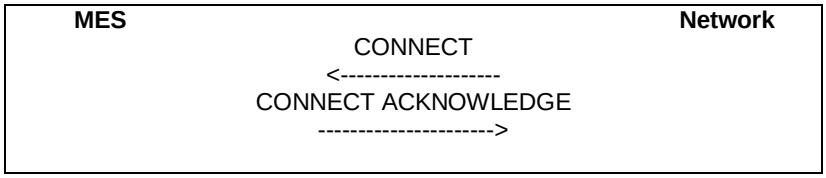

Figure 6.2.4: Call acceptance sequence at mobile originating call establishment

6.2.1.7 Call rejection

Upon receiving an indication that the network or the called user is unable to accept the call, the network shall initiate call clearing at the radio interface to the mobile which originated the call, as described in clause 6.4 using the cause provided by the terminating network or the called user.

6.2.1.8 Transit network selection

This clause does not apply to the GMR-2 system.

6.2.1.9 Traffic channel assignment at mobile originating call establishment

The Network shall only support the early assignment of an appropriate traffic channel during the mobile originating call establishment phase. Initiation of a suitable RR procedure to assign an appropriate traffic channel does neither change the state of a call control entity nor affect any call control timer.

NOTE: During certain phases of such an RR procedure, transmission of CC and MM messages may be suspended, see GSM 08.08 [29].

The assignment procedure does not affect any call control timer.

6.2.1.10 Call Queuing at mobile originating call establishment

The conditions to apply queuing are described in GMR-2 03.001 [6].

If an idle traffic channel is not available at the assignment instant, the network may place the traffic channel request in a queue. Calls arriving when all positions in the queue are occupied shall be cleared by the network using the cause #34 "no circuit/channel available." Traffic channel allocation and queuing procedures are specified in GSM 08.08 [29].

An explicit queuing indicator is not provided to the MES.

The maximum queuing interval is supervised by the network. The limit is a network dependent choice. In case the network is not able to allocate a traffic channel within the queuing limit, the network will release the call using cause #34 "no circuit/channel available."

Specific indications provided in the network to the remote user are a network dependent choice.

6.2.2 Mobile terminating call establishment

Before call establishment can be initiated in the MES, the MM connection must be established by the network.

6.2.2.1 Call indication

After the arrival of a call from a remote user, the corresponding call control entity in the network shall initiate the MM connection establishment according to clause 5 and enter the MM CONNECTION PENDING state. The request to establish the MM connection is passed from the CM sublayer to the MM sublayer. It contains the necessary routing information derived from the SETUP message.

Upon completion of the MM connection, the call control entity of the network shall send the SETUP message to its peer entity at the User Terminal, start timer T303 and enter the CALL PRESENT state.

Upon receipt of a SETUP message, the MES shall perform compatibility checking as described in clause 6.2.2.2. If the result of the compatibility checking was compatibility, the call control entity of the MES shall enter the CALL PRESENT state. An incompatible MES shall respond with a RELEASE COMPLETE message in accordance with clause 6.2.2.3.4.

If no response to the SETUP message is received by the call control entity of the network before the expiration of timer T303, the procedures described in clause 6.2.2.3.3 shall apply.

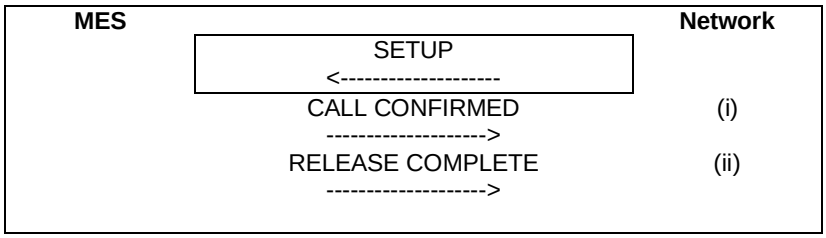

Figure 6.2.5: Mobile terminating call initiation an possible subsequent responses

6.2.2.2 Compatibility checking

The MES receiving a SETUP message shall perform compatibility checking before responding to that SETUP message. Annex B defines compatibility checking to be performed by the MES upon receiving a SETUP message.

6.2.2.3 Call confirmation

6.2.2.3.1 Response to SETUP

Having entered the CALL PRESENT STATE the call control entity of the MES shall, with the exception of the cases described below, acknowledge the SETUP message by a CALL CONFIRMED message, and enter the MOBILE TERMINATING CALL CONFIRMED state.

The call control entity of the MES may include in the CALL CONFIRMED message to the network one or two bearer capability information elements to the network, either preselected in the MES or corresponding to a service dependent directory number (see GSM 09.07 [30]). The MES may also include one or two bearer capabilities in the CALL CONFIRMED message to define the radio channel requirements. In any case, the rules specified in clause 10.3.2.2 shall be followed.

NOTE: The possibility of alternative responses (e.g., in connection with supplementary services) is for further study.

A busy MES which satisfies the compatibility requirements indicated in the SETUP message shall respond either with a CALL CONFIRMED message, if the call setup is allowed to continue, or a RELEASE COMPLETE message if the call setup is not allowed to continue, both with cause #17 "user busy."

If the mobile user wishes to refuse the call, a RELEASE COMPLETE message shall be sent with the cause #21 "call rejected."

In the cases where the MES responds to a SETUP message with a RELEASE COMPLETE message, the MES shall release the MM connection and enter the NULL state after sending the RELEASE COMPLETE message.

The network shall process the RELEASE COMPLETE message in accordance with clause 6.4.

6.2.2.3.2 Receipt of CALL CONFIRMED and ALERTING by the network

The call control entity of the network in the CALL PRESENT state, shall, upon receipt of a CALL CONFIRMED message, stop timer T303, start timer T310 and enter the MOBILE TERMINATING CALL CONFIRMED state.

The call control entity of the MES, having entered the MOBILE TERMINATING CALL CONFIRMED state, if the call is accepted at the called user side, the MES proceeds as described in clause 6.2.2.5. Otherwise, if the signal information element was present in the SETUP message, user alerting is initiated at the MES side. If the signal information element was not present in the SETUP message, user alerting is initiated when an appropriate channel is available.

Here, initiation of user alerting means:

a) The generation of an appropriate tone or indication at the MES; and

b) Sending of an ALERTING message by the call control entity of the MES to its peer entity in the network.

With regards to the negotiable parameters of the BC 1 IE included in the SETUP message, the possible negotiated parameters returned by the MES in the CALL CONFIRM message (within the BC 1 IE) shall conform to Table 6.2.1.

Table 6.2.1: Table of negotiable GSM-BC parameters for the SETUP message from the CALL CONFIRMED message

Parameters	Parameter values for the relative messages	
	SETUP message	CALL CONFIRM message
Number of Data Bits	n1	free choice
Number of Stop Bits	n2	free choice
Parity Information	n3	free choice (*note 3*)
Radio Channel Requirement (RCR)	arbitrary value (*note 1*)	• (*note 2*) • 01 • 10 • 11
Connection Element (CE)	• transparent • non transparent • both, transparent (T) preferred • both, non transparent (NT) preferred	• transparent • non transparent • selected, free choice • selected, free choice
User Information Layer 2 Protocol	• for CE = T : NAV • for CE = NT or noth T/NT : offered value	• for CE = T : ignored (forced to NAV) • for CE = NT : selected value for NAV (*note 4*)
Structure	unstructure or SDU	• not controlled • forced to unstructured for CE=T • forced to SDU for CE=NT
Intermediate Rate	8 kbit/s or 16 kbit/s	• not controlled • forced to 8 kbit/s if UR #9.6 kbit/s • forced to 16 kbit/s if CE=NT • else 16 kbit/s for CE=T
User rate	offered value	• free choice according to values supported by the network (5)
Modem Type	V series	• If CE=T : equal to the value corresponding to user rate, except for fax (where it is equal to none) • If CE=NT : not controlled, forced to the value corresponding to user rate (autobauding not supported).

NOTE 1 : The value sent is always for 'Full Rate'
NOTE 2 :
- For Data Calls
  If the value 00, 10 or 11 is received, then the value of the {channel type} included in the BSSMAP {Assignment Request} message (refer to GSM 08.08 [29]) shall always indicate a 'Full Rate' channel.
- For Speech Calls :
  Refer to Table 10.7.2 for a description of the RCR handling.

NOTE 3 : It is controlled that for 8 data bits, the value of parity is « none ». Otherwise the call is released
NOTE 4 :
- For Asynchronous services the only values accepted are NAV (byte 7 absent), IA5 (in-band flow control) or {videotex profile 3} (no flow control)
- For Synchronous services only the value X.25, is accepted by the network (NSC).

NOTE 5: Always true for fax teleservice and according to an option for bearer services.
NOTE 6: If no choice is done by the MS in its response (i.e. either a choice is returned in the GSM-BC or no GSM-BC is received in the call confirmed when a choice has been proposed in the setup) the call is released.

The call control entity of the network in the MOBILE TERMINATED CALL CONFIRMED state shall, upon receipt of an ALERTING message, send a corresponding ALERTING indication to the calling user, stop timer T310, start timer T301, and enter the CALL RECEIVED state.

In the MOBILE TERMINATING CALL CONFIRMED state or the CALL RECEIVED state, if the user of a MES is User Determined User Busy, then a DISCONNECT message shall be sent with cause #17 "user busy." In the MOBILE TERMINATING CALL CONFIRMED state, if the user of a MES wishes to reject the call then a DISCONNECT message shall be sent with cause #21 "call rejected."

6.2.2.3.3 Call failure procedures

In case of abnormal behavior, the following call failure procedures apply:

i) If the network does not receive any response to the SETUP message prior to the expiration of timer T303, then the network shall initiate clearing procedures towards the calling user with cause #18, "no user responding," and initiate clearing procedures towards the called MES in accordance with clause 6.4.4, using cause #102 "recovery on timer expiration."

ii) If the network has received a CALL CONFIRMED message, but does not receive an ALERTING, CONNECT or DISCONNECT message prior to the expiration of timer T310, then the network shall:

- Initiate clearing procedures towards the calling user with cause #18 "no user responding"; and
- Initiate clearing procedures towards the called MES in accordance with clause 6.4.4 using cause #102 "recovery on timer expiration."

iii) If the network has received an ALERTING message, but does not receive a CONNECT or DISCONNECT message prior to the expiration of timer T301 (or a corresponding internal alerting supervision timing function), then the network shall initiate clearing procedures towards the calling user with cause #19 "user alerting, no answer" and initiate clearing procedures towards the called MES in accordance with clause 6.4.4, using cause #102 "recovery on timer expiry" or using cause #31 "normal, unspecified."

NOTE: The choice between cause #31 and cause #102 may have consequences on indications generated by the MES, see GSM 02.40 [5].

6.2.2.3.4 Called MES clearing during mobile terminating call establishment

See clause 6.4.2.

6.2.2.4 Notification of interworking in connection with mobile terminating call establishment

In this clause, the term "interworking" is used only in the meaning of interworking with a network other than PLMN or ISDN, not as interworking between PLMN and ISDN since this is the normal case. In this sense, PLMN and ISDN are seen within the same environment, called the PLMN/ISDN environment.

During call establishment, the call may enter an PLMN/ISDN environment, e.g., because of interworking with another network, with a non-PLMN/ISDN user, or with non-PLMN/ISDN equipment within the calling or called user's premises. When this occurs, the network may include a progress indicator information element to be included in the SETUP message to be sent to the called MES specifying progress description value:

i) #1: "call is not end-to-end PLMN/ISDN; further call progress information may be available inband"; or

ii) #3: "origination address is non-PLMN/ISDN".

See also clause 6.5.1 for further reactions of the MES.

6.2.2.5 Call accept

In the MOBILE TERMINATING CALL CONFIRMED state or the CALL RECEIVED state, the call control entity in the MES indicates acceptance of a mobile terminating call by:

- Sending a CONNECT message to its peer entity in the network;
- Starting Timer T313; and
- Entering the "CONNECT REQUEST" state.

6.2.2.6 Active indication

In the MOBILE TERMINATED CALL CONFIRMED state or in the CALL RECEIVED state, the call control entity of the network shall, upon receipt of a CONNECT message, through-connect the traffic channel (including the connection of an interworking function, if required), stop timers T310, T303 or T301 (if running), send a CONNECT ACKNOWLEDGE message to its peer entity at the MES of the called user, initiate procedures to send a CONNECT message towards the calling user and enter the ACTIVE state.

In the CONNECT REQUEST state, the call control entity of the MES shall, upon receipt of a CONNECT ACKNOWLEDGE message, stop timer T313 and enter the ACTIVE state.

When timer T313 expires prior to the receipt of a CONNECT ACKNOWLEDGE message, the MES shall initiate clearing in accordance with clause 6.4.3.

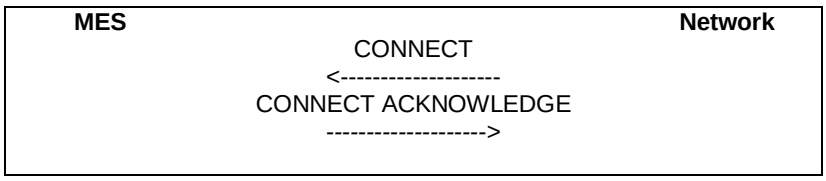

Figure 6.2.6: Call acceptance and active indication at mobile terminating call establishment

6.2.2.7 Traffic channel assignment at mobile terminating call establishment

It is a network dependent decision when to initiate the assignment of a traffic channel during the mobile terminating call establishment phase.

Only early assignment as described in clause 8.3.3 is supported by the MSC.

Initiation of the assignment phase does neither change the state of a CC entity nor affect any call control timer.

6.2.2.8 Call queuing at mobile terminating call establishment

The principles described in clause 6.2.1.1.10 apply accordingly.

NOTE: The interworking to the fixed network has to fulfill the network specific requirements.

6.2.2.9 User connection attachment during a mobile terminating call

For speech calls:

The MES shall attach the user connection at latest when sending the connect message.

For data calls:

The MES shall attach the user connection when receiving the CONNECT ACKNOWLEDGE message from the network.

6.2.3 Mobile-to-Mobile Call Establishment, Special Procedures

6.2.3.1 Call Initiation

To establish a mobile-to-mobile single hop connection, the following special procedures are implemented:

- The Mobile-to-Mobile Flag is set (per 11.5.2.5 Channel Description IE) to a value of 1 by the network in the ASSIGNMENT COMMAND to the MES.
- If the system does not support ciphering for Mobile-to-Mobile calls, then the network shall disable ciphering mode on the assigned channel, if previously activated, via the Cipher Mode Setting IE (11.5.2.9) in the ASSIGNMENT COMMAND.

6.2.3.2 Call Connection

- The Call Control entity of the Terminating MES indicates acceptance of the call by sending a CONNECT message as defined in clause 6.2.2.5.
- The Network responds by sending a CONNECT message to the Originating MES as defined in clause 6.2.1.6.
- The Originating MES shall connect the call and return a CONNECT ACKNOWLEDGE message as defined in clause 6.2.1.6 except that the user connection shall not be attached. The MES will start a wait timer – roughly corresponding to the round-trip delay in the network – while waiting for a L2 acknowledge to the CONNECT ACKNOWLEDGE, before proceeding.
- After the wait timer expires, the Originating MES will suspend the L2 multi-frame mode without saving any outstanding L3 messages which are not acknowledged. Then the MES shall initiate transmitting and searching for FTCB bursts as defined in GMR-2 05.002 [23], clauses 7.2.12 and 7.2.12.2. The Originating MES will start the M-MO timer defined in clause 11.5.2.47.
- Upon receipt of the CONNECT ACKNOWLEDGE message from the Originating MES, the network shall send a CONNECT ACKNOWLEDGE message to the Terminating MES.

NOTE: The network will initiate the direct MES-to-MES connection on the satellite at this time.

- Upon receipt of the CONNECT ACKNOWLEDGE message from the network, the Terminating MES will wait a short period (e.g., 0.2 s) then initiate transmitting and searching for FTCB bursts as defined in GMR-2 05.002 [23], clauses 7.2.12 and 7.2.12.2. The Terminating MES will start the M-MT timer defined in clause 11.5.2.47.

NOTE: The Terminating MES will send only one layer 2 CONNECT ACKNOWLEDGE to the network.

- If the Originating MES receives the FTCB burst from the Terminating MES, then at M-MO timer expiration, it will resume multi-frame operation by initiating a Normal DL Establishment procedure as defined in GMR-2 04.006 [15], clause 8.4.1.1 using the C/R field bit setting as defined in GMR-2 04.006 [15], clause 6.3.2.2.

NOTE: While transmitting and receiving FTCBs, the MESs shall not be required to handle S-FACCH messages. At M-MO and/or M-MT timer expiration, the MESs shall be permitted to perform a local release of the call, i.e., without transmitting any messages over the air interface, if the frequency and time correction process has failed.

- Upon receipt of the SABM, the Terminating MESs will send an acknowledge to the Originating MESs as defined in GMR-2 04.006 [15], clause 8.4.1.1 using the C/R field bit setting as defined in GMR-2 04.006 [15] clause 6.3.2.2.

NOTE: If the Terminating MES does not receive a SABM within 5 seconds after M-MT timer expiration, then the terminating User Terminal will perform a local release of the call (no messages are transmitted by the MES).

- At the end of a successful DL re-establishment, the MES shall attach the user connection.

6.3 Signalling procedures during the "Active" state

6.3.1 User notification procedure

This clause does not apply to the GMR-2 system.

6.3.2 Call rearrangements

This clause does not apply to the GMR-2 system.

6.3.3 DTMF protocol control procedure

Dual Tone Multi Frequency (DTMF) is an inband one out of four plus one out of four signalling system primarily used from terminal instruments in telecommunication networks. The support of DTMF in the network is described in GSM 03.14 [8].

The MES shall be capable of transmitting DTMF messages if and only if the MES has the user connection for speech attached and an appropriate channel is available.

The transaction identifier used by the DTMF messages shall be that of the attached call.

NOTE 1: This specification means that DTMF messages can generally be sent in the ACTIVE state of a call in speech transmission mode or when a traffic channel is available during setup or release and the progress indicator IE has been received.

NOTE 2: Since the DTMF protocol messages are sent in a store and forward mode on the signalling channels the control of the device at the far end may be delayed dependent on the load or quality of the channels.

NOTE 3: The procedures described in this clause support DTMF only in the direction MES to network.

6.3.3.1 Start DTMF request by the MES

A user may cause a DTMF tone to be generated, e.g., by depression of a key in the MES. The relevant action is interpreted by the MES as a requirement for a DTMF digit to be sent in a START DTMF message on an established S-FACCH. This message contains the value of the digit to be transmitted (0, 1, ..., 9, A, B, C, D, *, #).

Only a single digit will be transferred in each START DTMF message.

6.3.3.2 Start DTMF response by the network

Upon receiving the START DTMF message, the network will reconvert the received digit back into a DTMF tone which is applied toward the remote user and returns a START DTMF ACKNOWLEDGE message to the MES. This acknowledgement may be used in the MES to generate an indication as a feedback for a successful transmission.

If the network cannot accept the START DTMF message a START DTMF REJECT message will be sent to the MES.

6.3.3.3 Stop DTMF request by the user terminal

When the user indicates that the DTMF sending should cease, e.g., by releasing the key, the MES will send a STOP DTMF message to the network.

6.3.3.4 Stop DTMF response by the network

Upon receiving the STOP DTMF message, the network will stop sending the DTMF tone and return a STOP DTMF ACKNOWLEDGE message to the MES.

6.3.3.5 Sequencing of subsequent start DTMF requests by the MES

The minimum length of tone generated by the network should be according to CEPT recommendation T/CS 46-02.

The minimum gap between two subsequent tones should be according to CEPT recommendation T/CS 46-02.

There is no defined maximum length to the tone, which will normally cease when a STOP DTMF message is received from the MES. However, the operator may choose to put a pre-defined time limit on the duration of tones sent.

The appropriate sequencing of DTMF control messages is shown in figures 6.3.1 and 6.3.2.

NOTE 1: The network shall implement the time limit option where the DTMF tone duration is controlled by the network irrespective of the receipt of a STOP DTMF message from the MES, but the MES shall send the STOP DTMF message anyway.

NOTE 2: The transmission time of the messages over the air interface on S-FACCH/F or S-FACCH/H (see GMR-2 05.002 [23]), ensures that the minimum length of tones and minimum gap between tones according to T/CS 46-02 are fulfilled.

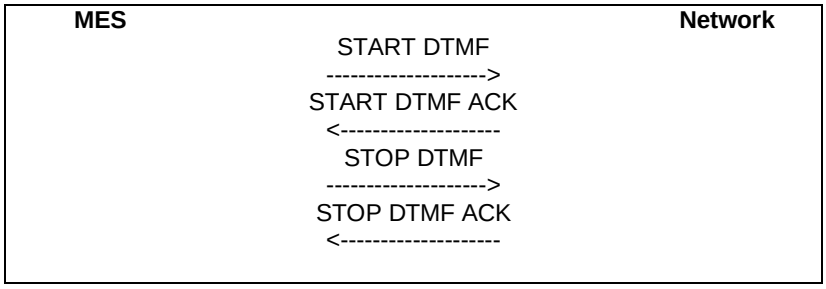

Figure 6.3.1: Single DTMF transmission

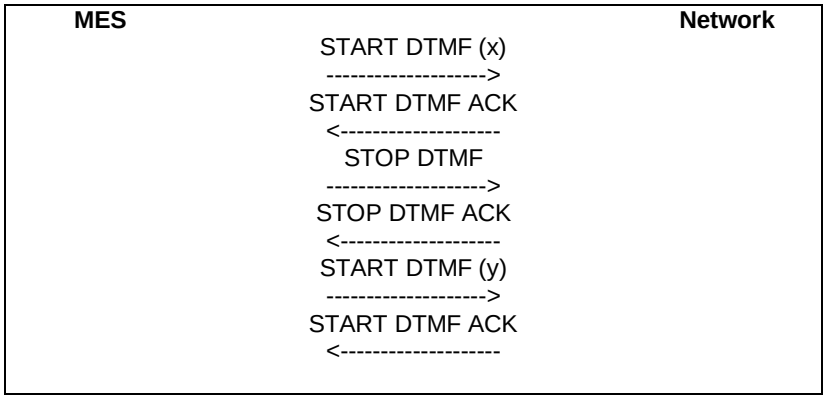

Figure 6.3.1: Multiple DTMF transmission

6.3.4 Support of Dual Services

This clause does not apply to the GMR-2 system.

6.3.5 Mobile-to-Mobile Signaling Procedures

During a Mobile-to-Mobile call on a single-hop connection, the following signalling channels are available.

1) S-FACCH - User Terminal to User Terminal, and User Terminal to Network.

2) S-SACCH - User Terminal to Network, Network to User Terminal.

The MES shall transmit any commands/responses destined for the other User Terminal in multi-frame mode using the S-FACCH signalling channel.

NOTE: The C/R bit shall be set as defined in GMR-2 04.006 [15].

The Network will also receive any messages transmitted by the MES using the S-FACCH signalling channel. The Network should ignore any message received which contains an incorrect (unexpected) C/R value.

The MES shall transmit any commands/responses destined for the Network in unnumbered mode using the S-FACCH signalling channel.

NOTE: The C/R bit shall be set as defined in GMR-2 04.006 [15]. The other User Terminal will also receive any messages transmitted by the MES using the S-FACCH signalling channel. The MES should ignore any message received which contains an incorrect (unexpected) C/R value.

6.4 Call clearing

6.4.1 Terminology

The following terms are used in the present document in the description of clearing procedures:

- A traffic channel (see GMR-2 04.003 [12]) is "connected" when the channel is part of a circuit-switched connection established according to the present document.
- A traffic channel is "disconnected" when the channel is no longer part of a circuit-switched connection, but is not yet available for use in a new connection.

6.4.2 Exception conditions

Under normal conditions, the call control entity of the MES, or of the network, initiates call clearing by sending a DISCONNECT message to its peer entity. Then both entities follow the procedures defined in clauses 6.4.3 and 6.4.4 respectively.

As an exception to the above rule, the call control entity of the MES, or of the network, in response to a SETUP message, can reject a call by stopping all running call control timers, responding with a RELEASE COMPLETE message, releasing the MM connection, and returning to the NULL state, provided no other response has previously been sent.

As a further exception, the call control entity of the network may initiate call clearing by stopping all running call control timers, sending a RELEASE message, starting timer T308, and entering the RELEASE REQUEST state.

NOTE: This way to initiate call clearing by sending a RELEASE message should not be used by the network:

- If in-band tones/announcements are provided and the network decides to use the procedure described in clause 6.4.4.1;
- If the network wants to have the opportunity to respond to information sent by the MES during call clearing.

If a BSSMAP CLEAR REQUEST message (see GSM 08.08 [29]) is received from the GSC, the MSC shall never send the DISCONNECT or RELEASE message to the MES.

A call control entity shall accept an incoming RELEASE COMPLETE message used to initiate the call clearing even though the cause information element is not included.

A control entity shall accept an incoming RELEASE message used to initiate the call clearing even though the cause information element is not included.

Furthermore, a call control entity shall regard an incoming RELEASE COMPLETE message as consistent with any of its states. A call control entity shall regard an incoming RELEASE message as consistent with any of its states except the NULL state. A call control entity of the MES shall regard an incoming DISCONNECT message as consistent with any of its call control states except the NULL state, the RELEASE REQUEST state, and the DISCONNECT INDICATION state. A call control entity of the network shall regard an incoming DISCONNECT message as consistent with any of its call control states except the NULL state and the RELEASE REQUEST state.

NOTE: This allows the introduction of shorter call clearing procedures in the future.

6.4.3 Clearing initiated by the MES

6.4.3.1 Initiation of call clearing

Apart from the exceptions identified in clause 6.4.2, the call control entity of the MES shall initiate clearing by stopping all running call control timers, sending a DISCONNECT message, starting timer T305, and entering the DISCONNECT REQUEST state.

6.4.3.2 Receipt of a DISCONNECT message from the MES.

The call control entity in the network in any state except the NULL state or the RELEASE REQUEST state shall, upon receipt of a DISCONNECT message:

- Stop all running call control timers;
- Initiate procedures to clear the network connection and the call to the remote user;
- Send a RELEASE message to its peer entity;
- Start timer T308;
- Enter the RELEASE REQUEST state.

NOTE: The RELEASE message has only local significance and does not imply an acknowledgement of clearing from the remote user.

6.4.3.3 Receipt of a RELEASE message from the network

The call control entity of the MES in any state except the NULL state or the RELEASE REQUEST state, shall, upon receipt of a RELEASE message, stop all running call control timers, send a RELEASE COMPLETE message, release the MM connection and return to the NULL state.

6.4.3.4 Receipt of a RELEASE COMPLETE message from the MES

A call control entity of the network in any call control state shall, upon receipt of a RELEASE COMPLETE message from its peer entity in the MES, stop all running call control timers, release the MM connection, and return to the NULL state.

6.4.3.5 Abnormal cases

The call control entity of the MES in the DISCONNECT REQUEST state, shall, upon expiration of timer T305, send a RELEASE message to the network with the *cause* number originally contained in the DISCONNECT message, and optionally, a second cause information element with cause #102 "recovery on timer expiry", start timer T308, and enter the RELEASE REQUEST state.

The call control entity of the network in the RELEASE REQUEST state, shall, at first expiration of timer T308, retransmit the RELEASE message, start timer T308, and stay in the RELEASE REQUEST state. At the second expiration of timer T308, the call control entity of the network shall release the MM connection and return to the NULL state.

6.4.3.6 Initiation of Call Clearing, Mobile-to-Mobile Calls

The User Terminal (Originating User Terminal or Terminating User Terminal – the procedure is the same for either of them) initiates the release of a mobile-to-mobile call as described below.

1. The Release-Initiating User Terminal transmits a CC RELEASE message with cause value #75, i.e., "MES-to-MES CC Release" (destined for the Other User Terminal) in an I-frame (acknowledged mode) using the S-FACCH and starts timer T308.

   NOTE: The network will ignore the receipt of this message.

2. Following the I-frame, the Release-Initiating User Terminal transmits a CC RELEASE message with cause value #75, i.e., "MES-to-MES CC Release" (destined for the Network) in a UI-frame (unacknowledged mode) using the S-FACCH.

   NOTE: The Terminating User Terminal will ignore the receipt of this message.

6.4.3.7 Receipt of RELEASE Message by the User Terminal

Upon receipt of a RELEASE message with cause value #75, i.e., "MES-to-MES CC Release" in the I-frame, any of the User Terminals will:

1) Transmit a RELEASE COMPLETE message with cause value #75, i.e., "MES-to-MES CC Release" to the Release-Initiating User Terminal.

2) Release the MM and CC connections and perform a local release of the RR connection.

6.4.3.8 Receipt of RELEASE Message by the Network

Upon receipt of the RELEASE message in the UI-frame, the network will perform local release of the RR connection.

6.4.3.9 Receipt of RELEASE COMPLETE Message by the User Terminal

Upon receipt of the RELEASE COMPLETE message with cause value #75, i.e., "MES-to-MES CC Release" in the I-frame, the Release-Initiating User Terminal will release the MM and CC connections and perform a local release of the RR connection.

6.4.3.10 Abnormal Cases

Upon the first timeout of timer T308, the Release-Initiating User Terminal will retransmit the CC RELEASE message as defined in clause 5.4.3.6, i.e., in an I-frame followed by a UI- frame.

Timer T308 is restarted.

Upon the second timeout of timer T308, the Release-Initiating User Terminal will release the MM and CC connections and perform a local release of the RR connection.

NOTE: If the RELEASE message is received successfully by the network on the first attempt, then the MES may release the call due to an S-SACCH timeout before the T308 timeout.

6.4.4 Clearing initiated by the network

Apart from the exception conditions identified in clause 6.4.2, the call control entity of the network shall initiate clearing by: sending a DISCONNECT message; and entering the DISCONNECT INDICATION state. The DISCONNECT message is a local invitation to clear the call.

NOTE: When the network initiates clearing by sending a RELEASE message, the procedures described in clauses 6.4.3.3, 6.4.3.4 and 6.4.3.5 are followed.

6.4.4.1 Clearing when tones/announcements provided

The network (MSC) never includes a progress indicator IE in the DISCONNECT message it sends to the MES for clearing the call.

6.4.4.2 Clearing when tones/announcements not provided

When in-band tones and announcements are not provided, the call control entity of the network shall initiate call clearing by stopping all running call control timers, sending a DISCONNECT message without progress indicator, starting timer T305 and entering the "disconnect indication" state.

6.4.4.2.1 Receipt of a DISCONNECT message without progress indicator or with progress indicator different from #8 from the network

The call control entity of the MES, in any state except the "null" state, the "disconnect indication" state, or the "release request" state, shall, upon the receipt of a DISCONNECT message without progress indicator information element or with progress indicator different from #8:

- Stop all running call control timers,
- Send a RELEASE message;
- Start timer T308;
- Enter the "release request" state.

6.4.4.2.2 Receipt of a RELEASE message from the MES

The call control entity of the network in any state except the "null" state or the "release request" state, shall, upon receipt of a RELEASE message, stop all running call control timers, send a RELEASE COMPLETE message, release the MM connection and return to the "null" state.

6.4.4.2.3 Abnormal cases

The call control entity of the network, having entered the "disconnect indication" state after sending a DISCONNECT message without progress indicator or with progress indicator different from #8, shall, upon expiration of timer T305, send a RELEASE message to the MES with the cause number originally contained in the DISCONNECT message, start timer T308, and enter the "release request" state. In addition to the original clearing cause, the RELEASE message may contain a second cause information element with cause #102 "recovery on timer expiry".

6.4.4.3 Completion of clearing

A call control entity of the MES in any call control state, shall, upon receipt of a RELEASE COMPLETE message from its peer entity in the network, stop all running call control timers, release the MM connection, and return to the "null" state.

6.4.4.3.1 Abnormal cases

The call control entity of the MES in the "release request" state, shall, at first expiration of timer T308, retransmit the RELEASE message and restart timer T308. At second expiration of timer T308, the call control entity of the MES shall release the MM connection and return to the "null" state.

6.4.5 Clear collision

Clear collision occurs when both the MES and the network simultaneously transfer DISCONNECT messages specifying the same call.

The behaviour of the network call control entity receiving a DISCONNECT message while in the "disconnect indication" state is specified in clause 6.4.3. The behaviour of the MES call control entity receiving a DISCONNECT message while in the "disconnect request" state is defined in clause 6.4.4.

Clear collision can also occur when both sides simultaneously transfer RELEASE messages related to the same call. The entity receiving such a RELEASE message while within the "release request" state shall stop timer T308, release the MM connection and enter the "null" state (without sending a RELEASE COMPLETE message).

6.5 Miscellaneous procedures

6.5.1 In-Band tones and announcements

When the network wants to make the MES attach the user connection (e.g., in order to provide in-band tones/announcement) before the MES has reached the "active" state of a call, the network may include a progress indicator IE indicating user attachment in a suitable CC message:

- In the case of the originating call when in-band tones or an announcement is generated by the remote party: according to the information provided in the Address Complete Message (ISUP {ACM} message) from the remote party, the MSC includes a progress indicator IE in the ALERTING message, or it will send a PROGRESS message.

- In the case of emergency calls: if an announcement is to be provided before establishing the call, the PROGRESS message containing the progress indicator IE indicating "user attachment," is sent to the MES before providing the announcement on the traffic channel.

A progress indicator IE indicates user attachment if it specifies a progress description in the set (1, 2, 3) or in the set (6, 7, 8, ..., 20).

On reception of a SETUP, CALL PROCEEDING, ALERTING, CONNECT, or PROGRESS message, the MES shall proceed as specified elsewhere in clause 6. In addition, if the progress indicator lE indicated user attachment and a speech mode traffic channel is appropriate for the call, the MES shall attach the user connection for speech as soon as an appropriate channel in speech mode is available. (If a new order to attach the user connection is received before the attachment has been performed, the new order shall supersede the previous one.)

NOTE: This allows the use of progress indicator IEs independently from the channel modes appropriate for the call.

6.5.2 Call collisions

Call collisions as such cannot occur at the Network. Any simultaneous mobile originating or mobile terminating calls are dealt with separately assigned and different transaction identifiers.

6.5.3 Status procedures

6.5.3.1 Status enquiry procedure

Whenever a call control entity wishes to check the call state of its peer entity, it may initiate the status enquiry procedure.

NOTE: This may, in particular, apply to procedural error conditions described in clause 8.

The MSC shall trigger the status enquiry procedure only after a switchover.

A call control entity initiates the status enquiry procedure by sending the STATUS ENQUIRY message and starting timer T322. While timer T322 is running, the call control entity shall not send further STATUS ENQUIRY messages.

Upon receipt of a STATUS ENQUIRY message, the receiver shall respond with a STATUS message, reporting the current call state and cause value #30 "response to STATUS ENQUIRY". Receipt of the STATUS ENQUIRY shall not result in a state change relating to any protocol and connection of the receiver.

If a STATUS message is received that contains cause value #30 "response to STATUS ENQUIRY", timer T322 shall be stopped and further appropriate actions taken based on the information in that STATUS message relative to the current state of the receiver of the STATUS message. These further "appropriate actions" are implementation dependent. However, the actions prescribed in clause 6.5.3.2 shall apply.

If a clearing message is received while timer T322 is running, timer T322 shall be stopped, and call clearing shall continue.

If T322 expires, the STATUS ENQUIRY message shall not be transmitted and the clearing of the call shall be initiated by the MSC sending a {Clear Command} BSSMAP message to the GSC.

Possible states sent by the network to the MES in response to a status enquiry procedure are N0, N0.1, N1, N3, N4, N6, N7, N8, N9, N10 (possibly together with the auxiliary state), N12, N19 and N28.

6.5.3.2 Reception of a STATUS message by a CC entity

6.5.3.2.1 STATUS message with incompatible state

On receipt of a STATUS message reporting an incompatible call control state, the receiving entity shall clear the call by sending a RELEASE COMPLETE message with cause # 101 "message not compatible with protocol state". The reported call control state is incompatible if the combination of call control states at the sender and receiver side cannot occur, do not match, or cannot be aligned by actions of the receiver. The exact definition is implementation dependent.

On receipt of the MES state U12, U19 or U0 in a STATUS message in answer to a status enquiry procedure, the network shall consider the call transaction as released at the MES level and will complete the call clearing at the network level (including the trigging of the radio resource release).

On receipt of a STATUS message expected in response to a status enquiry procedure, if the MES state is different from U4, U7, U8 or U10, or if the cause indicated in the STATUS message is other that {#30 response to status enquiry}, the network shall release the call (including the sending of the release procedure with the MES, i.e., sending a DISCONNECT message).

On receipt of a spontaneous STATUS message (i.e., not answering a status enquiry procedure), the state received from the MES shall be regarded as incompatible if its combination with the network call control state cannot occur or do not match. In that case the call shall be released (including the sending of the release procedure with the User Terminal, i.e., sending a DISCONNECT message).

6.5.3.2.2 STATUS message with compatible state

On receipt of the MES states, U7, U8 or U10 (for a terminating call) or, U4 or U10 (for an originating call) in a STATUS message in answer to a status enquiry procedure, the network state shall be updated according to the MES state. Auxiliary states that can be received together with the MES state U10 may not be taken into account by the network.

On receipt of a spontaneous STATUS message (i.e., not answering a status enquiry procedure), if the state received from the MES shall be regarded as compatible, no action shall be performed by the network. A STATUS message may be received indicating a compatible call state but containing one of the following causes:

95 "semantically incorrect message";

96 "invalid mandatory information";

97 "message type non-existent or not implemented";

98 "message type not compatible with protocol state";

99 "information element non-existent or not implemented";

100 "invalid information element contents.

This indicates that the transmitter of the STATUS message was unable to accept some information sent by the recipient of the STATUS message. This allow the recipient to retransmit some or all of the information. Other actions are possible and are implementation dependent. They may include releasing the call.

The cause values listed above may lead the receiving entity to discard the STATUS message (refer also to clause 9 on Error Handling).

6.5.4 Call re-establishment, MES side

This clause does not apply to the GMR-2 system.

6.5.5 Call re-establishment, network side

This clause does not apply to the GMR-2 system.

6.5.6 Progress

The MSC may send a PROGRESS message to the MES when the {Address Complete Message} (ISUP ACM) indicates that further call progress information may be available in-band. The ISUP {Progress} message is ignored by the MSC.

The MSC sends a PROGRESS message to the MES when an announcement is to be generated before the call is established.

On receipt of a PROGRESS message during the establishment or release of a call, the MES shall stop all call control timers related to that call.

NOTE: If the PROGRESS has been received before the receipt of a CALL PROCEEDING message, the MES will not start timer T310 on receipt of a CALL PROCEEDING message, see clause 6.2.1.1.3.

Figure 6.5.1: Progress

7 Support of packet services

The circuit-switched call control procedures of clause 6 apply to this case.

8 Examples of structured procedures

8.1 General

Clause 8 contains examples of how the network may group together the elementary procedures (i.e., the procedures defined in clauses 4 through 6) in order to provide normal service.

The layer 3 signalling at the radio interface may be divided into so-called structured procedures which consist of specific combinations of elementary procedures. In clause 8.3, selected examples of structured procedures are described. A structured procedure consists of (not necessarily all) components shown in figure 8.1.1. These components are characterized by the purpose of their use in structured procedures and their message flow in the following clauses 8.1.1 through 8.1.7.

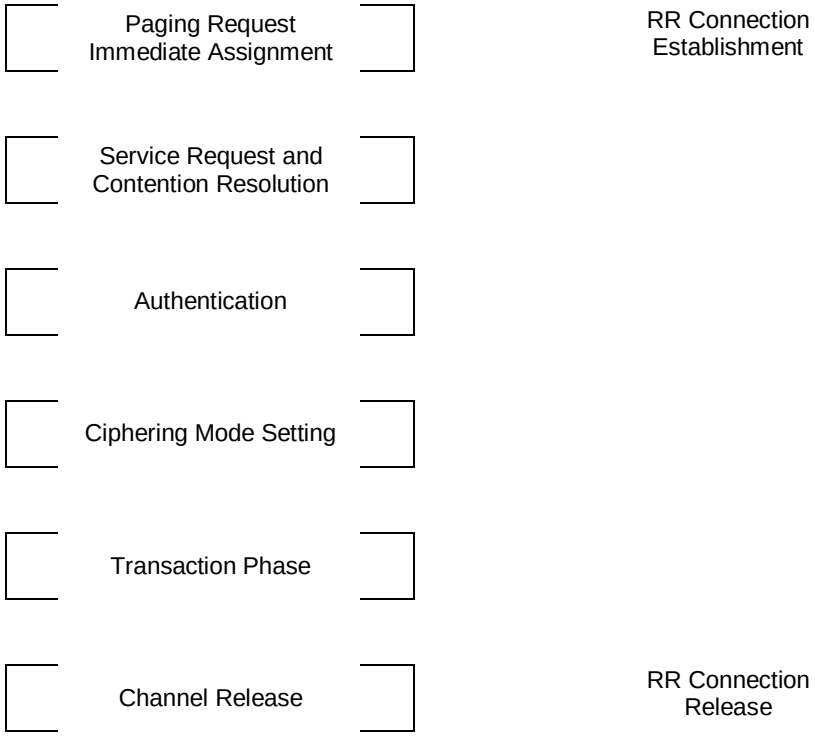

Figure 8.1.1: Components of structured procedures

8.1.1 Paging request

The paging procedure is used to locate a MES to which a connection shall be established.

Upon receipt of a PAGING REQUEST message, the addressed MES initiates the immediate assignment procedure.

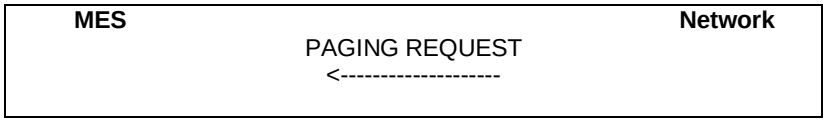

Figure 8.1.2: Paging request

8.1.2 Immediate assignment

The immediate assignment procedure is always initiated by the MES. It may be triggered by a paging request or by a mobile originating service request.

The MES sends a CHANNEL REQUEST message on the Random Access Channel. The network responds with an IMMEDIATE ASSIGNMENT message that causes the MES to seize the indicated dedicated channel.

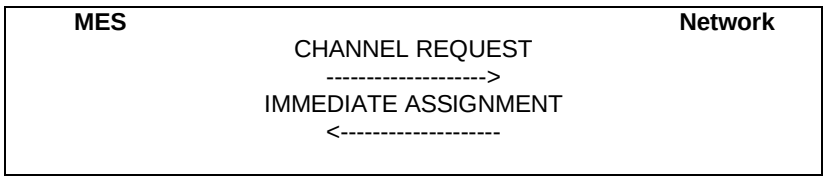

Figure 8.1.3: Immediate assignment

8.1.3 Service request and contention resolution

The initial service request message (a PAGING RESPONSE, LOCATION UPDATING REQUEST, CM SERVICE REQUEST) is sent by the MES to the network piggy-backed in the L2 SABM frames establishing the main signalling link. Its purpose is:

- To provide non-confidential information relevant to the service requested for the RR and MM sublayer in the network;
- To allow for contention resolution.

Contention resolution provides a resolution process when more than one MES try to seize a channel allocated during the immediate assignment procedure (because they happened to use the same random reference at the same time during random access). This is achieved by the network including in a L2 UA frame the same information field as that one received in the L2 SABM frame to which the UA frame responds. By comparing the two information fields, the MES can verify whether it was the originator of the L2 establishment because the service request contains the mobile identity.

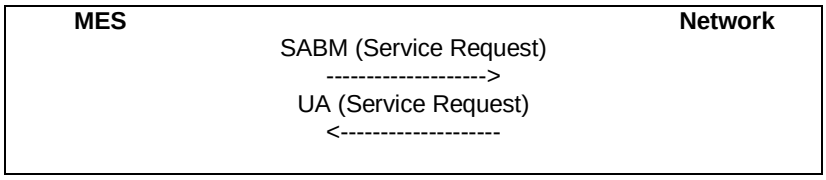

Figure 8.1.4: Service request and contention resolution

8.1.4 Authentication

The purpose of authentication is to validate the identity provided by the MES. It is initiated by the network. The authentication procedure also provides the MES with information from which a new ciphering key can be derived. The network decides whether or not to use authentication. This may depend on the context.

Figure 8.1.5: Service request and contention resolution

8.1.5 Ciphering mode setting

Ciphering mode setting is initiated by the network. Its purpose is to instruct the MES whether or not to use ciphering and which algorithm to use.

Where ciphering is used, this procedure synchronizes the start of ciphering at the MES and in the network.

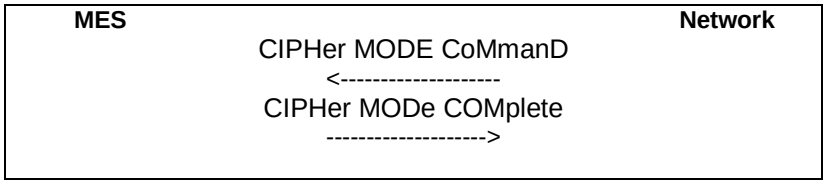

Figure 8.1.6: Ciphering mode setting

8.1.6 Transaction phase

A variety of elementary procedures described in clauses 4 through 6 may be performed during the transaction phase. In this clause, only the transmission mode change procedure is characterized.

8.1.6.1 Transmission mode change

The transmission mode change procedure may be used when a traffic channel has been assigned:

- During the in-call modification procedure in order that the channel mode of the S-TCH be changed to that one requested by call control;
- During call establishment with very early assignment in order that the channel mode of the S-TCH be changed from signalling only to the mode requested by call control;
- During the active phase of a data call in order that the speed of the data transmission be changed.

The transmission mode procedure is initiated by the network sending a CHANNEL MODE MODIFY message and completed by the MES changing the mode of the S-TCH and sending back a CHANNEL MODE MODIFY ACKNOWLEDGE message.

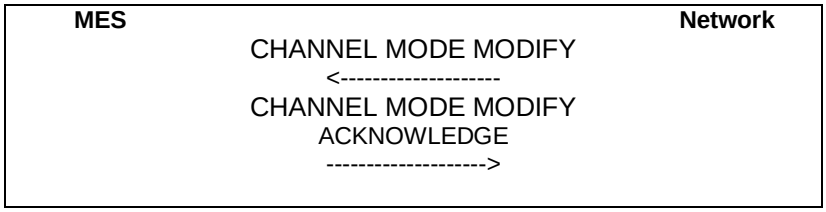

Figure 8.1.7: Channel mode change

8.1.7 Channel release

Once the transaction phase has been completed, the channel is released by the channel release procedure. The data link layer is released explicitly as described in GMR-2 04.006 [15]. After the channel release is completed, the radio resources which were in use may be reallocated by the network.

Figure 8.1.8: Channel release

8.2 Abnormal cases

Abnormal cases are not described in the examples of clause 8. They may arise from:

a) Failure at a lower layer (e.g., loss of radio connection);

b) Failure of an elementary procedure;

c) Errors in an elementary procedure.

8.3 Selected examples

The following examples are considered:

- Location updating;
- Mobile originating call establishment, without OACSU (early assignment);
- Mobile terminating call establishment, without OACSU (early assignment);
- Call clearing:
  - i) Network initiated;
  - ii) Mobile initiated;
  - iii) MES to MES call clearing;
- DTMF protocol control;
- In-call modification.

8.3.1 Location updating

The location updating procedure is always initiated by the MES, e.g., when it finds itself in a different location area from the one in which it was registered before. The cases where the procedure is triggered are described in clause 5 of the present document and in GMR-2 03.022 [10].

The procedure is shown in figure 8.3.1.

The MES initiates immediate assignment, service request using the LOCATION UPDATING REQUEST message, and contention resolution.

The network requires authentication (this again is an option).

After sending of the LOCATION UPDATING ACCEPT message the network initiates the channel release if no further transactions are scheduled.

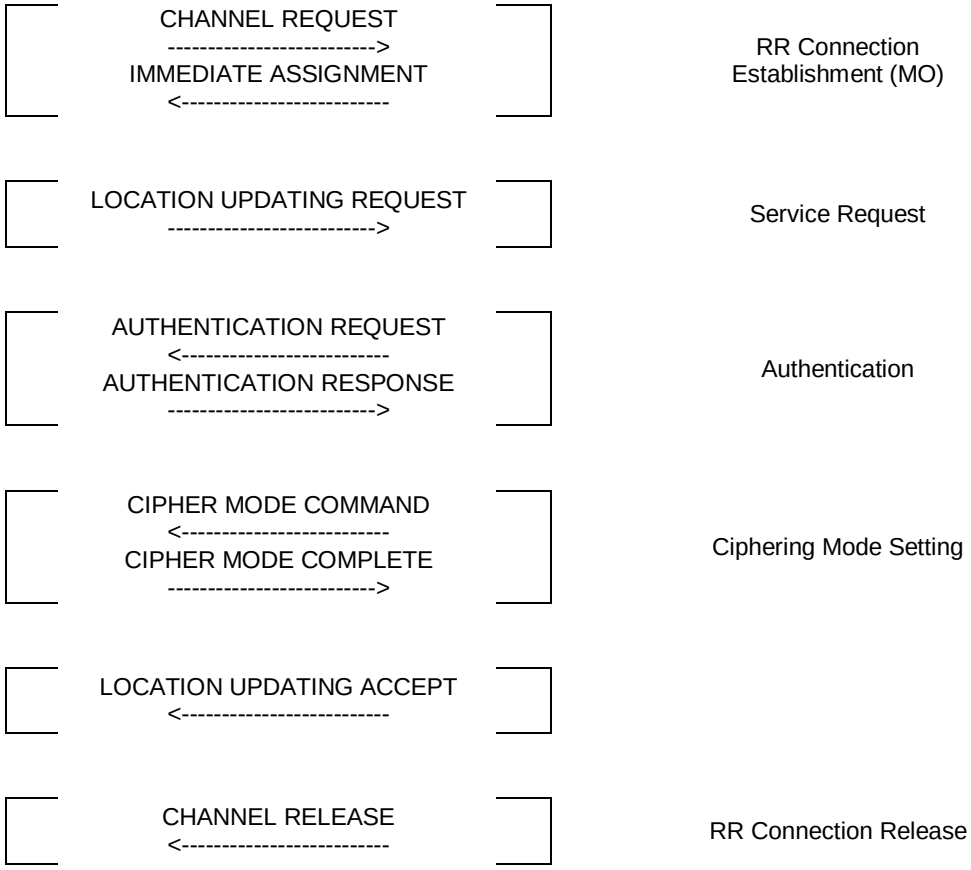

Figure 8.3.1: Location updating: Successful case

8.3.2 Mobile originating call establishment

The MES initiates immediate assignment, service request using the CM SERVICE REQUEST message, and contention resolution. The network may initiate authentication and may start the ciphering mode setting.

After sending the CIPHERING MODE COMPLETE message, the MES initiates call establishment by sending the SETUP message to the network. The network answers with a CALL PROCEEDING message:

Non-OACSU option (early assignment):

With this option the network allocates a traffic channel to the MES before it initiates call establishment in the fixed network.

If call queuing is applied, it may cause variable delay in the traffic channel assignment.

When user alerting has been initiated at the called side, an ALERTING message is sent to the MES. The network may optionally instruct the MES to attach the user connection at this stage of the call by means of the progress indicator information element set to the value #1 or #8 (if the ringing tone will be sent by the remote end) in the ALERTING message. In that case, an alerting ringing tone has to be generated by the network.

NOTE: The speech codec is transparent for supervisory tones.

A CONNECT message and its acknowledgement CONNECT ACKNOWLEDGE complete the call establishment when the called party has answered.

The mobile originating call setup with early assignment is shown in figure 8.3.2.

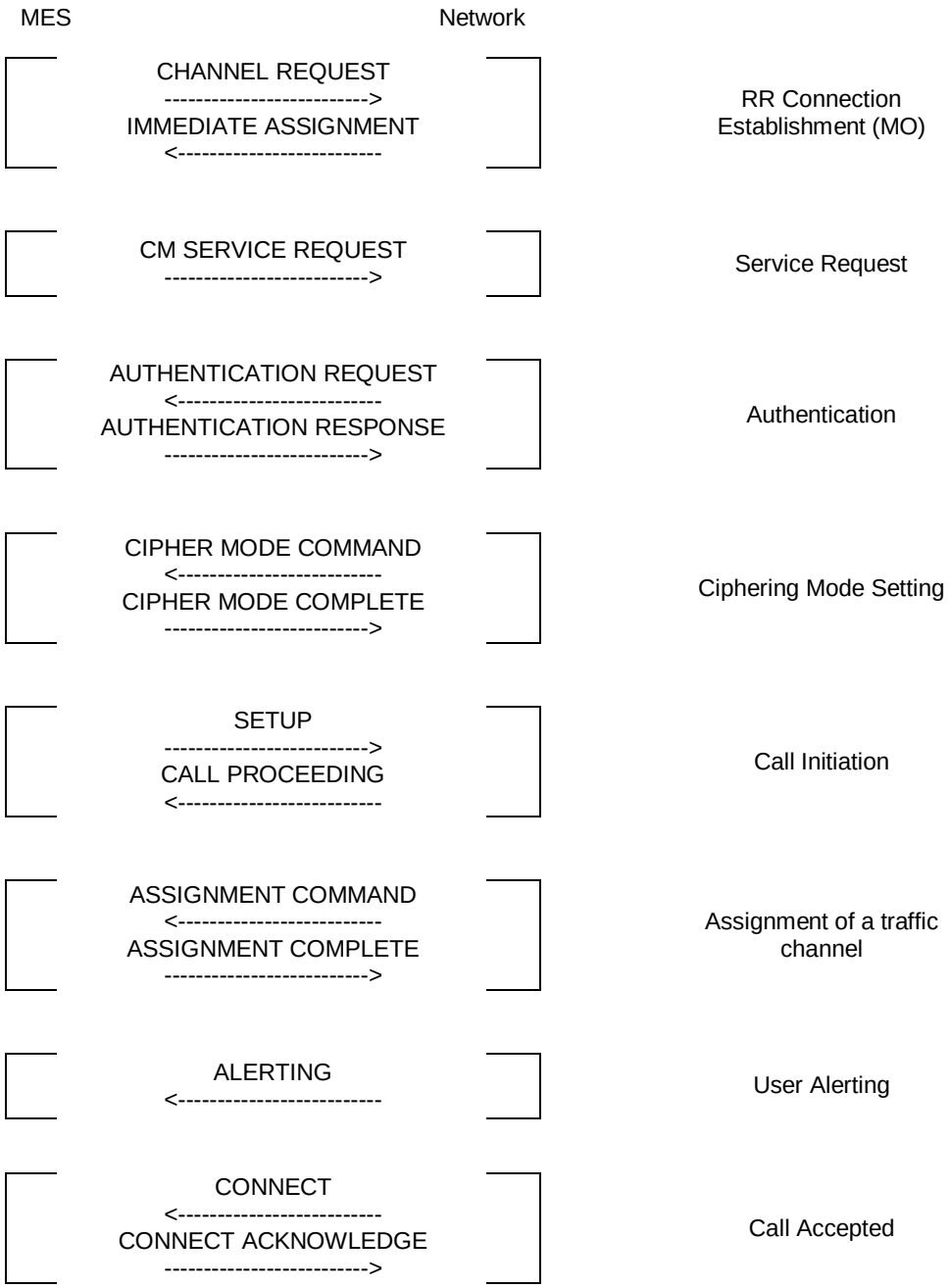

Figure 8.3.2: Mobile originating call establishment without OACSU (early assignment)

8.3.3 Mobile terminating call establishment

Non-OACSU option (early assignment) :

With this option the network initiates the assignment of a traffic channel upon receiving the CALL CONFIRMED message.

The signal IE is not included in the SETUP message. Therefore, user alerting is initiated only after a traffic channel has been allocated. An ALERTING message will be sent to the network.

NOTE: If the called MES is already involved in an active call and if the SETUP message is to be sent to same subscriber for a call waiting or for operator intervention, the signal IE will be included in that SETUP message. If that active call is a MES-to-MES single hop call, that SETUP message for call waiting or operator intervention shall be stopped at the GSC in order not to be sent to the MES:

- In the case of a call waiting, the MSC shall not receive any response to the SETUP message from the GSC and the waiting call shall be released toward the calling party at T303 timer expiration;
- In the case of an operator intervention, the MSC shall receive a RELEASE COMPLETE message from the GSC with cause #88 "incompatible destination" to indicate that operator intervention is not possible and the operator call to be released.

When the called user answers, the MES sends a CONNECT message to the network. Upon receiving the CONNECT message, the network completes the through connection of the communication path and sends a CONNECT ACK message to the MES.

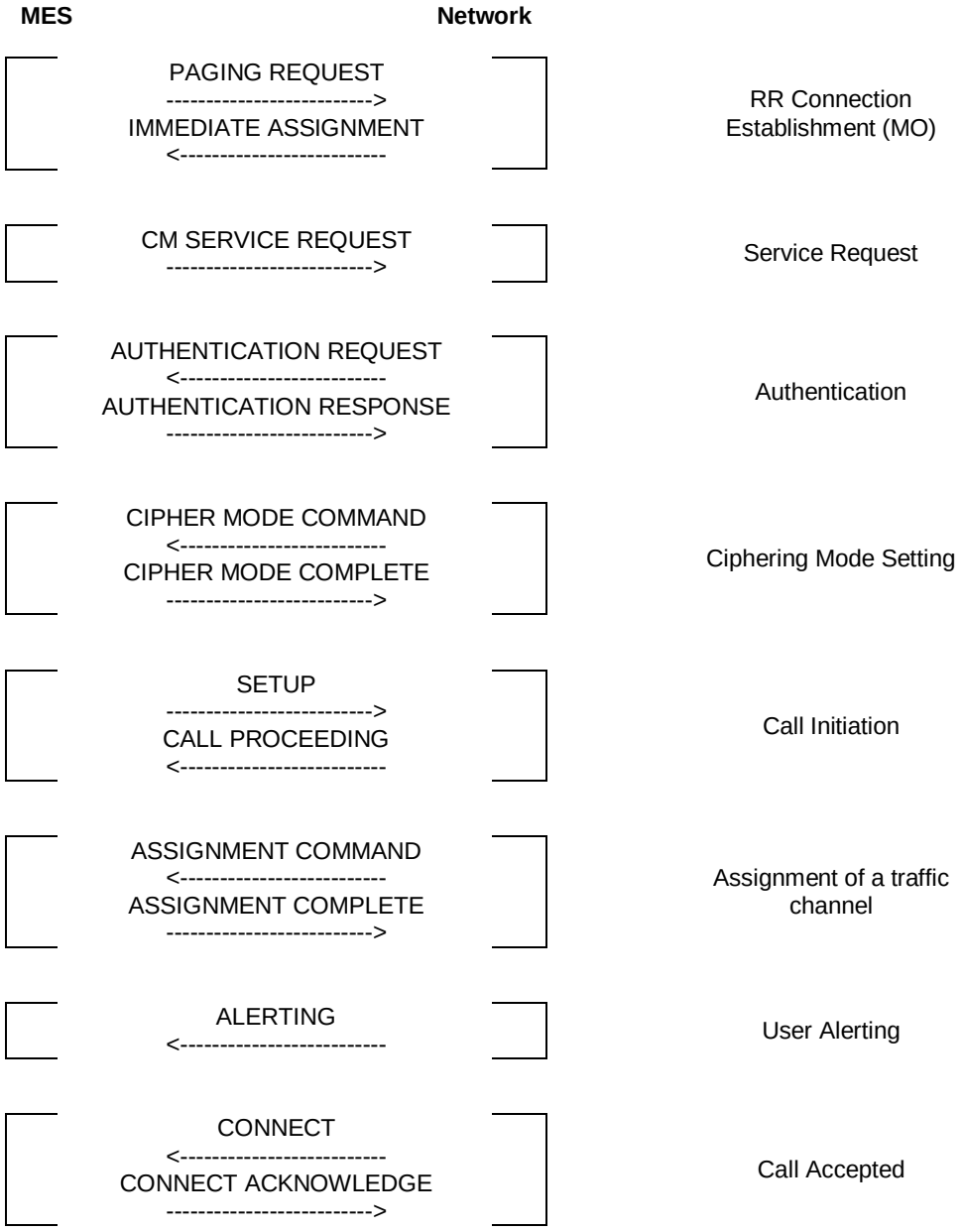

Figure 8.3.3: Mobile terminating call establishment without OACSU (early assignment)

8.3.4 Call clearing

a) Initiated by the network:

The network initiates the clearing of a call by sending a DISCONNECT message to the MES (see also clause 6.4.4).

Upon receiving the DISCONNECT message from the network, the MES sends a RELEASE message to the network.

Upon receiving the RELEASE message from the MES, the network sends a RELEASE COMPLETE to the MES and, if the traffic channel is longer needed (e.g., last activity on the traffic channel), performs the channel release procedure as described in clause 8.1.7.

Upon receiving the RELEASE COMPLETE message, and if the cleared call was the last activity on the traffic channel, the MES waits for the release of the channel which is always initiated by the network.

Call clearing initiated by the network is shown in figure 8.3.4.1.

b) Initiated by the MES in a PSTN call:

The MES initiates the clearing of a call by sending a DISCONNECT message to the network (see also clause 6.4.3).

Upon receiving the DISCONNECT message from the MES, the network sends a RELEASE message to the MES.

Upon receiving the RELEASE message from the network, the MES sends a RELEASE COMPLETE to the network, which, if the traffic channel is no longer needed (e.g., last activity on the traffic channel), performs the channel release procedure as described in clause 8.1.6.

Call clearing initiated by the MES is shown in figure 8.3.4.2.

c) Initiated by the MES in a MES-to-MES call (single hop):

A MES initiates the clearing of a call by sending a RELEASE message to the other MES.

Upon receiving the RELEASE message from the first MES, the second MES sends a RELEASE COMPLETE message to the first MES.

The RELEASE COMPLETE message is received by the GSC and the GSC will send then NCC_DISCONNECT_SAT_CMD to the NCC to close the satellite link. The GSC on receipt of the NCC_DISCONNECT_SAT_CMD_ack command to inform it that this option has completed, will clear both the MES calls with the MSC by the CLEAR REQUEST/COMMAND and COMPLETE sequence.

d) An abnormal mobile to mobile call (double hop):

If a MES initiates the clearing of a call by sending a RELEASE message to the other MES and receives a RR Release instruction from the network, the mobile shall instigate the call clearing procedure defined in the RR Release procedure.

If a MES receives a RR Release instruction from the network, the mobile shall instigate the call clearing procedure defined in the RR Release procedure.

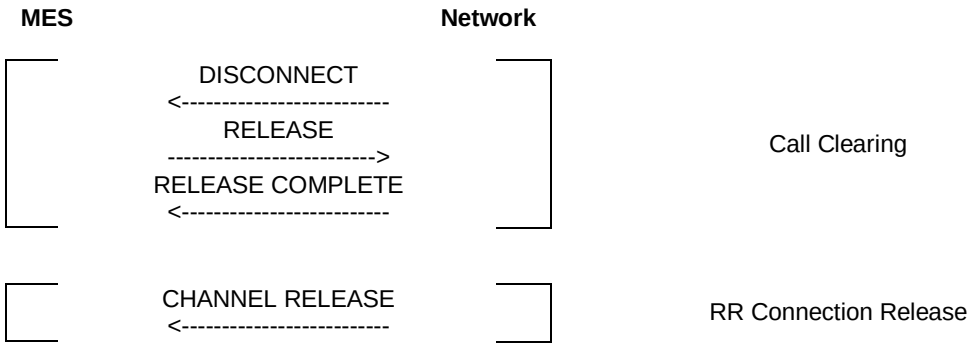

Figure 8.3.4.1: Call clearing initiated by the network

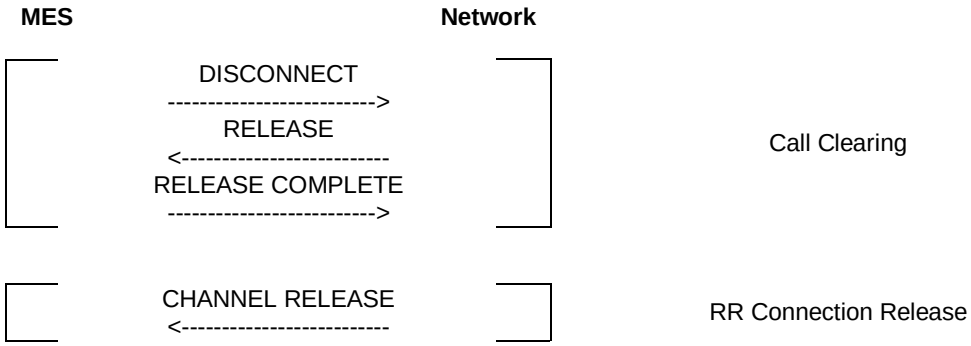

Figure 8.3.4.2: Call clearing initiated by the MES

8.3.5 DTMF protocol control

Figure 8.3.5 shows the structured procedure for DTMF protocol control.

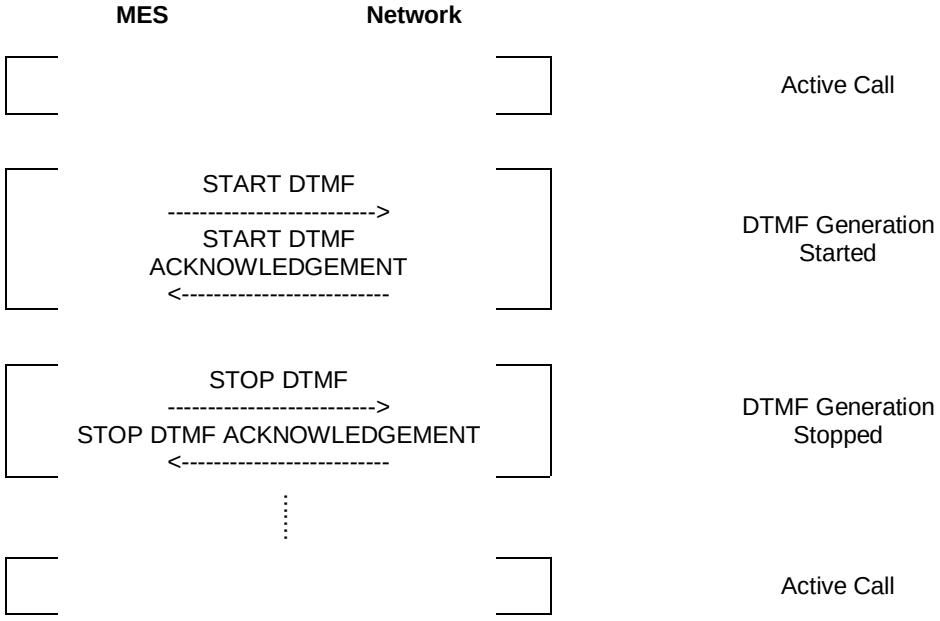

Figure 8.3.5: DTMF protocol control

8.3.6 Handover

This clause does not apply to the GMR-2 system.

8.3.7 In-call modification

Figure 8.3.6 shows the structured procedure for in-call modification.

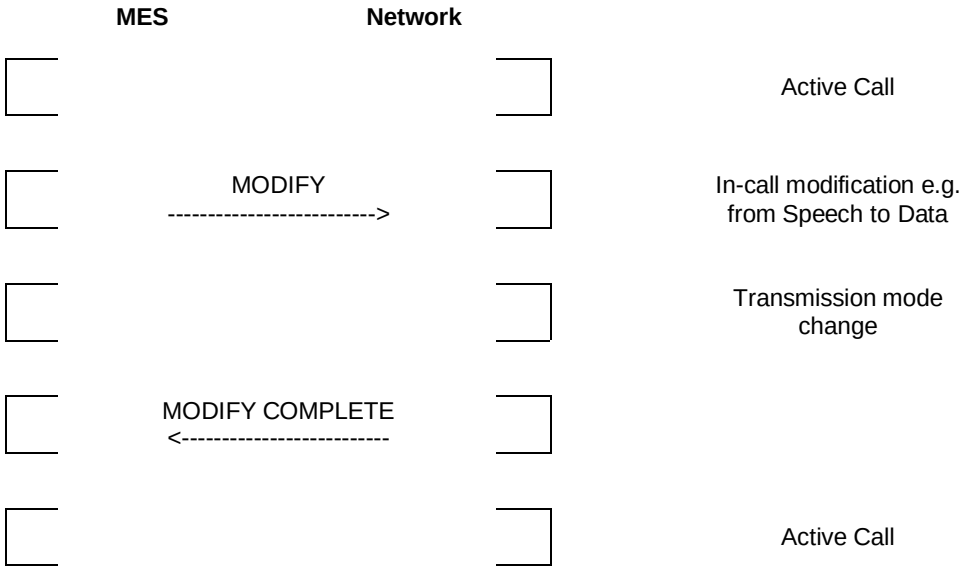

Figure 8.3.6: In-Call modification

9 Handling of unknown, unforeseen and erroneous protocol data

9.1 General

The procedures specified in the present document and call-related supplementary service handling in GSM 04.10 [17] apply to those messages which pass the checks described in this clause.

This clause also specifies procedures for the handling of unknown, unforeseen, and erroneous protocol data by the receiving entity. These procedures are called "error handling procedures," but in addition to providing recovery mechanisms for error situations, they define a compatibility mechanism for future extensions of the protocols.

Error handling concerning the value part of the Facility IE and of the SS Version Indicator IE are not in the scope of the present document. It is defined in GSM 04.10 [17] and the GSM 04.8x series.

Due to implementation within the MSC, clauses 9.1 to 9.8 may not be applied in order of precedence.

(The strategy of the network is to limit as much as possible the actions performed on reception of faulty messages in order to improve the overall performance.)

Most error handling procedures are mandatory for the MES.

Detailed error handling procedures in the network are implementation dependent and may vary. However, when extensions of this protocol are developed, networks will be assumed to have the error handling that is indicated in this clause as mandatory ("shall") and that is indicated as strongly recommended ("should"). Clauses 9.2, 9.3, 9.4, 9.5 and 9.7.2 do not apply to the error handling in the network applied to the receipt of initial layer 3 message. If the network diagnoses an error described in one of these clauses in the initial Layer 3 message received from the MES, it shall either:

- Try to recognize the classmark and then take further implementation dependent actions; or
- Release the RR-connection.

Also, the error handling of the network is only considered as mandatory or strongly recommended when certain thresholds for errors are not reached during a dedicated connection.

In this clause the following terminology is used:

- An IE is defined to be syntactically incorrect in a message if it contains at least one value defined as "reserved" in clause 11, or if its value part violates rules of clause 11. However, it is not a syntactical error that a type 4 IE specifies in its length indicator a greater length than defined in clause 11.
- A message is defined to have semantically incorrect contents if it contains information which, possibly dependent on the state of the receiver, is in contradiction to the resources of the receiver and/or to the procedural part (i.e., clauses 4, 5 and 6) of the present document, GSM 04.10 [17], or the relevant GSM 04.8x series.

9.2 Message too short

When a message is received that is too short to contain a complete message type information element, that message shall be ignored (see GMR-2 04.007 [16]).

9.3 Unknown or unforeseen transaction identifier

If transaction identifier (TI) checks are processed at the application level, which is the case in the MSC, then the following message faults will be found before a transaction identifier failure:

a) Unknown or unforeseen message type;

b) Non-semantically mandatory information element errors;

c) Unknown and unforeseen IEs in the non imperative message part;

d) Syntactically incorrect optional IEs.

The MES and network shall ignore a call control message received with TI value "111". For a call control message received with TI different from "111", the following procedures shall apply:

i) Whenever any call control message except EMERGENCY SETUP, SETUP or RELEASE COMPLETE is received specifying a transaction identifier which is not recognized as relating to an active call or to a call in progress, the receiving entity shall send a RELEASE COMPLETE message with cause #81 "invalid transaction identifier value" using the received transaction identifier value and remain in the "null" state;

ii) Whenever a RELEASE COMPLETE message is received specifying a transaction identifier which is not recognized as relating to an active call or to a call in progress, the message may be ignored;

iii) Whenever an EMERGENCY SETUP message or a SETUP message is received specifying a transaction identifier which is not recognized as relating to an active call or to a call in progress, and with a transaction identifier flag incorrectly set to "1", the message shall be ignored;

iv) When a SETUP message is received by the MES specifying a transaction identifier which is recognized as relating to an active call or to a call in progress, this SETUP message shall be ignored;

v) When an EMERGENCY SETUP message or a SETUP message is received by the network specifying a transaction identifier which is recognized as relating to an active call or to a call in progress, this message need not be treated and the network may perform other actions.

Before allocating or accepting a new transaction identifier, the number of already existing transactions for the network, whether they are related to an incoming or outgoing operation, shall be checked. If this number is less than 8, then the transaction is accepted, otherwise the message shall be rejected.

9.4 Unknown or unforeseen message type

If the MES receives a message with message type not defined for the PD, or not implemented by the receiver, it shall ignore the message except for the fact that, if an RR connection exists, it shall return a status message (STATUS, RR STATUS or MM STATUS depending on the protocol discriminator) with cause # 97 "message type non-existent or not implemented".

If the network receives an RR message or MM message with message type not defined for the PD, or not implemented by the receiver in a protocol state where reception of an unsolicited message with the given PD from the MES is not foreseen in the protocol, the network actions are implementation dependent. Otherwise, if the network receives a message with message type not defined for the PD or not implemented by the receiver, it shall ignore the message.

NOTE: A message type not defined for the PD in the given direction is regarded by the receiver as a message type not defined for the PD, see GMR-2 04.007 [16].

If the MES receives a message not compatible with the protocol state, the MES shall ignore the message except for the fact that, if an RR connection exists, it returns a status message (STATUS, RR STATUS or MM STATUS depending on the protocol discriminator) with cause #98 "Message type not compatible with protocol state".

If bit 8 of the message type IE is set ("1"), it is treated as "not defined." The message is ignored.

If the network receives a message not compatible with the protocol state, the message is ignored.

If compatibility check of message type with protocol state is processed at application level, the following mistakes will be discovered before those compatibility mistakes (if any):

a) Non semantical mandatory information element errors;

b) Unknown and unforeseen IEs in the non imperative part;

c) Syntactically incorrect optional IEs.

9.5 Non-semantical mandatory information element errors

When on receipt of a message:

- An "imperative message part" error; or
- A "missing mandatory IE" error is diagnosed, or when a message containing:
- A syntactically incorrect mandatory IE;
- An IE unknown in the message, but encoded as "comprehension required" (see clause 11.5); or
- An out of sequence IE encoded as "comprehension required" (see clause 11.5)

is received,

The MES shall proceed as follows:

When the message is not one of the messages listed in clauses 9.5.1, 9.5.2, and 9.5.3, the MES shall ignore the message except for the fact that, if an RR connection exists, it shall return a status message (STATUS, RR STATUS or MM STATUS depending on the protocol discriminator) with cause # 96 "invalid mandatory information".

The network shall proceed as follows:

When the message is not one of the message listed in clause 9.5.3 b) or c), the network shall either:

- Try to treat the message (the exact further actions are implementation dependent), or
- Ignore the message except that it should return a status message (STATUS, RR STATUS or MM STATUS depending on the protocol discriminator) with cause # 96 "invalid mandatory information".

Imperative message part errors include format errors, i.e., an IE with a length outside the range given by the present document.

9.5.1 Radio resource management

For the MES, the following procedures shall apply:

If the message is a CHANNEL RELEASE message, the actions taken shall be the same as specified in clause 4.5 "RR connection release".

9.5.2 Mobility management

No exceptional cases are described for mobility management messages.

9.5.3 Call control

a) Messages other than DISCONNECT and RELEASE COMPLETE are ignored and no status message is sent.

b) If the message is a DISCONNECT message, a RELEASE message shall be returned with cause value # 96 "invalid mandatory information" and clause 6.4 "call clearing" applies as normal.

c) If the message is a RELEASE COMPLETE message, it shall be treated as a normal RELEASE COMPLETE message.

9.6 Unknown and unforeseen IEs in the non-imperative message part

9.6.1 IEIs unknown in the message

The MES shall ignore all IEs unknown in a message which are not encoded as "comprehension required".

The network shall ignore all IEs unknown in a message which are not encoded as "comprehension required".

In order to continue decoding, the length of the unknown IE is deduces from the value of bit 8 of the IEI. The format is TV with a length of 1 byte if value is 1. Otherwise, the format shall be TLV.

9.6.2 Out of sequence IEs

The MES shall ignore all out of sequence IEs in a message which are not encoded as "comprehension required".

The network shall ignore all out of sequence IEs in a message which are not encoded as "comprehension required".

9.6.3 Repeated IEs

If an information element with format T, TV, or TLV is repeated in a message in which repetition of the information element is not specified in clause 10 of the present document, only the contents of the information element appearing first shall be handled and all subsequent repetitions of the information element shall be ignored. When repetition of information elements is specified, only the contents of specified repeated information elements shall be handled. If the limit on repetition of information elements is exceeded, the contents of information elements appearing first up to the limit of repetitions shall be handled and all subsequent repetitions of the information element shall be ignored.

9.7 Non-imperative message part errors

This category includes:

- Syntactically incorrect optional IEs;
- Conditional IE errors.

9.7.1 Syntactically incorrect optional IEs

The MES shall treat all optional IEs that are syntactically incorrect in a message as not present in the message.

The network shall treat all optional IEs that are syntactically incorrect in a message as not present in the message.

9.7.2 Conditional IE errors

When the MES, upon receipt of a message, diagnoses a "missing conditional IE" error or an "unexpected conditional IE" error or when it receives a message containing at least one syntactically incorrect conditional lE, it shall ignore the message except for the fact that, if an RR connection exists, it shall return a status message (STATUS, RR STATUS, or MM STATUS depending on the PD) with cause value # 100 "conditional IE error".

When the network receives a message and diagnose a "missing conditional IE" error or an "unexpected conditional IE" error or when it receives a message containing at least one syntactically incorrect conditional IE, the network shall either:

- Try to treat the message (the exact further actions are implementation dependent);
- Ignore the message.

9.8 Messages with semantically incorrect contents

When a message with semantically incorrect contents is received, the foreseen reactions of the procedural part of the present document (i.e., clauses 4, 5, and 6) are performed. If however, no such reactions are specified, the MES shall ignore the message except for the fact that, if an RR connection exists, it returns a status message (STATUS, RR STATUS, or MM STATUS depending on the PD) with cause value # 95 "semantically incorrect message."

The network should follow the same procedure except that a status message is not normally transmitted.

Semantic checking of the Facility information element value part (defined in GSM 04.80 [19]) is the subject of the technical specifications GSM 04.10 [17] and the GSM 04.8x series.

NOTE: Two cases of semantically incorrect IE contact may happen:

- Semantic error in a checked parameter:
  This type of error usually leads to an application error (e.g., error message sent back). No STATUS message is sent.
- Semantic error in a unchecked parameter:
  This type of error is not detected at least immediately. If the corresponding parameter is used at a later stage in the processing, an error will then occur. If the parameter is not used, then the error is not detected.

10 Message functional definitions and contents

This clause defines the structure of the messages of those Layer 3 protocols defined in the present document. These are standard L3 messages as defined in GMR-2 04.007 [16], with the exception of those sent on the S-SCH and S-RACH.

Each definition given in the present clause includes:

a) A brief description of the message direction and use, including whether the message has:

   1) Local significance, i.e., relevant only on the originating or terminating access;

   2) Access significance, i.e., relevant in the originating and terminating access, but not in the network;

   3) Dual significance, i.e., relevant in either the originating or terminating access and in the network; or

   4) Global significance, i.e., relevant in the originating and terminating access and in the network.

b) A table listing the information elements permitted to be in that message and their order of their appearance in the message. All information elements that may be repeated are explicitly indicated (V and LV formatted IEs, which compose the imperative part of the message, occur before T, TV, and TLV formatted IEs which compose the non-imperative part of the message, see GMR-2 04.007 [16]). In a (maximal) sequence of consecutive information elements with half octet length, the first information element with half octet length occupies bits 1 to 4 of octet N, the second bits 5 to 8 of octet N, the third bits 1 to 4 of octet N +1 etc. Such a sequence always has an even number of elements.

   For each information element, the table indicates:

   1) The information element identifier (IEI), in hexadecimal notation, if the IE has format T, TV, or TLV. Usually, there is a default IEI for an information element type. Default IEIs of different IE types of the same protocol are different. If the IEI has half octet length, it is specified by a notation representing the IEI as a hexadecimal digit followed by a "-" (example: B-);

   2) The name of the information element (which may give an idea of the semantics of the element). The name of the information element (usually written in italics) followed by "IE" or "information element" is used in this technical specification as reference to the information element within a message;

   3) The name of the type of the information element (which indicates the coding of the value part of the IE), and generally, the referenced clause of clause 10 of the present document describing the value part of the information element;

   4) The presence requirement indication (M, C. or 0) for the IE as defined in GMR-2 04.007 [16];

   5) The format of the information element (T, V, TV, LV, TLV) as defined in GMR-2 04.007 [16];

   6) The length of the information element (or permissible range of lengths), in octets, in the message, where "?" means that the maximum length of the IE is only constrained by link layer protocol, and in the case of the Facility IE by possible further conditions specified in GSM 04.10 [17]. This indication is informative.

c) Clauses specifying, where appropriate, conditions for IEs with presence requirement C or 0 in the relevant message which together with other conditions specified in the present document define when the information elements shall be included or not, what non-presence of such IEs means, and, for IEs with presence requirement C, the static conditions for presence and/or non-presence of the IEs (see GMR-2 04.007 [16]).

10.1 Messages for radio resources management

Table 10.1.1 summarizes the messages for Radio Resources management.

Table 10.1.1: Messages for Radio Resource Management

Channel Establishment Messages	**Reference**
IMMEDIATE ASSIGNMENT	10.1.18
IMMEDIATE ASSIGNMENT REJECT	10.1.20
Ciphering Messages:	**Reference**
CIPHERING MODE COMMAND	10.1.9
CIPHERING MODE COMPLETE	10.1.10
Handover Messages	**Reference**
ASSIGNMENT COMMAND	10.1.2
ASSIGNMENT COMPLETE	10.1.3
ASSIGNMENT FAILURE	10.1.4
Channel Release Messages:	**Reference**
CHANNEL RELEASE	10.1.7
Paging Messages:	**Reference**
Paging Request-HPACH IMSI	10.1.45
PAGING REQUEST TYPE 1	10.1.22
PAGING RESPONSE	10.1.25
System Information Messages:	**Reference**
SYSTEM INFORMATION TYPE 2	10.1.32
SYSTEM INFORMATION TYPE 3	10.1.34
SYSTEM INFORMATION TYPE 6	10.1.40
SYSTEM INFORMATION TYPE 7	10.1.41
SYSTEM INFORMATION TYPE 8	10.1.42
SYSTEM INFORMATION TYPE 9	10.1.43
SYSTEM INFORMATION TYPE 10	10.1.44
H-BCCH Version Number	10.1.48
Miscellaneous Messages:	**Reference**
CHANNEL MODE MODIFY	10.1.5
CHANNEL MODE MODIFY ACKNOWLEDGE	10.1.6
CHANNEL REQUEST	10.1.8
CLASSMARK CHANGE	10.1.11
CLASSMARK ENQUIRY	10.1.12
MEASUREMENT REPORT	10.1.21
SYNCHRONIZATION CHANNEL INFORMATION	10.1.30
RR STATUS	10.1.29
TRANSMIT DISABLE	10.1.46
TRANSMIT DISABLE ACK	10.1.47

10.1.1 Additional assignment

This clause does not apply to the GMR-2 system.

10.1.2 Assignment command

This message is sent on the main S-DCCH by the Network to the MES to change the channel configuration to another independent dedicated channel configuration, when no timing adjustment is needed (see table 10.1.2.1).

Message Type: ASSIGNMENT COMMAND

Significance: Dual

Direction: Network to MES

Table 10.1.2.1: ASSIGNMENT COMMAND message content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Assignment Command Message Type	Message Type	11.4	M	V	1
	Description of the Channel	Channel Description	11.5.2.5	M	V	4
	Forward Epoch Delay	Forward Epoch Delay	11.5.2.46	M	V	2
	Power Command	Power Command	11.5.2.28	M	V	1
63	Mode of the Channel	Channel Mode	11.5.2.6	O	TV	2
9-	Cipher Mode Setting	Cipher Mode Setting	11.5.2.9	O	TV	1

10.1.2.1 Mode of the channel

If this information element is not present, the channel mode of the previously allocated channel is assumed.

10.1.2.2 Description of the Second Channel

This clause does not apply to the GMR-2 system.

10.1.2.3 Mode of the Second Channel

This clause does not apply to the GMR-2 system.

10.1.2.4 Mobile Allocation and Frequency List, after the starting time

This clause does not apply to the GMR-2 system.

10.1.2.5 Starting Time

This clause does not apply to the GMR-2 system.

10.1.2.6 Reference cell frequency list

This clause does not apply to the GMR-2 system.

10.1.2.7 Cell Channel Description

This clause does not apply to the GMR-2 system.

10.1.2.8 Cipher mode setting

This information element appears when the ciphering mode is changed after the MES has switched to the assigned channel.

If this information element is omitted, the mode of ciphering is not changed after the MES has switched to the assigned channel.

10.1.3 Assignment complete

This message is sent on the main S-DCCH from the MES to the Network to indicate that the MES has established the main signalling link successfully (see table 10.1.3.1).

Message Type: ASSIGNMENT COMPLETE

Significance: Dual

Direction: MES to Network

Table 10.1.3.1: ASSIGNMENT COMPLETE message content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	ASSIGNMENT COMPLETE Message Type	Message Type	11.4	M	V	1
	RR Cause	RR Cause	11.5.2.31	M	V	1

10.1.4 Assignment failure

This message is sent on the main S-DCCH on the old channel from the MES to the network to indicate that the MES has failed to seize the new channel (see table 10.1.4.1).

Message Type: ASSIGNMENT FAILURE

Significance: Dual

Direction: MES to network

Table 10.1.4.1: ASSIGNMENT FAILURE message content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	ASSIGNMENT FAILURE Message Type	Message Type	11.4	M	V	1
	RR Cause	RR Cause	11.5.2.31	M	V	1

10.1.5 Channel mode modify

This message is sent on the main S-DCCH by the network to the MES to request the changing of the mode for the indicated channel (see table 10.1.5.1).

Message Type: CHANNEL MODE MODIFY

Significance: Local

Direction: Network to MES

Table 10.1.5.1: CHANNEL MODE MODIFY message content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	CHANNEL MODE MODIFY Message Type	Message Type	11.4	M	V	1
	Channel Description	Channel Description	11.5.2.5	M	V	4
	Forward Epoch Delay	Forward Epoch Delay	11.5.2.46	M	V	2
	Channel Mode	Channel Mode	11.5.2.6	M	V	1

10.1.6 Channel mode modify acknowledge

This message is sent on the main S-DCCH by the MES to the network to indicate the successful or unsuccessful execution of a channel mode modify request (see table 10.1.6.1).

Message Type: CHANNEL MODE MODIFY ACKNOWLEDGE

Significance: Local

Direction: MES to network

Table 10.1.6.1: CHANNEL MODE MODIFY ACKNOWLEDGE message content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	CHANNEL MODE MODIFY Acknowledge Message Type	Message Type	11.4	M	V	1
	Channel Description	Channel Description	11.5.2.5	M	V	4
	Channel Mode	Channel Mode	11.5.2.6	M	V	1

10.1.7 Channel release

This message is sent on the main S-DCCH from the network to the MES to initiate deactivation of the dedicated channel used (see table 10.1.7.1).

Message Type: CHANNEL RELEASE

Significance: Dual

Direction: Network to MES

Table 10.1.7.1: CHANNEL RELEASE message content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	CHANNEL RELEASE Message Type	Message Type	11.4	M	V	1
	RR Cause	RR Cause	11.5.2.31	M	V	1

10.1.8 Channel request

This message is sent in random mode on the S-RACH. It does not follow the basic format. The possible formats are presented in figure 10.1.8.1, without reference to information fields.

This message does not follow the basic format for L3 messages. In addition, the bit ordering may not conform to the general field mapping convention in GMR-2 04.006 [15] since the length of the message is not equal to an integer number of octets. However the message conforms to the bit transmission convention in GMR-2 04.007 [16] and all bits are transmitted according to it.

8	7	6	5	4	3	2	1	
Establishment Cause / Random Access (Half Octet A)				Message (Half Octet B)				Octet 1
Message (Half Octet C)				Message (Half Octet D)				Octet 2
Message (Half Octet E)				Message (Half Octet F)				Octet 3
				Message (Half Octet G)				Octet 4

Figure 10.1.8.1: CHANNEL REQUEST message format

Table 10.1.8.1: CHANNEL REQUEST message content

Half Octet	A				B, C, D, E, F	G	
Bits Message Type	8	7	6	5	see 10.1.8.2, 10.1.8.3 and 10.1.8.4	4,3	2,1
MES Origination	0	0	R	R	International Number	SV	AN
Other procedures requiring a S-DCCH (see note)	0	1	R	R	Subscriber IMSI Number	11	AN
Emergency	0	1	R	R	Subscriber IMS Number	00	AN
Emergency (local)	0	1	R	R	International Number	01	AN
Location Updating	1	0	R	R	Subscriber IMSI Number	SV	AN
Answer to paging	1	1	R	R	Paging Reference (22 IMSI bits)		AN
R is a bit of the RA defined below. Other Parameters defined below NOTE: Examples of these procedures are Short Message Service (SMS) and Supplementary Service Management							

10.1.8.1 Random Access (RA)

The MES shall generate a Random Access Reference number for every Channel Request Message as shown above. The RA is a binary number, with a length two as shown in table 10.1.8.1. The most significant bit shall be inserted into bit 6 of octet 1 (Half-Octet A) as shown in table 10.1.8.1.

10.1.8.2 Subscriber IMSI number

The first six digits of the subscriber's IMSI number, containing the MCC and MNC, shall be converted to a 20-bit-long binary number and inserted in Half Octets B, C, D, E, F as shown above. The MSB shall be inserted in bit 4, octet 1 (Half Octet B). The LSB shall be inserted in bit 1, octet 3 (Half Octet F). The most significant digit (MSD) of the truncated six-digit IMSI number, prior to binary conversion, shall be the leftmost digit of the MCC when the IMSI is ordered from left to right, starting with the MCC digit.

For definition of "number," see ITU-T Recommendation I.330 [38] and GMR-2 03.003 [7].

These requirements shall apply to the Other Procedures Requiring an S-SDCCH, Emergency, and Location Updating message types.

10.1.8.3 International number

The first six digits of the International Number shall be converted to a 20-bit-long binary number and inserted in Half Octets B, C, D, E, F as shown above. The MSB shall be inserted in bit 4, octet 1 (Half Octet B). The LSB shall be inserted in bit 1, octet 3 (Half Octet F). The number shall correspond to the ISDN/telephony numbering plan (ITU-T Recommendation E.163 [34]/E.164 [35]). The Most Significant Digit (MSD) of the truncated six-digit number, prior to binary conversion, shall be the first digit of an international country code when the International Number is ordered from left to right, starting with the International Country Code digits.

For definition of "number", see ITU-T Recommendation I.330 [38] and GMR-2 03.003 [7]. Prefix or escape digits shall not be used.

If the dialled number is an international type of number, the dialed number shall be used.

For other types of numbers (unknown, national, network specific, or a dedicated access (short code)), the MES is required to supply the first six digits representing the Country Code and National Destination code through its user interface prior to call initiation. Otherwise, the Other Procedures Requiring an S-SDCCH shall be used for originations.

These requirements shall apply to the MES Origination and Emergency (local) message types.

10.1.8.4 Paging references

For the Answer to Paging message type, the MES shall supply the least significant 22 bits of the IMSI from the page message. These 22 bits shall occupy Half Octets B, C, D, E, F and bits 4-3 in Half Octet G. The MES shall insert the MSB of the 22 bit number in bit 4, octet 1. The LSB +1 and LSB shall be inserted in bit 4 and 3, octet 4.

10.1.8.5 Satellite Visibility (SV)

The Satellite Visibility field indicates which satellites are visible to the MES in a multi-spacecraft constellation. The MES shall report on the two satellites other than the one to which it is sending a channel request. The bI values upon which the reporting is based are defined by the System Information Type 7 message IEI (clause 11.5.2.22). Each value, "1" or "2", is uniquely associated with a Satellite System Code, IEI 11.5.2.44, which specifies a satellite. The MES shall report the SV parameter as defined in table 10.1.8.2.

Table 10.1.8.2: Satellite visibility parameter definition

Satellite Visibility (based on b_i value)	SV
No other Satellite visible	0
"1" visible	SV = 1
"2" visible	SV = 2
Both "1" and "2" visible	SV = 3

The MSB shall be inserted into bit 4, octet 4 (Half Octet G) of the MES Origination and Location Updating message types.

This requirement shall be mandatory for the MES and optional for the NCC.

10.1.8.6 Attempt Number (AN)

The MES shall number each channel request for an access session sequentially using the parameter AN. This parameter shall be a binary number from 1 to 4 with most significant bit in bit 2, octet 4 (Half Octet G), using the following encoding scheme:

MSB	LSB	Attempt Number
0,	0	= 1
0,	1	= 2
1,	0	= 3
1,	1	= 4 or greater

If an access session includes more than 4 channel requests, the MES shall number the fourth and the rest of the channel requests within the session with the same binary '11' as above.

10.1.8.7 Location updating with follow-on

The MES is allowed to use a CHANNEL REQUEST message of type MES Origination or Other Procedures Requiring a S-SDCCH when establishing a RR connection for a LOCATION UPDATING procedure with a "follow-on" CM service request (see clause 5.5.1.1).

10.1.9 Ciphering mode command

This message is sent on the main S-DCCH from the Network to the MES to indicate that the network has started deciphering and that enciphering and deciphering shall be started in the MES, or to indicate that ciphering will not be performed (see table 10.1.9.1).

Message Type: CIPHERING MODE COMMAND

Significance: Dual

Direction: Network to MES

Table 10.1.9.1: CIPHERING MODE COMMAND Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	CIPHER MODE COMMAND Message Type	Message Type	11.4	M	V	1
	Ciphering Mode Setting	Cipher Mode Setting	11.5.2.9	M	V	1/2
	Cipher Response	Cipher Response	11.5.2.10	M	V	1/2

10.1.10 Ciphering mode complete

This message is sent on the main S-DCCH from the MES to the Network to indicate that enciphering and deciphering has been started in the MES (see table 10.1.10).

Message Type: CIPHERING MODE COMPLETE

Significance: Dual

Direction: MES to Network

Table 10.1.10.1: CIPHERING MODE COMMAND Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	CIPHER MODE COMPLETE message type	Message Type	11.4	M	V	1
17	Mobile Equipment Identity	Mobile Identity	11.5.1.4	O	TLV	10 -11

10.1.10.1 Mobile Equipment Identity

This information element is included if and only if the MES shall include its IMEISV (see clause 4.4.7). This information element shall only refer to IMEISV.

10.1.11 Classmark change

This message is sent on the main S-DCCH by the MES to the Network to indicate a classmark change or as a response to a classmark enquiry (see table 10.1.11).

Message Type: CLASSMARK CHANGE

Significance: Dual

Direction: MES to Network

Table 10.1.11.1: CLASSMARK CHANGE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Classmark Change Message Type	Message Type	11.4	M	V	1
	MES Classmark	MES Classmark 2	11.5.1.6	M	LV	4
20	Additional MES Classmark Information	MES Classmark 3	11.5.1.7	O	TLV	14

10.1.11.1 Additional MES classmark information

This IE shall be included if and only if the CM3 bit in the MES Classmark IE is set to "additional MES capabilities are described in the Classmark 2 information element." This information element is not supported in the network.

10.1.12 Classmark enquiry

This message is sent on the main S-DCCH by the network to the MES to request classmark information (see table 10.1.12.1).

Message Type: CLASSMARK ENQUIRY

Significance: Dual

Direction: Network to MES

Table 10.1.12.1: CLASS ENQUIRY Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Classmark Enquiry Message Type	Message Type	11.4	M	V	1

10.1.13 Frequency redefinition

This clause does not apply to the GMR-2 system.

10.1.14 Handover access

This clause does not apply to the GMR-2 system.

10.1.15 Handover command

This clause does not apply to the GMR-2 system.

10.1.16 Handover complete

This clause does not apply to the GMR-2 system.

10.1.17 Handover failure

This clause does not apply to the GMR-2 system.

10.1.18 Immediate assignment

This message is sent on the S-AGCH by the Network to the MES in idle mode to change the channel configuration to a dedicated configuration while staying in the same spotbeam (see table 10.1.18.1).

The L2 pseudo length of this message is 17 octets.

Message Type: IMMEDIATE ASSIGNMENT

Significance: Dual

Direction: Network to MES

Table 10.1.18.1: IMMEDIATE ASSIGNMENT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	L2 Pseudo Length	L2 Pseudo Length	11.5.2.19	M	V	1
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Immediate Assignment Message Type	Message Type	11.4	M	V	1
	Page Mode	Page Mode	11.5.2.26	M	V	1/2
	Spare Half Octet	Spare Half Octet	11.5.1.8	M	V	1/2
	Channel Description	Channel Description	11.5.2.5	M	V	4
	Forward Epoch Delay	Forward Epoch Delay	11.5.2.46	M	V	2
	Request Reference	Request Reference	11.5.2.30	M	V	6
	Timing Advance	Fine Timing Advance	11.5.2.40	M	V	2

10.1.19 Immediate assignment extended

This clause does not apply to the GMR-2 system.

10.1.20 Immediate assignment reject

This message is sent on the S-AGCH by the Network to indicate that no channel is available for assignment (see table 10.1.20.1). This message has L2 pseudo length 10.

Message Type: IMMEDIATE ASSIGNMENT REJECT

Significance: Dual

Direction: Network To MES

Table 10.1.20.1: IMMEDIATE ASSIGNMENT REJECT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	L2 Pseudo Length	L2 Pseudo Length	11.5.2.19	M	V	1
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Immediate Assignment Reject Message Type	Message Type	11.4	M	V	1
	Page Mode	Page Mode	11.5.2.26	M	V	1/2
	Spare Half Octet	Spare Half Octet	11.5.1.8	M	V	1/2
	Request Reference	Request Reference	11.5.2.30	M	V	6
	Wait Indication	Wait Indication	11.5.2.43	M	V	1

10.1.20.1 Use of the indexes

This clause does not apply to the GMR-2 system.

10.1.20.2 Filling of the Message

Octets 12 - 18 shall be filled with all 1's. The rest of the message shall be fill to 23 octets as specified in GMR-2 04.006 [15].

10.1.21 Measurement report

This message is sent on the S-SACCH by the MES to the Network to report measurement results about the dedicated channel (see table 10.1.21.1).

Message Type: MEASUREMENT REPORT

Significance: Dual

Direction: MES to Network

Table 10.1.21.1: MEASUREMENT REPORT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Measurement Report Message Type	Message Type	11.4	M	V	1
	Measurement Results	Measurement Results	11.5.2.20	M	V	3

10.1.22 Paging Request Type 1

This message is sent on the S-PCH by the Network to a single MES as defined in clause 4.3.2.1. This message is used to trigger channel access. The MES is identified by its IMSI (see table 10.1.22.1).

The L2 pseudo length of this message is the sum of lengths of all information elements present in the message except the P1 Rest Octets and L2 Pseudo Length information elements.

Message Type: PAGING REQUEST TYPE 1

Significance: Dual

Direction: Network to MES

Table 10.1.22.1: PAGING REQUEST TYPE 1 Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	L2 Pseudo Length	L2 Pseudo Length	11.5.2.19	M	V	1
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Paging Request Type 1 Message Type	Message Type	11.4	M	V	1
	Page Mode	Page Mode	11.5.2.26	M	V	1/2
	Channel Needed	Channel Needed	11.5.2.8	M	V	1/2
	Mobile Identity	Mobile Identity	11.5.1.4	M	LV	9
	Paging Reference Request	Paging Reference Request	11.5.2.50	M	V	2
	P1 Rest Octets	P1 Rest Octets	11.5.2.23	M	V	5-8

10.1.22.1 Unnecessary IE

A MES in idle mode shall consider all information elements as unnecessary IEs except for the Page Mode IE.

10.1.22.2 Channel needed for mobile identity

The CHANNEL field of the Channel Needed IE is associated with the Mobile Identity.

10.1.22.3 Mobile Identity

The Mobile Identity IE shall use IMSI.

10.1.22.4 P1 rest octets

The sum of the length of this IE and the L2 Pseudo Length of the message equals 22.

10.1.23 Paging request type 2

This clause does not apply to the GMR-2 system.

10.1.24 Paging request type 3

This clause does not apply to the GMR-2 system.

10.1.25 Paging response

This message is sent on the main S-DCCH by the MES to the Network in connection with establishment of the main signalling link as a response to the paging request message (see table 10.1.25.1).

Message Type: PAGING RESPONSE

Significance: Dual

Direction: MES to Network

Table 10.1.25.1: PAGING RESPONSE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Paging Response Message Type	Message Type	11.4	M	V	1
	Ciphering Key Sequence Number	Ciphering Key Sequence Number	11.5.1.2	M	V	1/2
	Spare Half Octet	Spare Half Octet	11.5.1.8	M	V	1/2
	MES Classmark	MES Classmark 2	11.5.1.6	M	LV	4
	Mobile Identity	Mobile Identity	11.5.1.4	M	LV	9
	Location Area Code	LAC	11.2.5.48	M	V	2

10.1.25.1 Location Area Code

The Location Area Code consists of the LAC portion on the LAI.

10.1.25.2 Mobile Identity

The MES shall use the IMSI.

10.1.26 Partial release

This clause does not apply to the GMR-2 system.

10.1.27 Partial release complete

This clause does not apply to the GMR-2 system.

10.1.28 Physical information

This clause does not apply to the GMR-2 system.

10.1.29 RR status

This message is sent by the MES or the Network at any time to report certain error conditions as described in clause 9 (see table 10.1.29.1).

Message Type: RR STATUS

Significance: Local

Direction: Both

Table 10.1.29.1: RR STATUS Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	RR Status Message Type	Message Type	11.4	M	V	1
	RR Cause	RR Cause	11.5.2.31	M	V	1

10.1.30 Synchronization channel information

This message is sent on the S-SCH, which is one of the broadcast channels (see GMR-2 05.002 [23]). Its purpose is to support the synchronization of a MES to the Network. It does not follow the basic format. Its length is 25 bits. See figure 10.1.30.1 and table 10.1.30.1.

This message does not follow the basic format for L3 messages. In addition, the bit ordering may not conform to the general field mapping convention in GMR-2 04.006 [15] since the length of the message is not equal to an integer number of octets. However, the message conforms to the bit transmission convention in GMR-2 04.004 [13] and all bits are transmitted according to it.

Message Type: SYNCHRONISATION CHANNEL INFORMATION

Significance: Dual

Direction: Network To MES

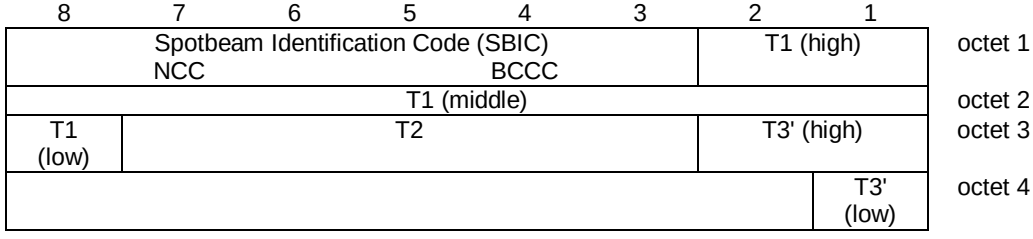

Figure 10.1.30.1: Frame Synchronization Information Element

Table 10.1.30.1: Synchronization Channel Information Message Contents

The Spotbeam Identification Code (SBIC) component NCC occupies bits 8, 7, and 6 of octet 1 with the MSB in bit 8. The Spotbeam Identification Code (SBIC) component BCCC occupies bits 5, 4, and 3 with the MSB in bit 5. T1, T2, and T3' are the three parts of the reduced TDMA frame number (RFN) as specified in GMR-2 05.002 [23].

10.1.31 System information type 1

This clause does not apply to the GMR-2 system.

10.1.32 System information type 2

This message is sent on the S-BCCH by the Network to all MESs within the spotbeam giving information of control of the S-RACH and of the S-BCCH allocation in the neighbor spotbeams (see table 10.1.32.1). Special requirements for the transmission of this message apply, see GMR-2 05.002 [23]. This message has a L2 Pseudo Length of 21.

Message Type: SYSTEM INFORMATION TYPE 2

Significance: Dual

Direction: Network to MES

Table 10.1.32.1: SYSTEM INFORMATION TYPE 2 Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	L2 Pseudo Length	L2 Pseudo Length	11.5.2.19	M	V	1
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	System Information Type 2 Message Type	Message Type	11.4	M	V	1
	S-BCCH Frequency List	Neighbour Spotbeam Description	11.5.2.22	M	V	15
	Network Colour Code Permitted	Network Colour Code Permitted	11.5.2.27	M	V	1
	S-RACH Control Parameter	S-RACH Control Parameters	11.5.2.29	M	V	3

10.1.33 System information type 2bis

This clause does not apply to the GMR-2 system.

10.1.34 System information type 3

This message is sent on the S-BCCH by the Network giving information of control on the S-RACH, the location area identification, the spotbeam identity and various other information about the beam (see table 10.1.34.1). Special requirements for the transmission of this message apply, see GMR-2 05.002 [23]. This message has a L2 Pseudo Length of 18.

Message Type: SYSTEM INFORMATION TYPE 3

Significance: Dual

Direction: Network to MES

Table 10.1.34.1: SYSTEM INFORMATION TYPE 3 Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	L2 Pseudo Length	L2 Pseudo Length	11.5.2.19	M	V	1
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	System Information Type 3 Message Type	Message Type	11.4	M	V	1
	Location Area Identification	Location Area Identification	11.5.1.3	M	V	5
	Control Channel Description	Control Channel Description	11.5.2.11	M	V	3
	Spotbeam Options	Spotbeam Options	11.5.2.3	M	V	1
	Spotbeam Selection Parameters	Spotbeam Selection Parameters	11.5.2.4	M	V	2
	S-RACH Control Parameters	S-RACH Control Parameters	11.5.2.29	M	V	3
	Spotbeam Re-selection Parameters	Spotbeam Re-selection Parameters	11.5.2.34	M	V	2

10.1.35 System information type 3

This clause does not apply to the GMR-2 system.

10.1.36 System information type 4

This clause does not apply to the GMR-2 system.

10.1.37 System information type 5

This clause does not apply to the GMR-2 system.

10.1.38 System information type 5bis

This clause does not apply to the GMR-2 system.

10.1.39 System information type 5ter

This clause does not apply to the GMR-2 system.

10.1.40 System information type 6

This message is sent on the S-SACCH by the Network to MESs to determine link Radio-Link Timeout variable and DTX setting (see table 10.1.40.1). If received correctly by the MES, this message is treated as in clauses 10.1.40.1 through 10.1.40.4.

Message Type: SYSTEM INFORMATION TYPE 6

Significance: Dual

Direction: Network to MES

Table 10.1.40.1: SYSTEM INFORMATION TYPE 6 Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	System Information Type 6 Message Type	Message Type	11.4	M	V	1
	Spotbeam Options	Spotbeam Options	11.5.2.3	M	V	1

10.1.40.1 Cell Identity

This clause does not apply to the GMR-2 system.

10.1.40.2 Location Area Identification

This clause does not apply to the GMR-2 system.

10.1.40.3 Spotbeam options

After assignment it is used for the duration of the connection after which the S-BCCH value is used.

10.1.41 System Information Type 7 (GMR-2 option)

This message is sent on the S-BCCH and S-HBCCH by the Network giving information about other satellite systems that are geographically near the spotbeam in which the message is broadcast (see table 10.1.41.1). Special requirements for the transmission of this message apply, see GMR-2 05.002 [23].

Message Type: SYSTEM INFORMATION TYPE 7

Significance: Dual

Direction: Network to MES

Table 10.1.41.1: SYSTEM INFORMATION TYPE 7 Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	System Information Type 7 Message Type	Message Type	11.4	M	V	1
	CCS Frequency List	Neighbour Spotbeam Description	11.5.2.22	M	V	18
	Satellite System Description	Satellite System Code	11.5.2.44	M	V	3

10.1.42 System Information Type 8

This message is sent on the S-BCCH and the S-HBCCH by the Network giving information about spotbeam frequencies in use on the satellite (see table 10.1.42.1). Special requirements for the transmission of this message apply, see GMR-2 05.002 [23].

Message Type: SYSTEM INFORMATION TYPE 8

Significance: Dual

Direction: Network to MES

Table 10.1.42.1: SYSTEM INFORMATION TYPE 8 Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	System Information Type 8 Message Type	Message Type	11.4	M	V	1
	Satellite Frequency List	Satellite Frequency Description	11.5.2.51	M	V	21

10.1.43 System Information Type 9

This message is sent on the S-BCCH by the Network to all MESs within the spotbeam giving information about the Common Channel Signal Configuration, the Forward Epoch Delay, and the HPA configuration that is used on the Common Channel Signal transmission (see table 10.1.43.1).

Special requirements for the transmission of this message apply, see GMR-2 05.002 [23].

The L2 pseudo Length of this message is the sum of all information elements present in the message except the L2 Pseudo Length information element.

Message Type: SYSTEM INFORMATION TYPE 9

Significance: Dual

Direction: Network to MES

Table 10.1.43.1: SYSTEM INFORMATION TYPE 9 Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	L2 Pseudo Length	L2 Pseudo Length	11.5.2.19	M	V	1
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	System Information Type 9 Message Type	Message Type	11.4	M	V	1
	Common Channel Configuration	CCS Configuration Parameters	11.5.2.45	M	V	4
	Forward Epoch Delay	Forward Epoch Delay	11.5.2.46	M	V	2
	HPA Configuration	HPA Configuration	11.5.2.47	M	V	5
	S-RACH Control Parameters	S-RACH Control Parameters	11.5.2.29	M	V	3

10.1.44 System Information Type 10

This message is sent on the S-BCCH by the Network to all MESs within the spotbeam giving information about the valid beam pairs for inclined orbit operations (see table 10.1.44.1).

Special requirements for the transmission of this message apply, see GMR-2 05.002 [23].

The L2 pseudo Length of this message is the sum of all information elements present in the message except the L2 Pseudo Length information element.

Message Type: SYSTEM INFORMATION TYPE 10

Significance: Dual

Direction: Network to MES

Table 10.1.44.1: SYSTEM INFORMATION TYPE 10 Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	L2 Pseudo Length	L2 Pseudo Length	11.5.2.19	M	V	1
	RR management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	System Information Type 10 Message Type	Message Type	11.4	M	V	1
	Single Spotbeam LAC	Location Area Code	11.5.2.48	M	V	2
	Inclined Orbit Beam Pairs 1	Location Area Code	11.5.2.48	M	V	2
	Inclined Orbit Beam Pairs 2	Location Area Code	11.5.2.48	M	V	2
	Inclined Orbit Beam Pairs 3	Location Area Code	11.5.2.48	M	V	2
	Inclined Orbit Beam Pairs 4	Location Area Code	11.5.2.48	M	V	2
	Inclined Orbit Beam Pairs 5	Location Area Code	11.5.2.48	M	V	2
	Inclined Orbit Beam Pairs 6	Location Area Code	11.5.2.48	M	V	2
	Beam-Pair LU Timer	BP LU Timer	11.5.2.49	M	V	1
	S-RACH Control Parameters	S-RACH Control Parameters	11.5.2.49	M	V	3

10.1.45 Paging Request-HPACH IMSI

This message is sent on the S-HPACH by the Network to a single MES to trigger channel access or MES disable/enable notification. The MES is identified by its IMSI (see figure 10.1.45.1).

This message does not follow the basic format for L3 messages. In addition, the bit ordering may not conform to the general field mapping convention in GMR-2 04.006 [15] clause since the length of the message is not equal to an integer number of octets. However, the message conforms to the bit transmission convention in GMR-2 04.004 [13] and all bits are transmitted according to it.

Message Type: Paging Request-HPACH IMSI

Significance: Dual

Direction: Network to MES

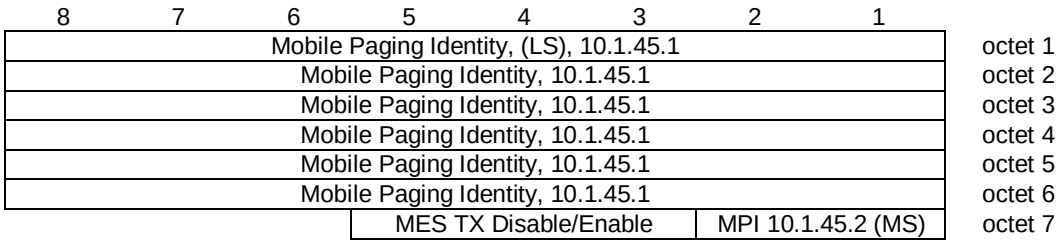

Figure 10.1.45.1: PAGING REQUEST-HPACH IMSI Message

10.1.45.1 Mobile paging identity

This IE occupies octets 1-6 and bits 1-2 in octet 7. It has the following contents.

The paged IMSI is converted to a 50-bit-long binary number. The least significant bit of this IMSI presentation is inserted in bit 1, octet 1. The Most Significant bit is inserted in bit 2, octet 7. The rest of the bits are inserted according to figure 10.1.45.2 (index 1 denotes the LS bit, index 50 denotes the MS bit).

8	7	6	5	4	3	2	1	
8	7	6	5	4	3	2	1	octet 1
16	15	14	13	12	11	10	9	octet 2
			:					:
			:					:
48	47	46	45	44	43	42	41	octet 6
			MES TX Disable/Enable			50	49	octet 7

Figure 10.1.45.2: Mapping of IMSI bits into PAGING REQUEST H-PACH IMSI Message

10.1.45.2 MES TX Disable/Enable

This IE occupies bits 3-5 in octet 7. The MES TX Disable/Enable message type is a binary value used to specify the transmit status of a specific MES.

Bit 5	Bit 4	Bit 3	
0	0	0	Normal Paging
1	1	0	Transmit Disable
0	1	1	Transmit Enable

10.1.46 Transmit Disable

This message is sent by the Network to the User Terminal to notify that transmission from the terminal has to be disabled.

Message Type: TRANSMIT DISABLE

Significance: Dual

Direction: Network To User Terminal

Table 10.1.46.1: TRANSMIT DISABLE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Transmit Disable Message Type	Message Type	11.4	M	V	1

10.1.47 Transmit Disable Acknowledgement

This message is sent by the User Terminal to the Network to acknowledge the receipt of transmit disable message.

Message Type: TRANSMIT DISABLE ACK

Significance: Dual

Direction: User Terminal To Network

Table 10.1.47.1: TRANSMIT DISABLE ACK Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	RR Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Transmit Disable Message Type	Message Type	11.4	M	V	1

10.1.48 H-BCCH version number

This message is sent on the S-HBCCH by the Network giving information on version number of the System Information messages that follow it on the H-BCCH broadcast.

This message does not follow the basic format for L3 messages. In addition, the bit ordering may not conform to the general field mapping convention in GMR-2 04.006 [15] since the length of the message is not equal to an integer number of octets. However, the message conforms to the bit transmission convention in GMR-2 04.004 [13] and all bits are transmitted according to it.

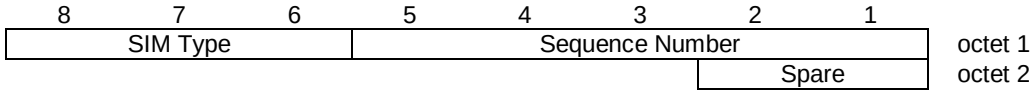

Figure 10.1.48.1: H-BCCH VERSION NUMBER Message Format

Table 10.1.48.1: H-BCCH VERSION NUMBER Message Content

SIM Type (octet 1, bits 8 to 6)

The System Information Message (SIM) Type is a binary value used to identify the contents of the following System Information message. The MSB is in bit 8. The parameter is encoded with the MSB being the left most bit as shown below:

0 0 0 Type 2
0 0 1 Type 3
0 1 0 Type 9
0 1 1 Type 10
1 0 0 Type 8 current satellite frequency list
1 0 1 Type 8 pending satellite frequency list
1 1 0 Type 7 multisat frequency list
1 1 1 Spare

Sequence Number (Octet 1, bits 5 to 1)

A binary number used to indicate the version of the following message. The MSB is in bit 5.

10.2 Messages for mobility management

Table 10.2.1 summarizes the messages for Mobility Management.

Table 10.2.1: Messages for Mobility Management

Registration messages:	Reference
LOCATION UPDATING ACCEPT	10.2.13
LOCATION UPDATING REJECT	10.2.14
LOCATION UPDATING REQUEST	10.2.15
Security messages:	**Reference**
AUTHENTICATION REJECT	10.2.1
AUTHENTICATION REQUEST	10.2.2
AUTHENTICATION RESPONSE	10.2.3
IDENTITY REQUEST	10.2.10
IDENTITY RESPONSE	10.2.11
Connection management messages:	**Reference**
CM SERVICE ACCEPT	10.2.5
CM SERVICE REJECT	10.2.6
CM SERVICE ABORT	10.2.7
CM SERVICE REQUEST	10.2.9
Miscellaneous message	**Reference**
MM Status	10.2.16

10.2.1 Authentication reject

This message is sent by the Network to the MES to indicate that authentication has failed (and that the receiving MES shall abort all activities). See table 10.2.1.1.

Message Type: AUTHENTICATION REJECT

Significance: Dual

Direction: Network to MES

Table 10.2.1.1: AUTHENICATION REJECT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Authentication Reject Message Type	Message Type	11.4	M	V	1

10.2.2 Authentication request

This message is sent by the Network to the MES to initiate authentication of the MES identity. See table 10.2.2.1.

Message Type: AUTHENTICATION REQUEST

Significance: Dual

Direction: Network to MES

Table 10.2.2.1: AUTHENICATION REQUEST Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Authentication Request Message Type	Message Type	11.4	M	V	1
	Ciphering Key Sequence Number	Ciphering Key Sequence Number	11.5.1.2	M	V	1/2
	Spare Half Octet	Spare Half Octet	11.5.1.8	M	V	1/2
	Authentication Parameter RAND	Auth. Parameter RAND	11.5.3.1	M	V	16

10.2.3 Authentication response

This message is sent by the MES to the Network to deliver a calculated response to the Network. See table 10.2.3.1.

Message Type: AUTHENTICATION RESPONSE

Significance: Dual

Direction: MES to Network

Table 10.2.3.1: AUTHENTICATION RESPONSE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Authentication Response Message Type	Message Type	11.4	M	V	1
	Authentication Parameter SRES	Auth. Parameter SRES	11.5.3.2	M	V	4

10.2.4 CM Re-establishment request

This clause does not apply to the GMR-2 system.

10.2.5 CM service accept

This message is sent by the Network to the MES to indicate that the requested service has been accepted. See table 10.2.5.1.

Message Type: CM SERVICE ACCEPT

Significance: Dual

Direction: Network to MES

Table 10.2.5.1: CM SERVICE ACCEPT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	CM Service Accept Message Type	Message Type	11.4	M	V	1

10.2.6 CM service reject

This message is sent by the Network to the MES to indicate that the requested service cannot be provided. See table 10.2.6.1.

Message Type: CM SERVICE REJECT

Significance: Dual

Direction: Network to MES

Table 10.2.6.1: CM SERVICE REJECT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	CM Service Reject Message Type	Message Type	11.4	M	V	1
	Reject Cause	Reject Cause	11.5.3.6	M	V	1

10.2.7 CM service abort

This message is sent by the MES to the Network to request the abort of the first MM connection establishment in progress and the release of the RR connection. See table 10.2.7.1.

Message Type: CM SERVICE ABORT

Significance: Dual

Direction: MES to Network

Table 10.2.7.1: CM SERVICE ABORT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	CM Service Abort Message Type	Message Type	11.4	M	V	1

10.2.8 Abort

This clause does not apply to the GMR-2 system.

10.2.9 CM service request

This message is sent by the MES to the Network to request a service for the connection management sublayer entities, e.g., circuit switched connection establishment, supplementary services activation, etc. See table 10.2.9.1.

Message Type: CM SERVICE REQUEST

Significance: Dual

Direction: MES to Network

Table 10.2.9.1: CM SERVICE REQUEST Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	CM Service Request Message Type	Message Type	11.4	M	V	1
	CM Service Type	CM Service Type	11.5.3.3	M	V	1/2
	Ciphering Key Sequence Number	Ciphering Key Sequence Number	11.5.1.2	M	V	1/2
	MES Classmark	MES Classmark 2	11.5.1.6	M	LV	4
	Mobile Identity	Mobile Identity	11.5.1.4	M	LV	9
	Location Area Code	LAC	11.5.2.48	M	V	2

10.2.9.1 Location area code

The LAC used in this message shall be the LAC portion of the LAI.

10.2.9.2 Mobile identity

The MES shall use the IMSI.

10.2.10 Identity request

This message is sent by the Network to the MES to request a MES to submit the specified identity to the network. See table 10.2.10.1.

Message Type: IDENTITY REQUEST

Significance: Dual

Direction: Network to MES

Table 10.2.10.1: IDENTITY REQUEST Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Identity Request Message Type	Message Type	11.4	M	V	1
	Identity Type	Identity Type	11.5.3.4	M	V	1/2
	Spare Half Octet	Spare Half Octet	11.5.1.8	M	V	1/2

10.2.11 Identity response

This message is sent by the MES to the Network in response to an IDENTITY REQUEST message providing the requested identity. See table 10.2.11.1.

Message Type: IDENTITY RESPONSE

Significance: Dual

Direction: MES to Network

Table 10.2.11.1: IDENTITY RESPONSE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Identity Response Message Type	Message Type	11.4	M	V	1
	Mobile Identity	Mobile Identity	11.5.1.4	M	LV	9 -10

10.2.12 IMSI detach indication

This clause does not apply to the GMR-2 system.

10.2.13 Location updating accept

This message is sent by the Network to the MES to indicate that updating in the network has been completed. See table 10.2.13.1

Message Type: LOCATION UPDATING ACCEPT

Significance: Dual

Direction: Network to MES

Table 10.2.13.1: LOCATION UPDATING ACCEPT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Location Updating Accept Message Type	Message Type	11.4	M	V	1
	Location Area Identification	Location Area Identification	11.5.1.3	M	V	5
17	Mobile Identity	Mobile Identity	11.5.1.4	O	TLV	10
A1	Follow On Proceed	Follow On Proceed	11.5.3.7	O	T	1

10.2.13.1 Follow on proceed

The follow on proceed information element appears if the Network wishes to indicate that the MES may attempt an MM connection establishment using the same RR connection.

10.2.13.2 Mobile identity

The Mobile Identity is not sent by the MSC.

10.2.14 Location updating reject

This message is sent by the Network to the MES to indicate that updating has failed. See table 10.2.14.1.

Message Type: LOCATION UPDATING REJECT

Significance: Dual

Direction: Network to MES

Table 10.2.14.1: LOCATION UPDATING REJECT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Location Updating Reject Message Type	Message Type	11.4	M	V	1
	Reject Cause	Reject Cause	11.5.3.6	M	V	1

10.2.15 Location updating request

This message is sent by the MES to the Network either to request update of its location file (normal updating or periodic updating). See table 10.2.15.1.

Message Type: LOCATION UPDATING REQUEST

Significance: Dual

Direction: MES to Network

Table 10.2.15.1: LOCATION UPDATING REQUEST Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Mobility Management Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Skip Indicator	Skip Indicator	11.3.1	M	V	1/2
	Location Updating Request Message Type	Message Type	11.4	M	V	1
	Location Updating Type	Location Updating Type	11.5.3.5	M	V	1/2
	Ciphering Key Sequence Number	Ciphering Key Sequence Number	11.5.1.2	M	V	1/2
	Location Area Identification	Location Area Identification	11.5.1.3	M	V	5
	MES Classmark	MES Classmark 1	11.5.1.5	M	V	1
	Mobile Identity	Mobile Identity	11.5.1.4	M	LV	9
	Location Area Code	LAC	11.5.2.48	M	V	2

NOTE: If the IMEI is received as a Mobile Identity, then the received location updating request shall be rejected with the cause "IMEI not accepted".

10.2.15.1 Location Area Identification

The location area identification stored in the SIM is used.

10.2.15.2 Location Area Code

This is the serving LAC for user registration. It is derived from the System Information message ID and subsequent user terminal actions with respect to inclined orbit operations (i.e., single spotbeam or beam pair LAC).

10.2.15.3 Mobile Identity

The user terminal shall use the IMSI.

10.2.16 MM Status

The network shall ignore this message if it is sent by the mobile.

10.2.17 TMSI reallocation command

This clause does not apply to the GMR-2 system.

10.2.18 TMSI reallocation complete

This clause does not apply to the GMR-2 system.

10.3 Messages for circuit-switched call control

Table 10.3.1 summarizes the messages for circuit-switched call control.

Table 10.3.1: Messages for Circuit-Mode Connections Call Control

Call Establishment Messages:	**Reference**
ALERTING	10.3.1
CALL CONFIRMED (see note)	10.3.2
CALL PROCEEDING	10.3.3
CONNECT	10.3.5
CONNECT ACKNOWLEDGE	10.3.6
EMERGENCY SETUP (see note)	10.3.8
PROGRESS	10.3.17
SETUP	10.3.23
Call Information Phase Messages:	**Reference**
MODIFY (see note)	10.3.13
MODIFY COMPLETE (see note)	10.3.14
MODIFY REJECT (see note)	10.3.15
USER INFORMATION	10.3.31
Call Clearing Messages:	**Reference**
DISCONNECT	10.3.7
RELEASE	10.3.18
RELEASE COMPLETE	10.3.19
Messages For Supplementary Service Control	**Reference**
FACILITY	10.3.9
HOLD (see note)	10.3.10
HOLD ACKNOWLEDGE (see note)	10.3.11
HOLD REJECT (see note)	10.3.12
RETRIEVE (see note)	10.3.20
RETRIEVE ACKNOWLEDGE (see note)	10.3.21
RETRIEVE REJECT (see note)	10.3.22
Miscellaneous Messages:	**Reference**
CONGESTION CONTROL	10.3.4
NOTIFY	10.3.16
START DTMF (see note)	10.3.24
START DTMF ACKNOWLEDGE (see note)	10.3.25
START DTMF REJECT (see note)	10.3.26
STATUS	10.3.27
STATUS ENQUIRY	10.3.28
STOP DTMF(see note)	10.3.29
STOP DTMF ACKNOWLEDGE (see note)	10.3.30
NOTE: Not supported by ITU-T Recommendation Q.931 [43]	

10.3.1 Alerting

10.3.1.1 Alerting (Network to MES Direction)

This message is sent by the Network to the calling MES to indicate that the called user alerting has been initiated. See table 10.3.1.1.

Message Type: ALERTING

Significance: Global

Direction: Network to MES

Table 10.3.1.1: ALERTING Message Content (Network to MES direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call Control Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Transaction Identifier	Transaction Identifier	11.3.2	M	V	1/2
	Alerting Message Type	Message Type	11.4	M	V	1
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
1E	Progress Indicator	Progress Indicator	11.5.4.21	O	TLV	4
7E	User-User	User-User	11.5.4.25	O	TLV	3-35

10.3.1.1.1 Facility

This information element may be used for functional operation of supplementary services. It will not be sent by the network (no supplementary services supported in the Network require this).

10.3.1.1.2 Progress indicator

This information element may be included by the Network:

- In order to pass information about the call in progress, e.g., in the event of interworking; and/or
- To make the MES attach the user connection for speech. interworking.

Refer to clause 6.2.1.4 for the possible values sent by the network (MSC).

10.3.1.1.3 User - User

This information element will not be sent (user-to-user service not supported in the network).

10.3.1.2 Alerting (MES to Network direction)

This message is sent by the called MES to the Network, to indicate that the called user alerting has been initiated. See table 10.3.1.2.

Message Type: ALERTING

Significance: Global

Direction: MES to Network

Table 10.3.1.2: ALERTING Message Content (MES to Network direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call Control Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Transaction Identifier	Transaction Identifier	11.3.2	M	V	1/2
	Alerting Message Type	Message Type	11.4	M	V	1
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
7E	User-User	User-User	11.5.4.25	O	TLV	3-35
7F	SS Version	SS Version Indicator	11.5.4.24	O	TLV	2-3

10.3.1.2.1 Facility

This information element may be used for functional operation of supplementary services. It will not be sent by the MES (no supplementary services supported in the Network require to send it). If received by the Network, a FACILITY message will be returned to the MES to reject the supplementary service invocation.

10.3.1.2.2 User - User

This information element will not be sent by the MES (user-to-user service not supported in the network) and will be ignored by the Network if received.

10.3.1.2.3 SS version

This information element shall not be included if the facility information element is not present in this message. If received without facility information element the call shall be released.

This information element shall be included or excluded as defined in GSM 04.10 [17]. This information element should not be transmitted unless explicitly required by GSM 04.10 [17].

10.3.2 Call Confirmed

This message is sent by the called MES to confirm an incoming call request. See table 10.3.2.1.

Message Type: CALL CONFIRMED

Significance: Local

Direction: MES to Network

Table 10.3.2.1: CALL CONFIRMED Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call Control Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Transaction Identifier	Transaction Identifier	11.3.2	M	V	1/2
	Call Confirmed Message Type	Message Type	11.4	M	V	1
D-	Repeat Indicator	Repeat Indicator	11.5.4.22	C	TV	1
04	Bearer Capability 1	Bearer Capability	11.5.4.5	O	TLV	3-10
04	Bearer Capability 2	Bearer Capability	11.5.4.5	O	TLV	3-10
08	Cause	Cause	11.5.4.11	O	TLV	4-32
15	CC Capabilities	Call Control	11.5.4.5a	O	TLV	3

10.3.2.1 Repeat indicator

The repeat indicator information element shall not be included as only bearer capability 1 information element is included in the message.

10.3.2.2 Bearer capability 1 and bearer capability 2

The bearer capability 1 information element shall be included if and only if at least one of the following cases holds:

- The MES wishes another bearer capability than that given by the bearer capability 1 information element of the incoming SETUP message;
- The bearer capability 1 information element is not fully specified in the SETUP message.

Refer to clause 6.2.2.3.2 for handling of bearer capability 1 information element by the Network. The bearer capability 2 information element shall not be included.

10.3.2.3 Cause

This information element is included if the MES is compatible but the user is busy. It will be ignored by the network.

10.3.2.4 CC Capabilities

This information element will not be sent by the MES and will be ignored by the network if received.

10.3.3 Call proceeding

This message is sent by the Network to the calling MES to indicate that the requested call establishment information has been received, and no more call establishment information will be accepted. See table 10.3.3.1.

Message Type: CALL PROCEEDING

Significance: Local

Direction: Network to MES

Table 10.3.3.1: CALL PROCEEDING Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call Control Protocol Discriminator	Protocol Discriminator	11.2	M	V	1/2
	Transaction Identifier	Transaction Identifier	11.3.2	M	V	1/2
	Call Proceeding Message Type	Message Type	11.4	M	V	1
D-	Repeat Indicator	Repeat Indicator	11.5.4.22	C	TV	1
04	Bearer Capability 1	Bearer Capability	11.5.4.5	O	TLV	3-10
04	Bearer Capability 2	Bearer Capability	11.5.4.5	O	TLV	3-10
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
1E	Progress Indicator	Progress Indicator	11.5.4.21	O	TLV	4

10.3.3.1 Repeat indicator

This information element shall not be included in the message.

10.3.3.2 Bearer capability 1 and bearer capability 2

The bearer capability 1 information element is always included. The network may specify at least one of the negotiable parameters described in GSM 07.01 [28].

The bearer capability 2 information element shall not be included.

10.3.3.3 Facility

This information element may be used for functional operation of supplementary services. It will not be sent by the network (no supplementary services supported in the Network require to send it).

10.3.3.4 Progress indicator

This information element will not be included

10.3.4 Congestion control

This message is sent by the MES or the network to indicate the establishment or termination of flow control on the transmission of USER INFORMATION messages.

User-to-user service being not supported in the network, this message shall not be sent by the MES nor by the Network and shall be ignored if received. See table 10.3.4.1.

Message Type: CONGESTION CONTROL

Significance: Local (see note)

Direction: Both

Table 10.3.4.1: CONGESTION CONTROL Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Congestion control message type	Message Type	11.4	M	V	1
	Congestion level	Congestion level	11.5.4.12	M	V	1/2
	Spare half octet	Spare half octet	11.5.1.8	M	V	1/2
08	Cause	Cause	11.5.4.11	O	TLV	4-32

NOTE: This message has local significance, but may carry information of global significance.

10.3.4.1 Cause

This information element is included if the user to user information has been discarded as a result of the congestion situation.

10.3.5 Connect

10.3.5.1 Connect (Network to MES direction)

This message is sent by the network to the calling MES to indicate call acceptance by the called user. See table 10.3.5.1.

Message Type: CONNECT

Significance: Global

Direction: Network to MES

Table 10.3.5.1: CONNECT Message Content (network to MES direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Connect message type	Message Type	11.4	M	V	1
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
1E	Progress Indicator	Progress Indicator	11.5.4.21	O	TLV	4
4C	Connected number	Connected number	11.5.4.13	O	TLV	3-14
4D	Connected subaddress	Connected subaddress	11.5.4.14	O	TLV	3-23
7E	User-user	User-user	11.5.4.25	O	TLV	3-35

10.3.5.1.1 Facility

This information element may be used for functional operation of supplementary services. It will not be sent by the Network (no supplementary services supported in the Network require to send it).

10.3.5.1.2 Progress indicator

This information element may be included by the Network:

- In order to pass information about the call in progress, e.g., in the event of interworking; and/or

- To make the MES attach the user connection for speech.

Refer to clause 6.2.1.4 for the possible values sent by the MSC.

10.3.5.1.3 User-User

This information element will not be sent (user-to-user service not supported in the network).

10.3.5.2 Connect (MES to Network direction)

This message is sent by the called MES to the network to indicate call acceptance by the called user. See table 10.3.5.2

Message Type: CONNECT

Significance: Global

Direction: MES to Network

Table 10.3.5.1: CONNECT Message Content (MES to network direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Connect message type	Message Type	11.4	M	V	1
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
4D	Connected subaddress	Connected subaddress	11.5.4.14	O	TLV	3-23
7E	User-user	User-user	11.5.4.25	O	TLV	3-35
7F	SS version	SS version indicator	11.5.4.24	O	TLV	2-3

10.3.5.2.1 Facility

This information element may be used for functional operation of supplementary services. It will not be sent by the MES (no supplementary services supported in the network require to send it). If received by the Network, a FACILITY message will be returned to the MES to reject the supplementary service invocation.

10.3.5.2.2 User-User

This information element will not be sent by the MES (user-to-user service not supported in the network) and will be ignored by the network if received.

10.3.5.2.3 SS version

This information element shall not be included if the facility information element is not present in this message. If received without a facility information element, the call shall be released.

This information element shall be included or excluded as defined in GSM 04.10 [17]. This information element should not be transmitted unless explicitly required by GSM 04.10 [17].

10.3.6 Connect acknowledge

This message is sent by the network to the called MES to indicate that the MES has been awarded the call. It shall also be sent by the calling MES to the network to acknowledge the offered connection. See table 10.3.6.1.

Message Type: CONNECT ACKNOWLEDGE

Significance: Local

Direction: Both

Table 10.3.6.1: CONNECT ACKNOWLEDGE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Connect acknowledge message type	Message Type	11.4	M	V	1

10.3.7 Disconnect

10.3.7.1 Disconnect (Network to MES direction)

This message is sent by the network to indicate that the end-to-end connection is cleared. See table 10.3.7.1.

Message Type: DISCONNECT

Significance: Global

Direction: Network to MES

Table 10.3.7.1: DISCONNECT Message Content (network to MES direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Disconnect message type	Message Type	11.4	M	V	1
	Cause	Cause	11.5.4.11	M	LV	3-31
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
1E	Progress indicator	Connected subaddress	11.5.4.21	O	TLV	4
7E	User-user	User-user	11.5.4.25	O	TLV	3-35

10.3.7.1.1 Facility

This information element may be used for functional operation of supplementary services. It will not be sent by the Network (no supplementary services supported in the Network require to send it).

10.3.7.1.2 Progress indicator

This information element may be included by the Network:

10.3.7.1.3 User-User

This information element will not be sent (user-to-user service not supported in the network).

10.3.7.2 Disconnect (MES to Network direction)

This message is sent by the MES to request the network to clear an end-to-end connection. This message shall not be sent by the MES if the call to be released is a MES-to-MES single hop call. See table 10.3.7.2.

Message Type: DISCONNECT

Significance: Global

Direction: MES to Network

Table 10.3.7.2: DISCONNECT Message Content (MES to Network direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Disconnect message type	Message Type	11.4	M	V	1
	Cause	Cause	11.5.4.11	M	LV	3-31
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
7E	User-user	User-user	11.5.4.25	O	TLV	3-35
7F	SS version	SS version indicator	11.5.4.24	O	TLV	2-3

10.3.7.2.1 Facility

This information element may be used for functional operation of supplementary services, such as the user-user service. It will not be sent by the MES (no supplementary services supported in the Network require to send it). If received by the Network, a FACILITY message will be returned to the MES to reject the supplementary service invocation.

10.3.7.2.2 User-User

This information element will not be sent by the MES (user-to-user service not supported in the Network) and will be ignored by the Network if received.

10.3.7.2.3 SS version

This information element shall not be included if the facility information element is not present in this message. If received without facility information element the call shall be released.

This information element shall be included or excluded as defined in GSM 04.10 [17]. This information element should not be transmitted unless explicitly required by GSM 04.10 [17].

10.3.8 Emergency setup

This message is sent from the MES to initiate emergency call establishment. See table 10.3.8.1.

Message Type: EMERGENCY SETUP

Significance: Global

Direction: MES to Network

Table 10.3.8.1: EMERGENCY SETUP Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Emergency setup message type	Message Type	11.4	M	V	1
04	Bearer capability	Bearer capability	11.5.4.5	O	TLV	3

10.3.8.1 Bearer capability

If the element is not included, the network shall by default assume speech and select full rate speech. If this information element is included, it shall indicate speech with the appropriate value radio channel requirement field.

10.3.9 Facility

10.3.9.1 Facility (Network to MES direction)

This message is sent by the network to the MES to request or acknowledge a supplementary service. The supplementary service to be invoked and its associated parameters are specified in the facility information element. See table 10.3.9.1.

Message Type: FACILITY

Significance: Local (Note 1)

Direction: Network to MES

Table 10.3.9.1: FACILITY Message Content (Network to MES direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Facility message type	Message Type	11.4	M	V	1
	Facility (note 2)	Facility	11.5.4.15	M	LV	1-?

NOTE 1: This message has local significance, however, it may carry information of global significance.

NOTE 2: The facility information element has no upper length limit except that given by the maximum number of octets in a L3 message, see GMR-2 04.006 [15].

10.3.9.2 Facility (MES to Network direction)

This message is sent by the MES to the network to request or acknowledge a supplementary service. The supplementary service to be invoked and its associated parameters are specified in the facility information element. See table 10.3.9.2.

Message Type: FACILITY

Significance: Local (Note 1)

Direction: MES to Network

Table 10.3.9.2: FACILITY Message Content (MES to Network direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Facility message type	Message Type	11.4	M	V	1
	Facility (Note 2)	Facility	11.5.4.15	M	LV	1-?
7F	SS version	SS version indicator	11.5.4.24	O	TLV	2-3

NOTE 1: This message has local significance; however, it may carry information of global significance.

NOTE 2: The facility information element has no upper length limit except that given by the maximum number of octets in a L3 message, see GMR-2 04.006 [15].

10.3.9.2.1 SS version

This information element shall be included or excluded as defined in GSM 04.10 [17]. This information element should not be transmitted unless explicitly required by GSM 04.10 [17]. If received without facility information element the call shall be released.

10.3.10 Hold

This message is sent by the mobile user to request the hold function for an existing call.

This message shall not be sent by the MES if the existing call to be put on hold is a single hop MES-to-MES call. See table 10.3.10.1 for the content of the HOLD message.

For the use of this message, see GSM 04.10 [17].

Message Type: HOLD

Significance: Local

Direction: MES to Network

Table 10.3.10.1: HOLD Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Hold message type	Message Type	11.4	M	V	1

10.3.11 Hold acknowledge

This message is sent by the network to indicate that the hold function has been successfully performed. See table 10.3.11.1 for the content of the HOLD ACKNOWLEDGE message.

For the use of this message, see GSM 04.10 [17].

Message Type: HOLD ACKNOWLEDGE

Significance: Local

Direction: Network to MES

Table 10.3.11.1: HOLD ACKNOWLEDGE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Hold Acknowledge message type	Message Type	11.4	M	V	1

10.3.12 Hold reject

This message is sent by the network to indicate the denial of a request to hold a call. See table 10.3.12.1 for the content of the HOLD REJECT message.

For the use of this message, see GSM 04.10 [17].

Message Type: HOLD REJECT

Significance: Local

Direction: Network to MES

Table 10.3.12.1: HOLD ACKNOWLEDGE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Hold Reject message type	Message Type	11.4	M	V	1
	Cause	Cause	11.5.4.11	M	LV	3-31

10.3.13 Modify

This message is sent by the MES to the network or by the network to the MES to request a change in bearer capability for a call.

As change of bearer capability for a call is not supported in the network (refer to SETUP description in clause 10.3.23), this message shall not be sent by the MES nor by the Network and shall be ignored if received. See table 10.3.13.1.

Message Type: MODIFY

Significance: Global

Direction: Both

Table 10.3.13.1: MODIFY Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Modify message type	Message Type	11.4	M	V	1
	Bearer capability	Bearer capability	11.5.4.5	M	LV	2-9
7C	Low layer comp	Low layer comp.	11.5.4.18	O	TLV	2-15
7D	High layer comp	High layer comp	11.5.4.16	O	TLV	2-5
A3	Reverse call setup direction	Reverse call setup direction	11.5.4.22a	O	T	1

10.3.13.1 Low layer compatibility

This information element shall be included if it was included in the initial SETUP message.

10.3.13.2 High layer compatibility

This information element shall be included if it was included in the initial SETUP message

10.3.13.3 Reverse call setup direction

This information element is included or omitted in the MES to Network direction according to the rules defined in clause 6.3.4.3.1.

10.3.14 Modify complete

This message is sent by the MES to the network or by the network to the MES to indicate completion of a request to change bearer capability for a call.

As change of bearer capability for a call is not supported in the network (refer to SETUP description in clause 10.3.23), this message shall not be sent by the MES nor by the Network and shall be ignored if received. See table 10.3.14.1.

Message Type: MODIFY COMPLETE

Significance: Global

Direction: Both

Table 10.3.14.1: MODIFY COMPLETE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Modify complete message type	Message Type	11.4	M	V	1
	Bearer capability	Bearer capability	11.5.4.5	M	LV	2-9
7C	Low layer comp	Low layer comp	11.5.4.18	O	TLV	2-15
7D	High layer comp	High layer comp	11.5.4.16	O	TLV	2-5

10.3.14.1 Low layer compatibility

This information element shall be included if it was included in the initial SETUP message.

10.3.14.2 High layer compatibility

This information element shall be included if it was included in the initial SETUP message.

10.3.14.3 Reverse call setup direction

This information element is included or omitted according to the rules defined in clause 6.3.4.3.2.

10.3.15 Modify reject

This message is sent by the MES to the network or by the network to the MES to indicate failure of a request to change the bearer capability for a call. See table 10.3.15.1.

As change of bearer capability for a call is not supported in the network (refer to SETUP description in clause 10.3.23), this message shall not be sent by the MES nor by the Network and shall be ignored if received.

Message Type: MODIFY REJECT

Significance: Global

Direction: Both

Table 10.3.15.1: MODIFY REJECT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Modify reject message type	Message Type	11.4	M	V	1
	Bearer capability	Bearer capability	11.5.4.5	M	LV	2-9
	Cause	Cause	11.5.4.11	M	LV	3-31
7C	Low layer comp	Low layer comp.	11.5.4.18	O	TLV	2-15
7D	High layer comp	High layer comp	11.5.4.16	O	TLV	2-5

10.3.15.1 Low layer compatibility

This information element shall be included if it was included in the initial SETUP message.

10.3.15.2 High layer compatibility

This information element shall be included if it was included in the initial SETUP message.

10.3.16 Notify

This message is sent either from the MES or from the network to indicate information pertaining to a call, such as user suspended. See table 10.3.16.1.

As user notification procedure is not required in the network (refer to clause 6.3.1), this message shall not be sent by the MES nor by the Network and shall be ignored if received.

Message Type: NOTIFY

Significance: Access

Direction: Both

Table 10.3.16.1: NOTIFY Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Notify message type	Message Type	11.4	M	V	1
	Notification Indicator	Notification Indicator	11.5.4.20	M	V	1

10.3.17 Progress

This message is sent from the network to the MES to indicate the progress of a call in the event of interworking or in connection with the provision of in-band information/patter. See table 10.3.17.1.

Refer to clause 6.2.1.4 and 6.5.1 for sending of this message. Possible values of the progress indicator information element are #1 and #8.

Message type: PROGRESS

Significance: Global

Direction: Network to MES

Table 10.3.17.1: PROGRESS Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Progress message type	Message Type	11.4	M	V	1
	Progress Indicator	Notification Indicator	11.5.4.21	M	LV	3
7E	User-user	User-user	11.5.4.25	O	TLV	3-35

10.3.17.1 User-user

This information element will not be sent (user-to-user service not supported in the network).

10.3.18 Release

10.3.18.1 Release (Network to MES direction)

This message is sent, from the network to the MES to indicate that the network intends to release the transaction identifier, and that the receiving equipment shall release the transaction identifier after sending RELEASE COMPLETE. See table 10.3.18.1.

Message Type: RELEASE

Significance: Local (see Note)

Direction: Network to MES

Table 10.3.18.1: RELEASE Message Content (Network to MES direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Release message type	Message Type	11.4	M	V	1
08	Cause	Cause	11.5.4.11	O	TLV	4-32
08	Second cause	Cause	11.5.4.11	O	TLV	4-32
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
7E	User-user	User-user	11.5.4.25	O	TLV	3-35

NOTE: This message has local significance, however, it may carry information of global significance when used as the first call clearing message.

10.3.18.1.1 Cause

This information element shall be included if this message is used to initiate call clearing. It will also be included when this message is sent after expiration of timer T305 (no RELEASE message received in response to a DISCONNECT message sent to the MES). The cause value will be the cause value originally contained in that DISCONNECT message.

10.3.18.1.2 Second cause

This information element will never be sent by the network.

10.3.18.1.3 Facility

This information element may be included for functional operation of supplementary services. It will not be sent by the Network (no supplementary services supported in the Network are required to send it).

10.3.18.1.4 User-user

This information element will not be sent (user-to-user service not supported in the network).

10.3.18.2 Release (MES to Network direction)

This message is sent from the MES to the network to indicate that the MES intends to release the transaction identifier, and that the receiving equipment shall release the transaction identifier after sending RELEASE COMPLETE. See table 10.3.18.2.

In the case of MES-to-MES single hop call, this message is sent by the MES which initiates the call clearing (no DISCONNECT message sent). In that case, the RELEASE message shall not be sent to the MSC. It shall be handled by the GSC (refer to clause 8.3.4 for MES-to-MES call clearing).

Message Type: RELEASE

Significance: Local (Note)

Direction: MES to Network

Table 10.3.18.2: RELEASE Message Content (MES to Network direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Release message type	Message Type	11.4	M	V	1
08	Cause	Cause	11.5.4.11	O	TLV	4-32
08	Second cause	Cause	11.5.4.11	O	TLV	4-32
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
7E	User-user	User-user	11.5.4.25	O	TLV	3-35
7F	SS version	SS version indicator	11.5.4.24	O	TLV	2-3

NOTE: This message has local significance, however, it may carry information of global significance when used as the first call clearing message.

10.3.18.2.1 Cause

This information element shall be included if this message is used to initiate call clearing.

10.3.18.2.2 Second cause

This information element will never be sent by the MES.

10.3.18.2.3 Facility

This information element may be included for functional operation of supplementary services. It will not be sent by the MES (no supplementary services supported in the Network require to send it). If received by the Network, a FACILITY message will be returned to the MES to reject the supplementary service invocation.

10.3.18.2.4 User-user

This information element will not be sent by the MES (user-to-user service not supported in the Network) and will be ignored by the Network if received.

10.3.18.2.5 SS version

This information element shall not be included if the facility information element is not present in this message.

This information element shall be included or excluded as defined in GSM 04.10 [17]. This information element should not be transmitted unless explicitly required by GSM 04.10 [17].

10.3.18.3 Release (MES to MES)

This message is sent from the MES to another MES in the case of a direct mobile-to-mobile call, to indicate that one of the MESs intends to release the traffic channel, terminate the call and return to idle, and that the receiving MES shall release the traffic channel, terminate the call and return to idle after sending RELEASE COMPLETE. See table 10.3.18.3.

Message Type: RELEASE

Significance: Local (Note)

Direction: MES to MES

Table 10.3.18.3: RELEASE Message Content (MES to MES)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Release message type	Message Type	11.4	M	V	1
08	Cause	Cause	11.5.4.11	O	TLV	4-32
08	Second cause	Cause	11.5.4.11	O	TLV	4-32
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
7E	User-user	User-user	11.5.4.25	O	TLV	3-35

10.3.18.3.1 Cause

This information element may be included under the conditions described in clause 6.4.3.5 "Abnormal cases" (Clearing initiated by the MES). In a valid Release, this shall be set to "MES to MES CC release".

10.3.19 Release complete

10.3.19.1 Release complete (Network to MES direction)

This message is sent from the network to the MES to indicate that the network has released the transaction identifier and that the User Terminal shall release the transaction identifier. See table 10.3.19.1.

Message Type: RELEASE COMPLETE

Significance: Local (Note)

Direction: Network to MES direction

Table 10.3.19.1: RELEASE COMPLETE Message Content (Network to MES direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Release complete message type	Message Type	11.4	M	V	1
08	Cause	Cause	11.5.4.11	O	TLV	4-32
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
7E	User-user	User-user	11.5.4.25	O	TLV	3-35

NOTE: This message has local significance, however, it may carry information of global significance when used as the first call clearing message.

10.3.19.1.1 Cause

This information element shall be included if the message is used to initiate call clearing.

10.3.19.1.2 Facility

This information element may be included for functional operation of supplementary services, e.g., it is sent by the network to notify the calling subscriber that the call is barred (message sent in response to SETUP).

10.3.19.1.3 User-user

This information element will not be sent (user-to-user service not supported in the Network).

10.3.19.2 Release complete (MES to Network direction)

This message is sent from the MES to the network to indicate that the MES has released the transaction identifier and that the network shall release the transaction identifier. See table 10.3.19.2.

Message Type: RELEASE COMPLETE

Significance: Local (Note)

Direction: MES to Network direction

Table 10.3.19.2: RELEASE COMPLETE Message Content (MES to Network direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Release complete message type	Message Type	11.4	M	V	1
08	Cause	Cause	11.5.4.11	O	TLV	4-32
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
7E	User-user	User-user	11.5.4.25	O	TLV	3-35
7F	SS version	SS Version indicator	11.5.4.24	O	TLV	2-3

NOTE: This message has local significance; however, it may carry information of global significance when used as the first call clearing message.

10.3.19.2.1 Cause

This information element shall be included if the message is used to initiate call clearing.

10.3.19.2.2 Facility

This information element may be included for functional operation of supplementary services. It will not be sent by the MES (no supplementary services supported in the Network require to send it). If received by the Network, it will be ignored (no possibility to reply).

10.3.19.2.3 User-user

This information element will not be sent by the MES (user-to-user service not supported in the Network) and will be ignored by the Network if received.

10.3.19.2.4 SS version.

This information element shall not be included if the facility information element is not present in this message.

This information element shall be included or excluded as defined in GSM 04.10 [17]. This information element should not be transmitted unless explicitly required by GSM 04.10 [17].

10.3.19.3 Release complete (MES to MES and Network)

This message is sent from the MES directly to another MES in the case of a mobile-to-mobile call to indicate that the MES has released the traffic channel, terminated the call and return to idle. This S-FACCH command will force the network to teardown the call. See table 10.3.19.3.

Message Type: RELEASE COMPLETE

Significance: Local (Note)

Direction: MES to MES and Network direction

Table 10.3.19.3: RELEASE COMPLETE Message Content (MES to MES and Network direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Release complete message type	Message Type	11.4	M	V	1
08	Cause	Cause	11.5.4.11	O	TLV	4-32

10.3.19.3.1 Cause

This information element shall be included if the message is used to initiate call clearing. In a valid Release this shall be set to "MES to MES CC release".

10.3.20 Retrieve

This message is sent by the mobile user to request the retrieval of a held call.

This message shall not be sent by the MES if the retrieve request is related to single hop MES-to-MES call. See table 10.3.20.1 for the content of the RETRIEVE message.

For the use of this message, see GSM 04.10 [17].

Message Type: RETRIEVE

Significance: Local

Direction: MES to Network

Table 10.3.20.1: RETREIVE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Retrieve message type	Message Type	11.4	M	V	1

10.3.21 Retrieve acknowledge

This message is sent by the network to indicate that the retrieve function has been successfully performed. See table 10.3.21.1 for the content of the RETRIEVE ACKNOWLEDGE message. For the use of this message, see GSM 04.10 [17].

Message Type: RETRIEVE ACKNOWLEDGE

Significance: Local

Direction: Network to MES

Table 10.3.21.1: RETREIVE ACKNOWLEDGE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Retrieve Acknowledge message type	Message Type	11.4	M	V	1

10.3.22 Retrieve reject

This message is sent by the network to indicate the inability to perform the requested retrieve function. See able 10.3.22.1 for the content of the RETRIEVE REJECT message.

For the use of this message, see GSM 04.10 [17].

Message Type: RETRIEVE REJECT

Significance: Local

Direction: Network to MES

Table: 10.3.22.1: RETREIVE REJECT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Retrieve Reject message type	Message Type	11.4	M	V	1
	Cause	Cause	11.5.4.11	M	LV	3-31

10.3.23 Setup

10.3.23.1 Setup (mobile terminated call establishment)

This message is sent by the network to the MES to initiate a mobile terminated call establishment. See table 10.3.23.1.

Message Type: SETUP

Significance: Global

Direction: Network to MES

Table: 10.3.23.1: SETUP Message Content (Network to MES direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Setup message type	Message Type	11.4	M	V	1
D-	BC repeat indicator	Repeat indicator	11.5.4.22	C	TV	1
04	Bearer capability 1	Bearer capability	11.5.4.5	O	TLV	3-10
04	Bearer capability 2	Bearer capability	11.5.4.5	O	TLV	3-10
1C	Facility	Facility	11.5.4.15	O	TLV	2-?
1E	Progress indicator	Progress indicator	11.5.4.21	O	TLV	4
34	Signal	Signal	11.5.4.23	O	TV	2
5C	Calling party BCD number	Calling party BCD num.	11.5.4.9	O	TLV	3-14
5D	Calling party sub-address	Calling party subaddress	11.5.4.10	O	TLV	2-23
5E	Called party BCD number	Called party BCD num.	11.5.4.7	O	TLV	3-13
6D	Called party sub- address	Called party subaddress	11.5.4.8	O	TLV	2-23
D-	LLC repeat indicator	Repeat indicator	11.5.4.22	O	TV	1
7C	Low layer compatibility I	Low layer comp.	11.5.4.18	O	TLV	2-15
7C	Low layer compatibility II	Low layer comp.	11.5.4.18	C	TLV	2-15
D-	HLC repeat indicator	Repeat indicator	11.5.4.22	O	TV	1
7D	High layer compatibility i	High layer comp.	11.5.4.16	O	TLV	2-5
7D	Low layer compatibility ii	High layer comp.	11.5.4.16	C	TLV	2-5
7E	User-user	User-user	11.5.4.25	O	TLV	3-35

10.3.23.1.1 BC repeat indicator

The BC repeat indicator information element is included if and only if bearer capability 1 information element and bearer capability 2 IE are both present in the message.

10.3.23.1.2 Bearer capability 1 and bearer capability 2

The bearer capability 1 information element is always sent by the network (it corresponds to the GSM-BC information received from HLR at roaming number provision or implicitly to speech if this information was not received. The bearer capability 2 IE is never sent.

10.3.23.1.3 Facility

This information element may be included for functional operation of supplementary services. e.g., it is sent by the Network in case of call forwarding (to notify the forwarded to party).

10.3.23.1.4 Progress indicator

This information element is included by the network:

- In order to pass information about the call in progress, e.g., in the event of interworking; and/or
- To make the MES attach the user connection for speech.

Possible values sent by the network are #1 and #3.

10.3.23.1.5 Called party subaddress

Included in the Network-to-MES direction if the calling user includes a called party subaddress information element in the SETUP message.

10.3.23.1.6 LLC repeat indicator

The LLC repeat indicator information element is included if and only if both following conditions hold:

- The *BC repeat indicator* IE is contained in the message;
- The *low layer compatibility I* IE is contained in the message.

The LLC repeat indicator IE will never be sent by the Network.

10.3.23.1.7 Low layer compatibility I

Included in the network-to-MES direction if the calling user specified a low layer compatibility.

The LLC 1 IE will never be sent by the Network.

10.3.23.1.8 Low layer compatibility II

Included if and only if the LLC repeat indicator information element is contained in the message.

The LLC 2 IE will never be sent by the Network.

10.3.23.1.9 HLC Repeat Indicator

The HLC repeat indicator IE will never be sent by the Network.

The HLC repeat indicator information element is included if and only both following conditions hold:

- The BC repeat indicator IE is contained in the message;
- The high layer compatibility IE is contained in the message.

10.3.23.1.10 High layer compatibility I

Included in the network-to-MES direction if the calling user specified a high layer compatibility.

The HLC I IE will be sent by the network if it has been previously received from the HLR at roaming number provision.

10.3.23.1.11 High layer compatibility II

Included if and only if the HLC repeat indicator information element is contained in the message.

The HLC II IE will never be sent by the network.

10.3.23.1.12 User-user

Not included (user-to-user service not supported in the network).

10.3.23.1.13 Signal

Sent by the network if the SETUP message is related to a call waiting invocation or to an operator intervention. Its possible values are:

- "call waiting tone on" (call waiting case);
- "intercept tone on" (operator intervention case).

Otherwise, it is never sent by the network.

10.3.23.1.14 Calling party BCD number

Not sent (CLIP supplementary service not required in the network).

10.3.23.1.15 Calling party subaddress

Not sent (CLIP supplementary service not required in network).

10.3.23.1.16 Called party BCD number

Always included except in the case of a SETUP message for call waiting or operator intervention.

10.3.23.2 Setup (mobile originating call establishment)

This message is sent from the MES to the network to initiate a mobile originating call establishment. See table 10.3.23.2.

Message Type: SETUP

Significance: Global

Direction: MES to Network

Table: 10.3.23.2: SETUP Message Content (MES to Network direction)

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Setup message type	Message Type	11.4	M	V	1
D-	BC repeat indicator	Repeat indicator	11.5.4.22	C	TV	1
04	Bearer capability 1	Bearer capability	11.5.4.5	M	TLV	3-10
04	Bearer capability 2	Bearer capability	11.5.4.5	0	TLV	3-10
1C	Facility	Facility	11.5.4.15	0	TLV	2-?
5D	Calling party sub- address	Calling party subaddr-	11.5.4.10	0	TLV	2-23
5E	Called party BCD number	Called party BCD num.	11.5.4.7	M	TLV	3-13
6D	Called party sub- address	Called party subaddr.	11.5.4.8	0	TLV	2-23
D-	LLC repeat indicator	Repeat indicator	11.5.4.22	0	TV	1
7C	Low layer compatibility I	Low layer comp.	11.5.4.18	O	TLV	2-15
7C	Low layer compatibility II	Low layer comp.	11.5.4.18	C	TLV	2-15
D-	HLC repeat indicator	Repeat indicator	11.5.4.22	O	TV	1
7D	High layer compatibility i	High layer comp.	11.5.4.18	O	TLV	2-5
7D	Low layer compatibility ii	High layer comp.	11.5.4.18	C	TLV	2-5
7E	User-user	User-user	11.5.4.25	O	TLV	3-35
7F	SS version	SS version indicator	11.5.4.24	O	TLV	2-3
A1	CLIR suppression	CLIR suppression	11.5.4.11a	C	T	1
A2	CLIR invocation	CLIR invocation	11.5.4.11b	C	T	1
15	CC Capabilities	Call Control	11.5.4.5a	0	TLV	3

10.3.23.2.1 BC repeat indicator

The BC repeat indicator information element is included if and only if bearer capability 1 IE and bearer capability 2 IE are both present in the message.

10.3.23.2.2 Facility

The information element may be included for functional operation of supplementary services. It will not be sent by the MES (no supplementary services supported in the Network require to send it). If received by the network, a FACILITY message will be returned to the MES to reject the supplementary service invocation.

10.3.23.2.3 LLC repeat indicator

The LLC repeat indicator information element is included if and only if both following conditions hold:

- The BC repeat indicator IE is contained in the message;
- The low layer compatibility I IE is contained in the message.

The LLC repeat indicator IE will never be sent by the MES.

10.3.23.2.4 Low layer compatibility I

The information element is included in the MES-to-network direction when the calling MES wants to pass low layer compatibility information to the called user.

If this information element consists of more than 15 octets, octets 4a and 4b are discarded by the network before sending it to the called party.

10.3.23.2.5 Low layer compatibility II

Included if and only if the LLC repeat indicator information element is contained in the message.

The LLC II IE will never be sent by the MES.

10.3.23.2.6 HLC Repeat Indicator

The HLC repeat indicator information element is included if and only if both following conditions hold:

- The BC repeat indicator IE is contained in the message;
- The high layer compatibility I IE is contained in the message.

The HLC II repeat indicator IE will never be sent by the MES.

10.3.23.2.7 High layer compatibility I

The information element is included when the calling MES wants to pass high layer compatibility information to the called user.

10.3.23.2.8 High layer compatibility II

Included if and only if the HLC repeat indicator information element is contained in the message.

The HLC II IE will never be sent by the MES.

10.3.23.2.9 User-user

The information element will not be included (user-to-user service not supported in the network) and will be ignored by the Network if received.

10.3.23.2.10 SS version

This information element shall not be included if the facility information element is not present in this message. If received without facility information element the call shall be released.

This information element shall be included or excluded as defined in GSM 04.10 [17]. This information element should not be transmitted unless explicitly required by GSM 04.10 [17].

10.3.23.2.11 CLIR suppression

The information element may be included by the MES (see GSM 04.81 [20]). If this information element is included the CLIR invocation IE shall not be included.

It will not be sent by the MES (CLIR supplementary services not required in the network)

10.3.23.2.12 CLIR invocation

The information element may be included by the MES (see GSM 04.81 [20]). If this information element is included the CLIR suppression IE shall not be included.

It will not be sent by the MES (CLIR supplementary services not required in the network)

10.3.23.2.13 Bearer capability 2

The bearer capability 2 IE shall never be sent by the MES (the only case where it would be accepted by the network is when one of the BC indicates speech and the other indicates facsimile group 3 which is not required in the network.

10.3.23.2.14 Calling party subaddress

May be included by the MES. The network will pass it to the called party if received.

10.3.23.2.15 Called party subaddress

May be included by the MES. The network will pass it to the called party if received.

10.3.23.2.16 CC capabilities

This information element may be included by the MES to indicate its call control capabilities. If this information element is sent by the MES, the network will ignore it.

10.3.24 Start DTMF

This message is sent by the MES to the Network and contains the digit the network should reconvert back into a DTMF tone which is then applied towards the remote user. This message is also sent by a MES to another MES in the case of a mobile to mobile call. See table 10.3.24.1.

Message Type: START DTMF

Significance: Local

Direction: MES to Network or MES to MES

Table: 10.3.24.1: START DTMF Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Start DTMF message type	Message Type	11.4	M	V	1
2C	Keypad facility	Keypad facility	11.5.4.17	M	TV	2

10.3.25 Start DTMF acknowledge

This message is sent by the network to the MES to indicate the successful initiation of the action requested by the START DTMF message (conversion of the digit contained in this message into a DTMF tone). See table 10.3.25.1.

Message Type: START DTMF ACKNOWLEDGE

Significance: Local

Direction: Network to MES or MES to another MES

Table: 10.3.25.1: START DTMF ACKNOWLEDGE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Start DTMF acknowledge message type	Message Type	11.4	M	V	1
2C	Keypad facility	Keypad facility	11.5.4.17	M	TV	2

10.3.25.1 Keypad facility

This information element contains the digit corresponding to the DTMF tone that the network applies towards the remote user.

10.3.26 Start DTMF reject

This message is sent by the network to the MES, if the network can not accept the START DTMF message. See table 10.3.26.1.

Message Type: START DTMF REJECT

Significance: Local

Direction: Network to MES or MES to MES

Table 10.3.26.1: START DTMF REJECT Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Start DTMF reject message type	Message Type	11.4	M	V	1
	Cause	Cause	11.5.4.11	M	LV	3-31

10.3.27 Status

This message is sent by the MES or the network at any time during a call to report certain error conditions listed in clause 9. It shall also be sent in response to a STATUS ENQUIRY message. See table 10.3.27.1.

Message Type: STATUS

Significance: Local

Direction: Both

Table: 10.3.27.1: STATUS Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Status message type	Message Type	11.4	M	V	1
	Cause	Cause	11.5.4.11	M	LV	3-31
	Call state	Call state	11.5.4.6	M	V	1
24	Auxiliary states	Auxiliary states	11.5.4.4	O	TLV	3

10.3.27.1 Auxiliary states

The information element is included if and only if the call state is "active" and any auxiliary state is different from "idle". For the definition of the auxiliary states see GMR-2 04.083 [21] and GMR-2 04.084 [22].

10.3.28 Status enquiry

This message is sent by the MES or the network at any time to solicit a STATUS message from the peer layer 3 entity. Sending of STATUS message in response to a STATUS ENQUIRY message is mandatory. See table 10.3.28.1.

Message Type: STATUS ENQUIRY

Significance: Local

Direction: Both

Table 10.3.28.1: STATUS ENQUIRY Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Status enquiry message type	Message Type	11.4	M	V	1

10.3.29 Stop DTMF

This message is sent by a MES to the network and is used to stop the DTMF tone sent towards the remote user. See table 10.3.29.1.

Message Type: STOP DTMF

Significance: Local

Direction: MES to Network or MES to MES

Table 10.3.29.1: STOP DTMF Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Stop DTMF message type	Message Type	11.4	M	V	1

10.3.30 Stop DTMF acknowledge

This message shall be ignored if received by the network. See table 10.3.30.1.

When applicable, this message is sent by the network to the MES to indicate that the sending of the DTMF tone has been stopped.

Message Type: STOP DTMF ACKNOWLEDGE

Significance: Local

Direction: Network to MES or MES to MES

Table 10.3.30.1: STOP DTMF ACKNOWLEDGE Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	Stop DTMF acknowledge message type	Message Type	11.4	M	V	1

10.3.31 User information

This message shall not be sent by the user terminal nor by the network and shall be ignored if received (user-to-user service not supported in the network).

When applicable, this message is sent by the MES to the network to transfer information to the remote user. This message is also sent by the network to the MES to deliver information transferred from the remote user. This message is used if the user-to-user transfer is part of an allowed information transfer as defined in GSM 04.10 [17]. See table 10.3.31.1

Message Type: USER INFORMATION

Significance: Access

Direction: Both

Table 10.3.31.1: USER INFORMATION Message Content

IEI	Information Element	Type	Reference	Presence	Format	Length
	Call control protocol discriminator	Protocol discriminator	11.2	M	V	1/2
	Transaction identifier	Transaction identifier	11.3.2	M	V	1/2
	User information message type	Message Type	11.4	M	V	1
	User-user	User-user	11.5.4.25	M	LV	3-130
AO	More data	More data	11.5.4.19	O	T	1

10.3.31.1 User-user

Some networks may only support a maximum length of 35 octets. Procedures for interworking are not currently defined and are for further study.

10.3.31.2 More data

The information element is included by the sending user to indicate that another USER INFORMATION message pertaining to the same message block will follow.

11 General message format and information elements coding

The figures and text in this clause describe the Information Elements (IE) contents.

11.1 Overview

Within the Layer 3 protocols defined in the present document, every message, with the exception of the messages sent on the S-BCCH, S-HBCCH, S-AGCH, S-PCH, S-HPACH, S-SCH and S-RACH, is a standard L3 message as defined in GMR-2 04.007 [16]. This means that the message consists of the following parts:

a) Protocol discriminator;

b) Transaction identifier;

c) Message type;

d) Other information elements, as required.

This organization is illustrated in the example shown in figure 11.1.1.

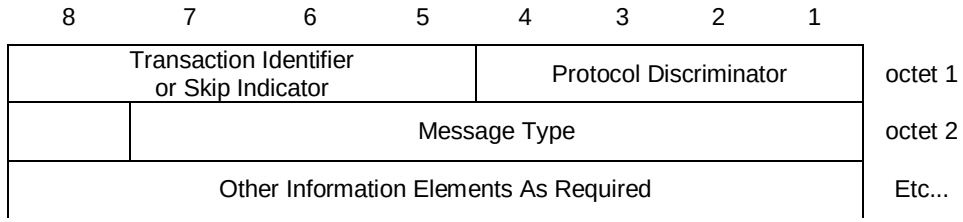

Figure 11.1.1: General message organization example

Unless specified otherwise in the message descriptions of clause 10, a particular information element shall not be present more than once in a given message.

The term "default" implies that the value defined shall be used in the absence of any assignment, or that this value allows negotiation of alternative values in between the two peer entities.

When a field extends over more than one octet, the order of bit values progressively decreases as the octet number increases. The least significant bit of the field is represented by the lowest numbered bit of the highest numbered octet of the field.

11.2 Protocol Discriminator

The Protocol Discriminator (PD) and its use are defined in GMR-2 04.007 [16]. This specification defines the protocols relating to the PD values

Bits :				
4	**3**	**2**	**1**	
0	0	1	1	Call Control; Call Related SS Messages
0	1	0	1	Mobility Management Messages
0	1	1	0	Radio Resource Management Messages

except the call related SS procedures, which are defined in GSM 04.10 [17].

11.3 Skip indicator and transaction identifier

11.3.1 Skip indicator

Bits 5 to 8 of the first octet of every Radio Resource management message and Mobility Management message contains the skip indicator. A message received with skip indicator different from 0000 shall be ignored. A message received with skip indicator encoded as 0000 shall not be ignored (unless it is ignored for other reasons). A protocol entity sending a Radio Resource management message or a Mobility Management message shall encode the skip indicator as 0000.

11.3.2 Transaction identifier

Bits 5 to 8 of the first octet of every message belonging to the protocol "Call Control; call related SS messages" contain the transaction identifier (TI). The transaction identifier and its use are defined in GMR-2 04.007 [16].

NOTE: Transaction ID may be ignored for single hop mobile-to-mobile calls.

11.4 Message type

The message type IE and its use are defined in GMR-2 04.007 [16]. Tables 11.4.1, 11.4.2, and 11.4.3 define the value part of the message type IE used in the Radio Resource management protocol, the Mobility Management protocol, and the Call Control protocol.

Table 11.4.1: Message type for Radio Resource management

8	7	6	5	4	3	2	1	
0	0	1	1	1	-	-	-	**Channel Establishment Messages:**
					0	1	1	- Reserved
					1	1	1	- Immediate Assignment
					0	0	1	- Reserved
					0	1	0	- Immediate Assignment Reject
0	0	1	1	0	-	-	-	**Ciphering Messages:**
					1	0	1	- Ciphering Mode Command
					0	1	0	- Ciphering Mode Complete
0	0	1	0	1	-	-	-	**Handover Messages:**
					1	1	0	- Assignment Command
					0	0	1	- Assignment Complete
					1	1	1	- Assignment Failure
					0	1	1	- Reserved
					1	0	0	- Reserved
					0	0	0	- Reserved
					1	0	1	- Reserved
0	0	0	0	1	-	-	-	**Channel Release Messages:**
					1	0	1	- Channel Release
					0	1	0	- Reserved
					1	1	1	- Reserved
0	0	1	0	0	-	-	-	**Paging Messages:**
					0	0	1	- Paging Request Type 1
					0	1	0	- Reserved
					1	0	0	- Reserved
					1	1	1	- Paging Response
0	0	0	1	1	-	-	-	**System Information Messages:**
					0	0	0	- System Information Type 8
					0	0	1	- Reserved
					0	1	0	- System Information Type 2
					0	1	1	- System Information Type 3
					0	0	1	
					1	0	1	- System Information Type 5
					1	1	0	- System Information Type 6
					1	1	1	- System Information Type 7
0	0	0	0	0	-	-	-	**System Information Messages:**
					0	1	0	- System Information Type 9
					1	0	1	- System Information Type 10
0	0	0	1	0	-	-	-	**Miscellaneous Messages:**

8	7	6	5	4	3	2	1	
					0	0	0	- Channel Mode Modify
					0	1	0	- RR Status
					1	1	1	- Channel Mode Modify Acknowledge
					1	0	0	- Transmit Disable
					0	0	1	- Transmit Disable Ack
					1	0	1	- Measurement Report
					1	1	0	- Classmark Change
					0	1	1	- Classmark Enquiry

Bit 8 is reserved for possible future use as an extension bit, se GMR-2 04.007 [16].

Table 11.4.2: Message types for Mobility Management

8	7	6	5	4	3	2	1	
0	x	0	0	-	-	-	-	**Registration Messages:**
				0	0	0	1	- Reserved
				0	0	1	0	- Location Updating Accept
				0	1	0	0	- Location Updating Reject
				1	0	0	0	- Location Updating Request
0	x	0	1	-	-	-	-	**Security Messages:**
				0	0	0	1	- Authentication Reject
				0	0	1	0	- Authentication Request
				0	1	0	0	- Authentication Response
				1	0	0	0	- Identity Request
				1	0	0	1	- Identity Response
				1	0	1	0	- Reserved
				1	0	1	1	- Reserved
0	x	1	0	-	-	-	-	**Connection Management Messages**:
				0	0	0	1	- CM Service Accept
				0	0	1	0	- CM Service Reject
				0	0	1	1	- CM Service Abort
				0	1	0	0	- CM Service Request
				1	0	0	0	- Reserved
				1	0	0	1	- Reserved
								Miscellaneous Messages:
0	x	1	1	-	-	-	-	- Reserved

Bit 8 is reserved for possible future use as an extension bit, see GMR-2 04.007 [16].

Bit 7 is reserved for the send sequence number in messages sent from the MES. In messages sent from the Network, bit 7 is coded with a "0". See GMR-2 04.007 [16]. This bit may be ignored for single hop mobile-to-mobile signalling.

Table 11.4.3: Message Types for Call Control and Call related SS messages

8	7	6	5	4	3	2	1	
0	x	0	0	0	0	0	0	**Escape To Nationally Specific Message Types; see note below**
0	x	0	0	-	-	-	-	**Call Establishment Messages:**
				0	0	0	1	- Alerting
				1	0	0	0	- Call Confirmed
				0	0	1	0	- Call Proceeding
				0	1	1	1	- Connect
				1	1	1	1	- Connect Acknowledge
				1	1	1	0	- Emergency Setup
				0	0	1	1	- Progress
				0	1	0	1	- Setup
0	x	0	1	-	-	-	-	**Call Information Phase Messages:**
				0	1	1	1	- Modify
				1	1	1	1	- Modify Complete
				0	0	1	1	- Modify Reject
				0	0	0	0	- User Information
				1	0	0	0	- Hold
				1	0	0	1	- Hold Acknowledge
				1	0	1	0	- Hold Reject
				1	1	0	0	- Retrieve
				1	1	0	1	- Retrieve Acknowledge
				1	1	1	0	- Retrieve Reject
0	x	1	0	-	-	-	-	**Call Clearing Messages:**
				0	1	0	1	- Disconnect
				1	1	0	1	- Release
				1	0	1	0	- Release Complete
0	x	1	1	-	-	-	-	**Miscellaneous Messages:**
				1	0	0	1	- Congestion Control
				1	1	1	0	- Notify
				1	1	0	1	- Status
				0	1	0	0	- Status Enquiry
				0	1	0	1	- Start DTMF
				0	0	0	1	- Stop DTMF
				0	0	1	0	- Stop DTMF Acknowledge
				0	1	1	0	- Start DTMF Acknowledge
				0	1	1	1	- Start DTMF Reject
				1	0	1	0	- Facility

NOTE: When used, the message type is defined in the following octet(s), according to the national specification.

Bit 8 is reserved for possible future use as an extension bit, see GMR-2 04.007 [16].

Bit 7 is reserved for the send sequence number in messages sent from the MES. In messages sent from the Network, bit 7 is coded with a "0". See GMR-2 04.007 [16]. This bit may be ignored for single hop mobile-to-mobile signalling.

11.5 Other Information Elements

The different formats (V, LV, T, TV, TLV) and the four categories of information elements (type 1, 2, 3, and 4) are defined in GMR-2 04.007 [16].

The first octet of an information element in the non-imperative part contains the IEl of the information element. If this octet does not correspond to an IEl known in the message (see GMR-2 04.007 [16]), the receiver shall assume that the information element is:

a) Of type 1 or 2, i.e., that it is an information element of one octet length, if bit 8 of the first octet of the lE has the value 1;

b) Of type 4, i.e., that the next octet is the length indicator indicating the length of the remaining information elements, if bit 8 of the first octet of the IE has the value 0. If in this case, bits 5, 6, and 7 of the first octet of the IE also have the value 0, the IE is encoded as "comprehension required."

NOTE: The handling of messages containing unknown IEs encoded as "comprehension required" is specified in clause 9.

This rule allows the receiver to jump over unknown information elements and to analyze any following information elements.

The information element types which are common for at least two of the three protocols, Radio Resources management, Mobility Management and Call Control, are listed in clause 11.5.1.

The information element types for the protocols Radio Resources management, Mobility Management and Call Control are listed in clauses 11.5.2, 11.5.3 and 11.5.4 respectively. Default information element identifiers are defined in tables 11.5.1-1, 11.5.2-1, 11.5.3-1, and 11.5.4-1.

NOTE: Different information elements may have the same default information element identifier if they belong to different protocols.

The descriptions of the information element types in clauses 11.5.1, 11.5.2, 11.5.3, and 11.5.4 are organized in alphabetical order of the IE types. Each IE type is described in one clause.

The clause may have an introduction:

- possibly explaining the purpose of the IE;
- possibly describing whether the IE belongs to type 1, 2, 3, or 4;
- possibly indicating the length that the information element has if it is used in format TV (type 1 and 3) or TLV (type 4).

A figure in the clause defines the structure of the IE indicating:

- possibly the position and length of the IEl. (However it depends on the message in which the IE occurs whether the IE contains an IEl.);
- the fields the IE value part is composed of;
- possibly the position and length of the length indicator. (However it depends on the IE type whether the IE contains a length indicator or not.);
- possibly octet numbers of the octets that compose the IE (see clause a) below).

Finally, the clause contains tables defining the structure and value range of the fields that compose the lE value part. The order of appearance for information elements in a message is defined in clause 10.

The order of the information elements within the imperative part of messages has been chosen so that information elements with 1/2 octet of content (type 1) go together in succession. The first type 1 information element occupies bits 1 to 4 of octet N, the second bits 5 to 8 of octet N, the third bits 1 to 4 of octet N + 1 etc. If the number of type 1 information elements is odd, then bits 5 to 8 of the last octet occupied by these information elements contains a spare half octet IE in format V.

Where the description of information elements in the present document contains bits defined to be "spare bits", these bits shall set to the indicated value (0 or 1) by the sending side, and their value shall be ignored by the receiving side. With few exceptions, spare bits are indicated as being set to "0" in the present document.

The following rules apply for the coding of variable length information elements:

a) The octet number of an octet (which is defined in the figure of a clause) consists of a positive integer, possibly of an additional letter, and possibly of an additional asterisk, see item f.). The positive integer identifies one octet or a group of octets;

b) Each octet group is a self contained entity. The internal structure of an octet group may be defined in alternative ways;

c) An octet group is formed by using some extension mechanism. The preferred extension mechanism is to extend an octet (N) through the next octet(s) (Na, Nb, etc.) by using bit 8 in each octet as an extension bit.

- The bit value "0" indicates that the octet group continues through to the next octet. The bit value "1" indicates that this octet is the last octet of the group. If one octet (Nb) is present, the preceding octets (N and Na) shall also be present.

- In the format descriptions appearing in clauses 11.5.1 through 11.5.4, bit 8 is marked "0/1 ext" if another octet follows. Bit 8 is marked "1 ext" if this is the last octet in the extension domain.

- Additional octets may be defined in later versions of the protocols ("1 ext" changed to "0/1 ext") and equipments shall be prepared to receive such additional octets. The contents of these octets shall be ignored. However the length indicated in clauses 10 and 11 only takes into account this version of the protocols;

d) In addition to the extension mechanism defined above, an octet (N) may be extended through the next octet(s) (N + 1, N + 2 etc.) by indications in bits 7-1 (of octet N).

e) The mechanisms in c.) and d.) may be combined;

f) Optional octets are marked with asterisks (*)

11.5.1 Common Information Elements.

For the common information elements types listed below, the default coding of information element identifier bits is summarized in table 11.5.1.1.

Table 11.5.1.1: Information Element identifier coding for common Information Elements

8	**7**	**6**	**5**	**4**	**3**	**2**	**1**		**Reference clause**
1	:	:	:	-	-	-	-	Type 1 Info Elements	
1	1	1	1	-	-	-	-	Note	
0	:	:	:	:	:	:	:	Type 3 & 4 Info Elements	
0	0	0	1	0	0	0	1	Note	
0	0	0	1	0	0	1	1	Location Area Indentification	11.5.1.3
0	0	0	1	0	1	1	1	Mobile Identity	11.5.1.4
0	0	0	1	1	0	0	0	Note	
0	0	0	1	1	1	1	1	Note	
0	0	1	0	0	0	0	1	User Terminal Classmark 3	11.5.1.7
								Spare Half Octet	11.5.1.8
All other values are reserved									

11.5.1.1 Cell identity

This clause does not apply to the GMR-2 system.

11.5.1.2 Ciphering Key Sequence Number

The purpose of the Ciphering Key Sequence Number information element is to make it possible for the network to identify the ciphering key Kc which is stored in the MES without invoking the authentication procedure. The ciphering key sequence number is allocated by the Network and sent with the AUTHENTICATION REQUEST message to the MES where it is stored together with the calculated ciphering key Kc.

The Ciphering Key Sequence Number information element is coded as shown in figure 11.5.1.1 and table 11.5.1.2.

The Ciphering Key Sequence number is a type 1 information element.

8	7	6	5	4	3	2	1	
	Ciphering Key Sequence Number IEI			0 spare	Key Sequence			octet 1

Figure 11.5.1.1: Ciphering Key Sequence Number Information Element Format

Table 11.5.1.2: Ciphering Key Sequence Number Information Element Coding Standard

Key Sequence (octet 1) Bits			
3	**2**	**1**	
0	0	0	Possible values for the ciphering key sequence number
through			
1	1	0	No key is available (MES to Network);
1	1	1	Reserved (Network to MES)

11.5.1.3 Location Area Identification

The purpose of the Location Area Identification information element is to provide an unambiguous identification of location areas within the area covered by the system.

The Location Area Identification information element is coded as shown if figure 11.5.1.2 and table 11.5.1.3.

The Location Area Identification is a type 3 information element with 6 octets length.

8	7	6	5	4	3	2	1	
	Location Area Identification IEI							octet 1
SSC/MCC digit 2				SSC/MCC digit 1				octet 2
1	1	1	1	SSC/MCC digit 3				octet 3
SSC/MCC digit 2				SSC/MCC digit 1				octet 4
Location Area Code 11.5.2.48								octet 5
Location Area Code 11.5.2.48								octet 6

Figure 11.5.1.1: Location Area Identification Information Element Format

Table 11.5.1.3: Location Area Identification Information Element Coding Standard

When used in System Information Messages the following applies:

SSC (Octets 2 and 3)
The SSC will be used to indicate the Satellite System country. This allows the terminal to know its Home Satellite System or a Visited Satellite System. It shall be coded the same as the MCC field described below.

SNC (Octet 4)
The SNC allows the terminal to know which satellite in a multi-satellite system is providing the spotbeam and allows regional roaming concepts between satellites having overlapping but dissimilar geographical coverage as well as satellites having totally overlapping coverage. It shall be coded the same as the MNC field described below.

When used in Mobility management messages, the following applies:

MCC, Mobile country code (octet 2 and 3)
The MCC field is coded as in ITU-T Recommendation E.212 [36] , Annex A.

If the LAI is deleted, the MCC and MNC shall take the value from the deleted LAI.

In abnormal cases, the MCC stored in the User Terminal can contain elements not in the set (0, 1 ... 9). In such cases the User Terminal should transmit the stored values using full hexadecimal encoding. When receiving such an MCC, the network shall treat the LAI as deleted.

MNC, Mobile network code (octet 4)
The coding of this field is the responsibility of each administration but BCD coding shall be used. If an administration decides to include only one digit in the MNC then bits 5 to 8 of octet 4 are coded as "1111".

NOTE: GMR-2 03.003 [7] defines that a 2 digit MNC shall be used, however the possibility to use a one digit MNC in LAI is provided on the radio interface.

In abnormal cases, the MNC stored in the MES can have digit 1 not in the set (0, 1 .. 9) and/or digit 2 not in the set (0, 1,...9, F) hex. In such cases the MES should transmit the stored values using full hexadecimal encoding. When receiving such an MNC, the network shall treat the LAI as deleted.

Ordering: Digit 1 shall represent the leftmost digit of the field when the LAI is ordered from left to right, as shown in GMR-2 03.003 [7]

11.5.1.4 Mobile Identity

The purpose of the Mobile Identity information element is to provide either the international mobile subscriber identity, IMSI, or the international mobile equipment identity, IMEI together with the software version number, IMEISV.

The IMSI shall not exceed 15 digits and the IMEI is composed of 15 digits, the IMEISV is 16 digits (see GMR-2 03.003 [7]).

For all transactions except emergency call establishment, the identification procedure, and the ciphering mode setting procedure, the MES and the network shall select the IMSI as the mobile identity type.

For emergency call establishment the MES shall have a SIM present and select the mobile identity type as IMSI.

In the identification procedure the MES shall select the mobile identity type which was requested by the network.

In the ciphering mode setting procedure the mobile shall select the IMEISV.

The Mobile Identity information element is coded as shown in figure 11.5.1.3 and table 11.5.3.4. The value of N has a minimum length of 4 octets and a maximum length of 11 octets.

The Mobile Identity is a type 4 information element. When it is used in a message, it has a minimum length of 3 octets and a maximum length of 10 octets. Further restriction on the length may be applied, e.g., number plans.

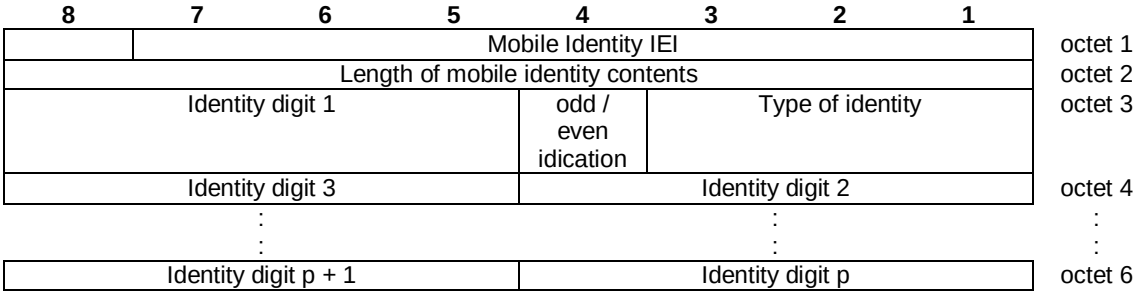

Figure 11.5.1.3: Mobile Identity Information Element Format

Table 11.5.1.4: Mobile Identity Information Element Coding Standard

Type of identity (octet 3)
Bits

3	**2**	**1**	
0	0	1	IMSI
0	1	0	IMEI
0	1	1	IMEISV
1	0	0	Reserved
0	0	0	No Identity (note)

Odd/event indication (octet 3)
Bit

4	
0	even number of identity digits
1	odd number of identity digits

Identity digits (octet 3 etc)
For the IMSI, IMEl and IMEISV this field is coded using BCD coding. If the number of identity digits is even then bits 5 to 8 of the last octet shall be filled with an end mark coded as "1111".
Ordering: Identity digit 1 shall represent the leftmost digit of the field when the IMSI, IMEI, or IMEISV is ordered from left to right as shown in GMR-2 03.003 [7].

NOTE: This can be used in the case when a fill paging message without any valid identity has to be sent on the paging subchannel.

11.5.1.5 MES Classmark 1

The purpose of the MES Classmark 1 information element is to provide the network with information concerning aspects of high priority of the MES equipment. This affects the manner in which the network handles the operation of the MES.

The MES Classmark 1 information element is coded as shown in figure 11.5.1.4 and table 11.5.1.5.

The MES Classmark 1 is a type 3 information element with 2 octets length.

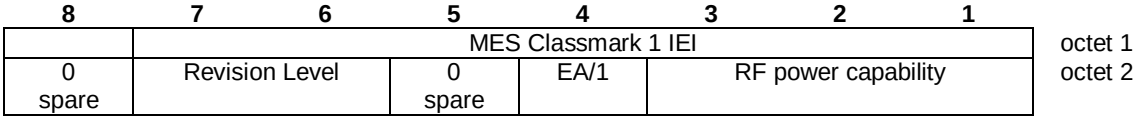

Figure 11.5.1.4: MES Classmark 1 Information Element Format

Table 11.5.1.5: MES Classmark 1 Information Element Coding Standard

Revision Level (octet 2)
Bits

7	**6**	
0	0	Reserved
0	1	Used by GMR-2 MESs

All other values are reserved for future use

EA/1 algorithm supported (octet 2, bit 4)

0	encryption algorithm EA/1 available
1	encryption algorithm EA/1 not available

RF power capability (octet 2)
Bits

3	**2**	**1**	
0	0	0	class 1 (reserved)
0	0	1	class 2
0	1	0	class 3
0	1	1	class 4
1	0	0	class 5 (reserved)

All other values are reserved

11.5.1.6 MES Classmark 2

The purpose of the MES Classmark 2 information element is to provide the network with information concerning aspects of both high and low priority of the MES equipment. This affects the manner in which the network handles the operation of the MES.

The MES Classmark 2 information element is coded as shown in figure 11.5.1.5 and table 11.5.1.6.

The MES Classmark 2 is a type 4 information element with 5 octets length.

8	7	6	5	4	3	2	1	
	User Terminal Classmark 2 IEI							octet 1
Length Of User Terminal Classmark 2 Contents								octet 2
0 spare	Revision Level		0 spare	EA/1	RF Power Capability			octet 3
0 spare	0 spare	SS Screen Indicator		SM capa-bility	0 0 spare		0 spare	octet 4
CM3	MES Vocoder Capability				0 spare	EA/3	EA/2	octet 5

Figure: 11.5.1.5: MES Classmark 2 Information Element Format

NOTE: Owing to backward compatibility problems, octet 4, bit 8 should not be used unless it is also checked that octet 3, bits 8, 7 and 6 are not "0 0 0".

Table 11.5.1.6: MES Classmark 2 Information Element Coding Standard

Revision Level (octet 3)

7	**6**	
0	0	Reserved
0	1	Used by GMR-2 MESs

All other values are reserved for future use

EA/1 network equivalent algorithm supported (octet 3, bit 4)

0	encryption algorithm EA/1 available
1	encryption algorithm EA/1 not available

EA/2 network equivalent algorithm supported (octet 5, bit 1)

0	encryption algorithm EA/2 available
1	encryption algorithm EA/2 not available

EA/3 network equivalent algorithm supported (octet 5, bit 2)

0	Encryption algorithm EA/3 available
1	Encryption algorithm EA/3 not available

RF power capability (octet 3)

3	**2**	**1**	
0	0	0	class 1 (reserved)
0	0	1	class 2
0	1	0	class 3
0	1	1	class 4
1	0	0	class 5 (reserved)

All other values are reserved

Classmark 3 (CM3) (octet 5, bit 8)

0	No additional MES capability information available
1	Additional MES capabilities are described in the Classmark 3 information element

SS Screening indicator (octet 4)

6	**5**	Bits
0	0	Defined in GSM 04.80 [19]
0	1	Defined in GSM 04.80 [19]
1	0	Defined in GSM 04.80 [19]
1	1	Defined in GSM 04.80 [19]

SM capability (short message capability) (octet 4, bit 4)

0	SM capability not present
1	SM capability present

MES Vocoder Capability (octet 5, bits 7 to 4)

Bit 7

0	Quarter Rate Basic Speech Capability not present
1	Quarter Rate Basic Speech Capability present

Bit 6

0	Eighth Rate Low Rate Speech Capability not present
1	Eighth Rate Low Rate Speech Capability present

Bit 5

0	Reserved

Bit 4

0	Reserved

NOTE: Additional MES capability information might be obtained by invoking the classmark interrogation procedure

11.5.1.7 MES Classmark 3

The purpose of the MES Classmark 3 information element is to provide the network with information concerning aspects of the MES. The contents might affect the manner in which the network handles the operation of the MES.

The MES Classmark 3 information element is coded as shown in figure 11.5.1.6 and table 11.5.1.7.

The MES Classmark 3 is a type 4 information element with a maximum of 14 octets length.

8	7	6	5	4	3	2	1	
MES Classmark 3 IEI								octet 1
Length of MES Classmark 3 Contents								octet 2
0	0	spare 0	0	EA/7	EA/6	EA/5	EA/4	octet 3
0	0	0	0	0	0	0	0	octet 4-14
Spare								

Figure 11.5.1.6: MES Classmark 3 Information Element Format

Octets 4 to 14 are for future applications. The bits inside these octets are spare and these octets may be omitted. However, if octet n is present, then octet m shall also be present, where m <n.

Table 11.5.1.7: MES Classmark 3 Information Element Coding Standard

EA/4 algorithm supported (octet 3, bit 1)
0 encryption algorithm EA/4 not available
1 encryption algorithm EA/4 available
EA/5 network equivalent algorithm supported (octet 3, bit 2)
0 encryption algorithm EA/5 not available
1 encryption algorithm EA/5 available
EA/6 network equivalent algorithm supported (octet 3, bit 3)
0 encryption algorithm EA/6 not available
1 encryption algorithm EA/6 available
EA/7 network equivalent algorithm supported (octet 3, bit 4)
0 encryption algorithm EA/7 not available
0 encryption algorithm EA/7 available

11.5.1.8 Spare half octet

This element is used in the description of messages in clause 10 when an odd number of half octet type 1 information elements are used. This element is filled with spare bits set to zero and is placed in bits 5 to 8 of the octet unless otherwise specified.

11.5.2 Radio Resource Management Information Elements

For the Radio Resource management information elements listed below, the default coding of the information element identifier bits is summarized in table 11.5.2.1.

Table 11.5.2.1: Information Element Identifier Coding for Radio Resource Management Information Elements

									Reference clause
8	**7**	**6**	**5**	**4**	**3**	**2**	**1**		
1	:	:	:	-	-	-	-	Type 1 info elements	
1	0	0	1	-	-	-	-	Cipher Mode Setting	11.5.2.9
1	0	1	0	-	-	-	-	Cipher Response	11.5.2.10
1	0	1	1	-	-	-	-	Reserved	
1	1	0	0	-	-	-	-	Reserved	
1	1	1	0	-	-	-	-	Channel Needed	11.5.2.8
0	:	:	:	:	:	:	:	Type 3 & 4 Info Elements	
0	0	0	0	0	0	1	0	Reserved	
0	0	0	0	0	1	0	1	Reserved	
0	1	1	0	0	0	0	1	Reserved	
0	1	1	0	0	0	1	0	Reserved	
0	1	1	0	0	0	1	1	Channel Mode	11.5.2.6
0	1	1	0	0	1	0	0	Channel Description	11.5.2.5
0	1	1	0	1	0	0	0	Reserved	
0	1	1	0	1	0	0	1	Reserved	
0	1	1	0	1	0	1	0	Reserved	
0	1	1	0	1	0	1	1	Reserved	
0	1	1	0	1	1	0	0	Reserved	
0	1	1	1	0	0	0	1	Reserved	
0	1	1	1	0	0	1	0	Reserved	
0	1	1	1	0	0	1	1	Reserved	
0	1	1	1	0	1	0	0	Reserved	
0	1	1	1	0	1	0	1	Reserved	
0	1	1	1	0	1	1	0	Reserved	
0	1	1	1	0	1	1	1	Reserved	
0	1	1	1	1	0	0	0	Reserved	
0	1	1	1	1	0	0	1	Reserved	
0	1	1	1	1	0	1	0	Reserved	
0	1	1	1	1	0	1	1	Reserved	
0	1	1	1	1	1	0	0	Reserved	
0	1	1	1	1	1	0	1	Timing Advance	11.5.2.40
0	1	1	1	1	1	1	0	Reserved	
0	1	1	1	1	1	1	1	Reserved	

11.5.2.1 Void

11.5.2.1a BA range

This clause does not apply to the GMR-2 system.

11.5.2.1b Cell channel description

This clause does not apply to the GMR-2 system.

11.5.2.2 Cell description

This clause does not apply to the GMR-2 system.

11.5.2.3 Spotbeam options

The purpose of the Spotbeam Options information element is to provide a variety of information about a spotbeam.

The Spotbeam Options information element is coded as shown in figure 11.5.2.2 and table 11.5.2.2.

The Spotbeam Options is a type 3 information element with 2 octets length.

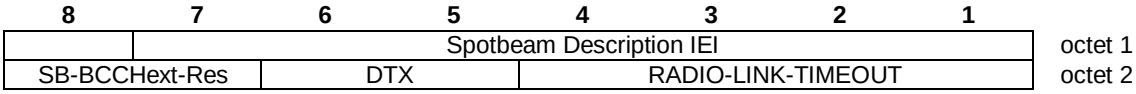

Figure 11.5.2.2: Spotbeam Options Information Element Format

Table 11.5.2.2: Spotbeam Options Information Element Coding Standard

SB-BCCHext-Res (Octet 2, bits 8 and 7)

8	**7**	
0	0	S-BCCHext not in use
0	1	S-BCCHext in use, Sys Info Message 7 only (option)
1	0	S-BCCHext in use, Sys Info Message 8 only
1	1	S-BCCHext in use, Sys Info Message 7 and 8 (option)

DTX, DTX Indicator (octet 2, bits 6 and 5) Note 2

6	**5**	
0	0	The MESs may use return discontinuous transmission
0	1	The MESs shall use return discontinuous transmission
1	0	The MESs shall not use return discontinuous transmission

RADIO-LINK-TIMEOUT (octet 2, bits 4 to 1) Note 1

4	**3**	**2**	**1**	**S-SACCH value**
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
		:		
		:		
1	1	1	0	15
1	1	1	1	16

NOTE 1: The precise meaning of the RADIO-LINK-TIMEOUT parameter can be found in GMR-2 05.008 [26].

NOTE 2: The DTX indicator field is not related to the use of forward discontinuous transmission.

11.5.2.4 Spotbeam selection parameters

The purpose of the Spotbeam Selection Parameters information element is to provide a variety of information about a spotbeam.

The Spotbeam Selection Parameters information element is coded as shown in figure 11.5.2.3 and table 11.5.2.3.

The Spotbeam Selection Parameters information element is a type 3 information element with 3 octets length.

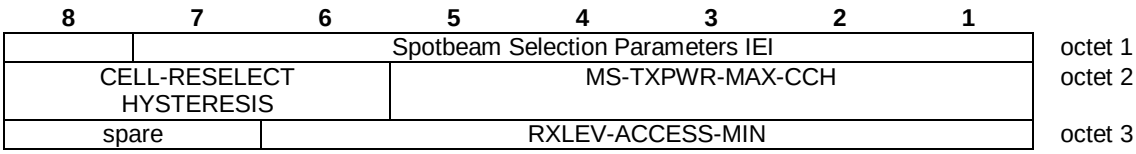

Figure 11.5.2.3: Spotbeam Selection Parameters Information Element Format

Table 11.5.2.3: Spotbeam Selection Parameters Information Element Coding Standard

CELL-RESELECT-HYSTERESIS (octet 2)
The usage of this information is defined in GMR-2 05.008 [26]

Bits

8	7	6		
0	0	0	0	dB RXLEV hysteresis for LA re-selection
0	0	1	2	dB RXLEV hysteresis for LA re-selection
0	1	0	4	dB RXLEV hysteresis for LA re-selection
0	1	1	6	dB RXLEV hysteresis for LA re-selection
1	0	0	8	dB RXLEV hysteresis for LA re-selection
1	0	1	10	dB RXLEV hysteresis for LA re-selection
1	1	0	12	dB RXLEV hysteresis for LA re-selection
1	1	1	14	dB RXLEV hysteresis for LA re-selection

MS-TXPWR-MAX-CCH (octet 2)

The MS-TXPWR-MAX-CCH field is coded as the binary representation of the "power control level" in GMR-2 05.008 [26] corresponding to the maximum TX power level a MES may use when accessing on a Control Channel CCH. This value shall be used by the MES according to GMR-2 05.008 [26].

Range: 0 to 31.

RXLEV-ACCESS-MIN (octet 3)

The RXLEV-ACCESS-MIN field is coded as the binary representation of the minimum received signal level at the MES for which it is permitted to access the system.

Range: 0 to 63. (See GMR-2 05.008 [26]).

11.5.2.5 Channel description

The purpose of the Channel Description information element is to provide a description of an allocable channel together with its S-SACCH.

The Channel Description information element is coded as shown in figure 11.5.2.4 and table 11.5.2.4.

The Channel Description is a type 3 information element with 5 octets length.

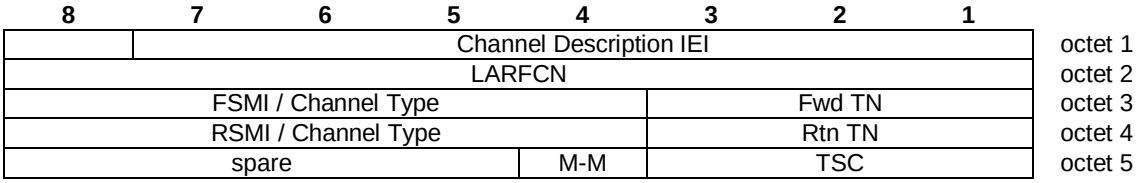

Figure 11.5.2.4: Channel Description Information Element Format

Table 11.5.2.4: Channel Description Information Element Coding Standard

Channel Type (octet 3/forward, octet 4/return)

Bits

8	7	6	5	4	
0	0	0	0	1	S-TCH/F + ACCH/Fs
0	0	0	1	T	S-TCH/H + ACCH/Hs
0	0	1	T	T	S-TCH/Q + ACCH/Qs
0	1	T	T	T	S-TCH/E + ACCH/Es
1	1	T	T	T	S-SDCCH/E + ACCH/E
1	0	1	T	T	S-SDCCH/Q + ACCH/Q (Reserved)
1	0	0	0	T	S-SDCCH/HR + ACCH/HR (Reserved)

The T bits indicate the Forward Submultiplex Index, and Return Submultiplex Index, in binary. All other values are reserved.

Fwd TN, Timeslot number (octet 3)
The TN field is coded as the binary representation of the timeslot number as defined in GMR-2 05.010 [27].
Range: 0 to 7.

Rtn TN, Timeslot number (octet 4)
The TN field is coded as the binary representation of the timeslot number as defined in GMR-2 05.010 [27].
Range: 0 to 7.

TSC, Training Sequence Code (octet 5)
The TSC field is coded as the binary representation of the Training Sequence code as defined in GMR-2 05.003 [24]
Range: 0 to 7.

LARFCN, (octet 2)
The ARFCN is coded as the binary representation of the absolute L-B and RF channel number
Range: 0 to 169

M-M, (bit 4 in octet 5)
Set to one for mobile to mobile single hop calls; otherwise set to zero.

11.5.2.6 Channel mode

The Channel Mode information element gives information of the mode of coding/decoding and transcoding.

The Channel Mode information element is coded as shown in figure 11.5.2.5 and table 11.5.2.5.

The Channel Mode is a type 3 information element with 2 octets length.

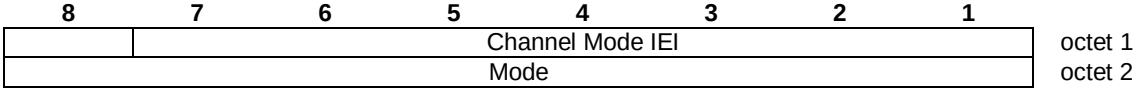

Figure 11.5.2.5: Channel Mode Information Element Format

Table 11.5.2.5: Channel Mode Information Element Coding Standard

Mode (octet 2) Bits								
8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
0	0	0	0	0	0	0	0	Signalling only
0	0	0	1	0	1	0	1	speech half rate (robust mode)
0	0	0	0	0	1	0	1	speech half rate (enhanced mode)
0	0	0	0	1	0	0	1	speech quarter rate
0	0	0	0	1	1	0	1	speech eighth rate (reserved)
0	0	0	0	0	0	1	1	data, full rate, 12 kbits/s radio interface rate (reserved)
0	0	0	1	0	1	1	1	data, half rate, 6 kbits/s radio interface rate (reserved)
0	0	1	0	1	0	1	1	data, quarter rate, 3 kbits/s radio interface rate
0	0	1	0	0	1	1	1	data, half rate, 3 kbits/s radio interface rate (reserved)
Other values are reserved for future use								

11.5.2.7 Channel Mode 2

This clause does not apply to the GMR-2 system.

11.5.2.8 Channel needed

The purpose of the Channel Needed information element is to indicate to a MES class, as defined in clause 4.3.21, which type of channel is needed for the transaction linked to the paging procedure.

The Channel Needed information element is coded as shown in figure 11.5.2.6 and table 11.5.2.6.

The Channel Needed is a type 1 information element.

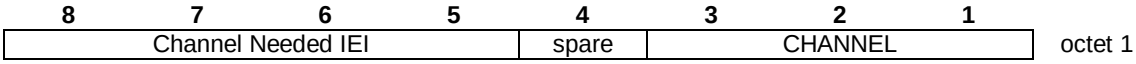

Figure 11.5.2.6: Channel Needed Information Element Format

Table 11.5.2.6: Channel Needed Information Element Coding Standard

CHANNEL (octet 1) Bits			
3	**2**	**1**	
0	0	0	Any channel
0	0	1	S-SDCCH
0	1	0	S-TCH/F (full rate) (reserved)
0	1	1	S-TCH/H (half rate) (reserved)
1	0	0	S-TCH/Q (quarter rate) (reserved)
1	0	1	S-TCH/E (eighth rate) (reserved)
1	1	0	S-SDCCH/Q (reserved)
1	1	1	S-SDCCH/HR (reserved)

11.5.2.9 Cipher mode setting

The purpose of the Cipher Mode Setting information element is to indicate whether stream ciphering shall be started or not and if it is to be started, which algorithm to use.

The Cipher Mode Setting information element is coded as shown in figure 11.5.2.7 and table 11.5.2.7.

The Cipher Mode Setting is a type 1 information element.

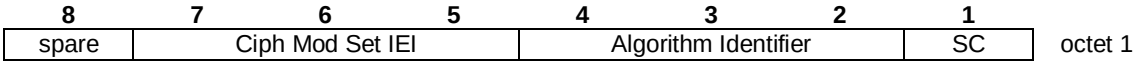

Figure 11.5.2.7: Cipher Mode Setting Information Element Format

Table 11.5.2.7: Cipher Mode Setting Information Element Coding Standard

Algorithm Identifier			
if SC = 1 then:			
bits			
4	**3**	**2**	
0	0	0	cipher with algorithm EA/1
0	0	1	cipher with algorithm EA/2 (reserved)
0	1	0	cipher with algorithm EA/3 (reserved)
0	1	1	cipher with algorithm EA/4 (reserved)
1	0	0	cipher with algorithm EA/5 (reserved)
1	0	1	cipher with algorithm EA/6 (reserved)
1	1	0	cipher with algorithm EA/7 (reserved)
1	1	1	Reserved
If SC = 0 then bits 4,3 and 2 are spare			
SC (octet 1)			
Bit			
1			
0			No ciphering
1			Start ciphering

11.5.2.10 Cipher response

The Cipher Response information element is used by the network to indicate to the MES which information the MES has to include in the CIPHERING MODE COMPLETE message.

The Cipher Response information element is coded as shown in figure 11.5.2.8 and table 11.5.2.8.

The Cipher Response is a type 1 information element.

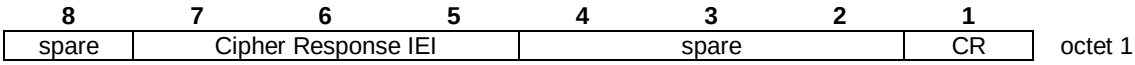

Figure 11.5.2.8: Cipher Response Information Element Format

Table 11.5.2.8: Cipher Response Information Element Coding Standard

Cipher response (octet 1)		
Bit		
1		
0		IMEISV shall not be included
1		IMEISV shall be included

11.5.2.11 Control channel description

The purpose of the Control Channel Description information element is to provide a variety of information about a spotbeam.

The Control Channel Description information element is coded as shown in figure 11.5.2.9 and table 11.5.2.9.

The Control Channel Description is a type 3 information element with 4 octets length.

8	7	6	5	4	3	2	1	
spare	Control Channel Description IEI							octet 1
0 spare	0 spare	0 spare	0 spare	0 spare	CCCH-CONF			octet 2
BS-AG-BLKS-RES					BS-PA-MFRMS			octet 3
T3212 time-out value								octet 4

Figure 11.5.2.9: Control Channel Description Information Element Format

Table 11.5.2.9: Control Channel Description Information Element Coding Standard

CCCH-CONF (octet 2)

Bits

3	2	1	
0	0	0	One basic forward TN (TN_0) used for S-HMSCH, S-HBCCH, S-SCH, S-BCCH, S-AGCH and S-PCH and two return TNs (one return sub-channel) used for S-RACH. The actual return sub-channels used for the S-RACH are set by the SB_RACH_X parameters discussed in clause 11.5.2.45.7
0	0	1	Reserved
0	1	0	Two basic forward TNs, the first TN (TN_0) used for S-HMSCH, S-HBCCH, S-SCH, S-BCCH, S-AGCH and S-PCH, the second TN is a CCCH extension as specified in GMR-2 05.002 [23] and is used for S-AGCH/S-PCH only, and four return TNs (two return sub-channels) used for S-RACH. The actual return sub-channels used for the S-RACH are set by the SB_RACH_X parameters discussed in clause 11.5.2.45.
0	1	1	Three basic forward TNs, the first TN (TN_0) used for S-HMSCH, S-HBCCH, S-SCH, S-BCCH, S-AGCH and S-PCH, the second and third TNs are CCCH extensions as specified in GMR-2 05.002 [23], clause 8.5.1 (see also table 5.3.4) and are used for S-AGCH/S-PCH only, and six return TNs (three return sub-channels) used for S-RACH. The actual return sub-channels used for the S-RACH are set by the SB_RACH_X parameters discussed in clause 11.5.2.45.
1	0	0	Four basic forward TNs, the first TN (TN_0) used for S-HMSCH, S-HBCCH, S-SCH, S-BCCH, S-AGCH and S-PCH, the second, third and fourth TNs are CCCH extensions as specified in GMR-2 05.002 [23], clause 8.5.1 (see also table 5.3.4) and are used for S-AGCH/S-PCH only, and eight return TNs (four return sub-channels) used for S-RACH. The actual return sub-channels used for the S-RACH are set by the SB_RACH_X parameters discussed in clause 11.5.2.45.

all other values are reserved

BS-AG-BLKS-RES (octet 3)

The BS-AG-BLKS-RES field is coded as the binary representation of the number of blocks reserved for access grant with the most significant bit in bit 8.

Range 0 to 21 for all values of CCCH-CONF.

Table 11.5.2.9 (cont): Control Channel Description Information Element Coding Standard

BS-PA-MFRMS (octet3)
Bits

3	2	1	
0	0	0	1 102 multiframe period for transmission of PAGING REQUEST messages to the same paging subgroup
0	0	1	2 102 multiframe periods for transmission of PAGING REQUEST messages to the same paging subgroup
0	1	0	3 102 multiframe periods for transmission of PAGING REQUEST messages to the same paging subgroup
0	1	1	4 102 multiframe periods for transmission of PAGING REQUEST messages to the same paging subgroup
1	0	0	5 102 multiframe periods for transmission of PAGING REQUEST messages to the same paging subgroup

All other values are reserved

T3212 time-out value (octet 4)

The T3212 time-out value field is coded as the binary representation of the time-out value for periodic updating in decihours.
Range: 1 to 255
The value 0 is used for infinite time-out value
i.e. periodic updating shall not be used within the spotbeam.

11.5.2.12 Frequency Channel Sequence

This clause does not apply to the GMR-2 system.

11.5.2.13 Frequency List

This clause does not apply to the GMR-2 system.

11.5.2.14 Frequency Short List

This clause does not apply to the GMR-2 system.

11.5.2.15 Handover Reference

This clause does not apply to the GMR-2 system.

11.5.2.16 IA Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.17 IAR Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.18 IAX Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.19 L2 pseudo length

The L2 Pseudo Length information element indicates the number of octets following it in the message which are to be interpreted in the scope of the phase 1 protocol.

The L2 Pseudo Length information element is the first part of e.g., SYSTEM INFORMATION messages which are mentioned as exceptions in clause 11.1. It occupies the first octet of such messages.

The L2 Pseudo Length Information element is an element with 2 octets length.

8	7	6	5	4	3	2	1	
spare	L2 Pseudo Length IEI							octet 1
L2 Pseudo Length value						0	1	octet 2

Figure 11.5.2.10: L2 Pseudo Length Information Element Format

Table 11.5.2.10: L2 Pseudo Length Information Element Coding Standard

L2 pseudo length value (octet 2) The coding of the L2 pseudo length value field is the binary representation of the L2 pseudo length of the message in which the L2 pseudo length information element occurs. NOTE: bits 1 and 2 are not spare.

11.5.2.20 Measurement Results

The purpose of the Measurement Results information element is to provide the results of the measurements made by the MES on the serving spotbeam.

The Measurement Results information element is coded as shown in figure 11.5.2.11 and table 11.5.2.11.

The Measurement Results is a type 3 information element with 4 octets length

8	7	6	5	4	3	2	1	
	Measurement Results IEI							Octet 1
DTX Detect	DTX Used	RXLEV-FULL-SERVING-CELL						Octet 2
0 spare	MEAS VALID	RXLEV-SUB-SERVING-CELL						Octet 3
RXQUAL-FULL SERVING-CELL				RXQUAL-SUB SERVING-CELL				Octet 4

Figure 11.5.2.11: Measurement Results Information Element Format

Table 11.5.2.11: Measurement Results Information Element Coding Standard

DTX-USER (octet 2)
This bit indicates whether or not the MES used DTX during the previous measurement period.

Bit
7
0 DTX was not used
1 DTX was used

DTX-Detect (octet 2)
This bit indicates whether or not the MES detected DTX in the measurement period.

Bit
8
0 DTX was not detected
1 DTX was detected

RXLEV-FULL-SERVING-CELL and RXLEV-SUB-SERVING-CELL (octets 2 and 3)
Received signal strength on serving beam, measured respectively on all slots and on a subset of slots (see GMR-2 05.008 [26])
The RXLEV-FULL-SERVING-CELL and RXLEV-SUB-SERVING- CELL
fields are coded as the binary representation of a value N. N corresponds according to the mapping defined in GMR-2 05.008 [26] to the received signal strength on the serving spotbeam.

Range: 0 to 63

MEAS-VALID (octet 3)
This bit indicates if the measurement results for the dedicated channel are valid or not

Bit
7
0 The measurement results are valid
1 The measurement results are not valid

RXQUAL-FULL-SERVING-CELL and RXQUAL-SUB-SERVING- CELL (octet 4)
Received signal quality on serving beam, measured respectively on all slots and on a subset of the slots (see GMR-2 05.008 [26])
The RXQUAL-FULL-SERVING-CELL and RXQUAL-SUB-SERVING-
CELL fields are coded as the binary representation of the received signal quality on the serving spotbeam.

Range: 0 to 7 (See GMR-2 05.008 [26])

11.5.2.21 Mobile Allocation

This clause does not apply to the GMR-2 system.

11.5.2.21a Mobile Time Difference

This clause does not apply to the GMR-2 system.

11.5.2.22 Neighbour spotbeams description

The purpose of the Neighbour Spotbeams Description information element is to provide the absolute radio frequency channel numbers of the S-BCCH carriers to be monitored by the MESs in the beam. The S-BCCH carriers to be monitored include carriers of adjacent spotbeams as well as spotbeams from other spacecraft within the system which overlap depending upon the System Information Message that invokes the Information element.

When used in the System Information Type 2 message, the IE contains six frequencies and uses 15 octets – from octet number 2 to octet number 16.

When used in the System Information Type 7 message, the IE contains seven frequencies and uses 18 octets – from octet number 2 to octet number 19.

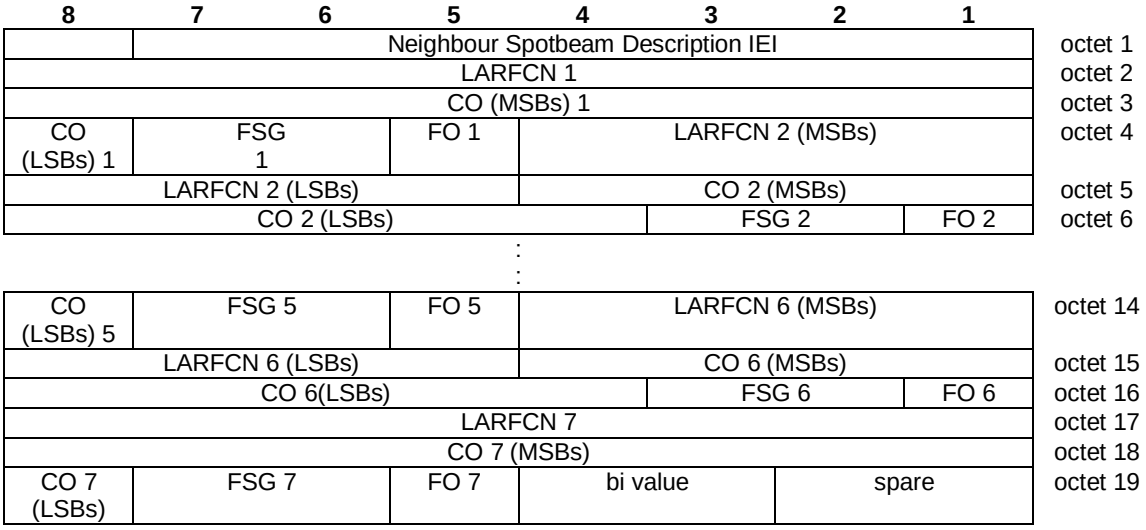

Figure 11.5.2.12: Neighbour Spotbeams Description Information Element Format

Table 1.5.2.12: Neighbour Spotbeams Description Information Element Coding Standard

The following parameters are repeated for each frequency used in the IE. LARFCN (various octets) See clause 11.5.2.5. Binary 255 (xFF) shall indicate a spotbeam that does not exist or does not have a CCS frequency. CO (various octets) See clause 11.5.2.46 FSG (various octets) See clause 11.5.2.46 FO (various octets) See clause 11.5.2.46 bi Value (octet 19, bits 4 and 3) A binary valued with MSB in bit 4. Its ranges from 1 to 2. Binary 0 is reserved for the satellite providing the current spotbeam. Binary 3 is not allowed. This parameter is associated with IE clause 11.5.2.44 in a unique correspondence when this IE is used in a System Information Type 7 message. The Channel Request message and The Immediate Assignment message use this value in lieu of IE clause 11.5.2.44 during MES visibility reporting reassignment to another satellite, respectively.

11.5.2.23 P1 rest octets

The P1 Rest Octets information element contains only spare bits only. Its purpose is to allow the upward compatible introduction of new information on the S-PCH in later phases.

The P1 Rest Octets information element is a type 5 information element with 1-18 octets length.

8	7	6	5	4	3	2	1	
	P1 Rest Octets IEI							octet 1
0 spare	0 spare	1 spare	0 spare	1 spare	0 spare	1 spare	1 spare	octet 2
0 spare	0 spare	1 spare	0 spare	1 spare	0 spare	1 spare	1 spare	octet 3
				:				
0 spare	0 spare	1 spare	0 spare	1 spare	0 spare	1 spare	1 spare	octet n

Figure 11.5.2.13: P1 Rest Octets Information Element Format

11.5.2.24 P2 Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.25 P3 Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.26 Page mode

The purpose of the Page Mode information element is to control the action of the MES belonging to the paging subgroup corresponding to the paging subchannel.

The Page Mode information element is coded as shown in figure 11.5.2.14 and table 11.5.2.14.

The Page Mode is a type 1 information element.

8	7	6	5	4	3	2	1	
	Page Mode IEI			0 spare	PM			octet 1

Figure 11.5.2.14: Page Mode Information Element Format

Table 11.5.2.14: Page Mode Information Element Coding Standard

PM (octet 1) Bits			
3	**2**	**1**	
0	0	0	Normal paging
0	0	1	Extended paging
0	1	0	Paging reorganization
0	1	1	Reserved
1	1	1	SMS paging
All other values reserved			

11.5.2.27 Network Colour Code (NCC) permitted

The purpose of the NCC Permitted information element is to provide a definition of the allowed satellite network color codes (NCC) on the BCCH carriers to be monitored in idle mode.

The NCC Permitted information element is coded as shown in figure 11.5.2.15 and table 11.5.2.15.

The NCC Permitted information element is a type 3 information element with two octets length.

8	7	6	5	4	3	2	1	
	NCC Permitted IEI							octet 1
NCC Permitted								octet 2

Figure 11.5.2.15: NCC Permitted Information Element Format

Table 11.5.2.15: NCC Permitted Information Element Coding Standard

NCC Permitted (octet 2) The NCC permitted field is coded as a bit map, i.e. bit N is coded with a "0" if the S-BCCH carrier with NCC = N-1 is not permitted for monitoring and with a "1" if the S-BCCH carrier with NCC = N-1 is permitted for monitoring; N=1,2,...,8.

11.5.2.28 Power command

The purpose of the Power Command information element is to provide the power level to be used by the User Terminal.

The Power Command information element is coded as shown in figure 11.5.2.16 and table 11.5.2.16.

The Power Command is a type 3 information element with 2 octets length.

8	7	6	5	4	3	2	1	
spare	Power Command IEI							octet 1
0 spare	0 spare	POWER LEVEL						octet 2

Figure 11.5.2.16: NCC Permitted Information Element Format

Table 11.5.2.16: NCC Permitted Information Element Coding Standard

Power level (octet 2) The power level field is coded as the binary representation of the "power control level", see GMR-2 05.005 [25]. This value shall be used by the User Terminal according to GMR-2 05.008 [26]. Range: 0 to 64. Actual range defined in GMR-2 05.005 [25].

11.5.2.29 S-RACH control parameters

The purpose of the S-RACH Control Parameters information element is to provide parameters used to control the S-RACH utilization. This information element is broadcast to MESs in SYSTEM INFORMATION TYPE 2, 3, 9, and 10 messages.

The S-RACH Control Parameters information element is coded as shown in figure 11.5.2.17 and table 11.5.2.17.

The S-RACH Control Parameters is a type 3 information element with 4 octets length.

8	7	6	5	4	3	2	1	
spare	S-RACH Control Parameters IEI							octet 1
Max retrans		Tx-integer mod				CELL BARR ACCESS	RE	octet 2
AC C15	AC C14	AC C13	SDCCH C12	LU C11	EC C10	AC C09	AC C08	octet 3
AC C07	AC C06	AC C05	AC C04	AC Co3	AC C02	AC C01	AC C00	octet 4

Figure 11.5.2.17: S-RACH Control Parameters Information Element Format

Table 11.5.2.17: S-RACH Control Parameters Information Element Coding Standard

Max retrans, Maximum number of retransmissions (octet 2, bits 8 and 7)

8	**7**	
0	0	Maximum 1 retransmission
0	1	Maximum 2 retransmissions
1	0	Maximum 3 retransmissions
1	1	Maximum 5 retransmissions

Tx-integer mod (octet 2, bits 6 to 3), Number of S-RACH slots over which transmission is spread (randomized). The corresponding number of frames periods is determined by the S-RACH configuration parameter.

6	**5**	**4**	**3**	
0	0	0	0	3
0	0	0	1	4
0	0	1	0	5
0	0	1	1	6
0	1	0	0	7
0	1	0	1	8
0	1	1	0	9
0	1	1	1	10
1	0	0	0	11
1	0	0	1	12
1	0	1	0	14
1	0	1	1	16
1	1	0	0	20
1	1	0	1	25
1	1	1	0	32
1	1	1	1	50

CELL_BAR_ACCESS, Spotbeam Barred for Access (octet 2, bit 2)

0	The spotbeam is not barred, see GMR-2 03.022 [10]
1	The spotbeam is barred, see GMR-2 03.022 [10]

RE, Call re-establishment allowed (octet 2, bit 1)

1	Call Re-establishment not allowed in the spotbeam

EC Emergency Call allowed (octet 3, bit 3)

0	Emergency call allowed in the spotbeam to all MESs.
1	Emergency call not allowed in the spotbeam except for the MESs that belong to one of the classes 13 to 15.

LU Location Updates allowed (octet 3, bit 4)

0	Location Updates allowed in the spotbeam
1	Location Updates not allowed in the spotbeam, except those belonging to classes 13 to 15

SDCCH for other procedures allowed (octet 3, bit 5)

0	SDCCH for other procedures allowed in the spotbeam
1	SDCCH for other procedures not allowed in the spotbeam, except for the MESs that belong to other classes between 13 and 15

AC CN, Access Control Class N (octet 3(except bits 3, 4, 5)and octet 4)

For a MES with AC C = N access is not barred if the AC CN bit is coded with a "0"; N = 0, 1, . . 9,13, . ., 15. Access classes 13 to 15 are reserved

11.5.2.30 Request reference

The purpose of the Request Reference information element is to provide a method to uniquely identify User Terminal responses to paging messages.

The Request Reference information element is coded as shown in figure 11.5.2.18 and table 11.5.2.18.

The Request Reference is a type 3 information element with 7 octets length.

8	7	6	5	4	3	2	1	
	Request Reference IEI							octet 1
Establishment Cause / Random Access (Half Octet A)				Message (Half Octet B)				octet 2
Message (Half Octet C)				Message (Half Octet D)				octet 3
Message (Half Octet E)				Message (Half Octet F)				octet 4
spare				Message (Half Octet G)				octet 5
T1'						Reference Message		octet 6
spare				T2				octet 7

Figure 11.5.2.18: Request Reference Information Element Format

Table 11.5.2.18: Request Reference Information Element Coding Standard

Channel Request Message (Octet 2 to 5)
The Channel Request message, with a format as specified in clause 10.1.8 that originated the response.

T1' Reduced Superframe Count (octet 6 , bits 8 to 4)
The T1' field is coded as the binary representation of (FN div [51x26]) mod 32.

T2 (octet 7 , bits 5 to 1)
The T2 field is coded as the binary representation of FN mod 26.
T1' and T2 represent the first Frame Number (FN) of the RACH slot in which the Channel Request message was received by the network. For example, if a RACH slot has 4 frames labeled FN+0, FN+1, FN+2, and FN+3, then the frame number would be FN+0.

Reference Message (octet 6 , bits 3 to 1)
The purpose of the Reference Message is to provide information and/or direction to the User Terminal associated with a request of the network.
The first two bits of the Reference Message (octet 6 , bits 3 and 2) indicate a feedback code.
The last bit of the Reference Message (octet 6 , bit 1) contain feedback message information.
If the first two bits of the Reference Message are all 0's then the Reference Message can be ignored. If the NCC is unable to route a MES origination because of an unknown international number, the message, Requested Number Unknown, shall be used. The NCC shall use the message, Request new channel on the bI, to redirect the user origination to another spacecraft.

Octet 6 Bits			Octet 6 Bit
3	**2**		**1**
0	0	Ignore Reference Message	0
0	1	Requested Number Unknown	0
1	0	Request new channel on the	b

where b is a binary zero if the call is redirected to the satellite having a bI value of one and is a binary one if the call is redirected to the satellite having a bI value of two.
The bI values are sent in to the MES in System Information Type 7 messages in IEI 11.5.2.22. Each value is uniquely associated with a Satellite System Code, IEI 11.5.2.44, which specifies a satellite.

NOTE: The NCC capability to use the message, request new channel on the bI to redirect the user origination to another satellite is a future growth capability.

11.5.2.31 RR cause

The purpose of the RR Cause information element is to provide the reason for release or the reason for completion of an assignment or handover.

The RR Cause information element is coded as shown in figure 11.5.2.19 and table 11.5.2.19.

The RR Cause is a type 3 information element with 2 octets length.

8	7	6	5	4	3	2	1	
	RR Cause IEI							octet 1
RR cause value								octet 2

Figure 11.5.2.19: RR Cause Information Element Format

Table 11.5.2.19: RR Cause Information Element Coding Standard

RR cause value (octet 2)

Bits

8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	0	Normal event
0	0	0	0	0	0	0	1	Abnormal release, unspecified
0	0	0	0	0	0	1	0	Abnormal release, channel unacceptable
0	0	0	0	0	0	1	1	Abnormal release, timer expired
0	0	0	0	0	1	0	0	Abnormal release, no activity on the radio path
0	0	0	0	0	1	0	1	Preemptive release
0	0	0	0	0	1	1	0	Satellite Mobile to Mobile Link failure
0	0	0	0	0	1	1	1	Local Transmit Disable by the network
0	0	0	0	1	0	0	0	Handover impossible, timing advance out of range
0	0	0	0	1	0	0	1	Channel mode unacceptable
0	0	0	0	1	0	1	0	Frequency not implemented
0	1	0	0	0	0	0	1	Call already cleared
0	1	0	1	1	1	1	1	Semantically incorrect message
0	1	1	0	0	0	0	0	Invalid mandatory information
0	1	1	0	0	0	0	1	Message type non-existant or not implemented
0	1	1	0	0	0	1	0	Message typenot compatible with protocol state
0	1	1	0	0	1	0	0	Conditional IE error
0	1	1	0	0	1	0	1	No spotbeam allocation available
0	1	1	0	1	1	1	1	Protocol error unspecified

All other cause values shall be treated as 0000 0000, "normal event"

The listed RR cause values are defined in Annex F.

11.5.2.32 SI 1 Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.33 SI 2bis Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.34 Spotbeam Re-selection Parameters

The Spotbeam Re-selection parameters information element includes parameters which are used by the MES for spotbeam reselection purposes.

The meaning of the parameters in octet 2 and 3 are determined by the value of PI as indicated in figure 11.5.2.20 and described in table 11.5.2.20.

The Spotbeam Re-selection parameters information element is a type 5 information element with 3 octets length.

8	7	6	5	4	3	2	1	
	Spotbeam Re-selection Parameters							octet 1
PI	CBQ	CELL_RESELECT_OFFSET						octet 2
TEMPORARY_OFFSET			PENALTY_TIME					octet 3

Figure 11.5.2.20: Spotbeam Re-selection Parameters Information Element Format

Table 11.5.2.20: Spotbeam Re-selection Parameters Information Element Coding Standard

PI, CELL_RESELECT_PARAM_IND (octet 2)

PI	Value
1	C2 Parameters present
0	C2 Parameters not present

PI is used by the MESto determine if the C2 parameters which are, CBQ, CELL RESELECT_OFFSET, TEMPORARY_OFFSET and PENALTY_TIME are being broadcast by the network in this message. The C2 parameters shall always be present i.e., PI = 1.

CBQ, CELL_BAR_QUALIFY (octet 2)
CELL_BAR_QUALIFY is used by the network to control MES spotbeam selection and reselection. The use and coding of this parameter is defined in GMR-2 05.008 [26].

CELL_RESELECT_OFFSET (octet 2)
CELL_RESELECT_OFFSET is coded as the binary representation of the "CELL_RESELECT_OFFSET" in GMR-2 05.008 [26]. It is a value used by the MES to apply a positive or negative offset to the value of C2 as defined in GMR-2 03.022 [10] and GMR-2 05.008 [26].

TEMPORARY_OFFSET (octet 3)
The TEMPORARY_OFFSET field is coded as the binary representation of the "TEMPORARY_OFFSET" in GMR-2 05.008 [26]. It is used by the MES as part of its calculation of C2 for the spotbeam reselection process as described in GMR-2 05.008 [26]. It is used to apply a negative offset to C2 for the duration of PENALTY_TIME.

PENALTY_TIME (octet 3)
The PENALTY TIME is coded as the binary representation of the "PENALTY_TIME" in GMR-2 05.008 [26]. It defines the length of time for which TEMPORARY OFFSET is active. The usage of PENALTY_TIME is described in GMR-2 03.022 [10] and GMR-2 05.008 [26].

11.5.2.35 SI 4 Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.36 SI 7 Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.37 SI 8 Rest Octets

This clause does not apply to the GMR-2 system.

11.5.2.38 Starting Time

This clause does not apply to the GMR-2 system.

11.5.2.39 Synchronization Indication

This clause does not apply to the GMR-2 system.

11.5.2.40 Fine timing advance

The purpose of the Fine Timing Advance information element is to provide the fine timing advance value.

The Fine Timing Advance information element is coded as shown in figure 11.5.2.22 and table 11.5.2.22.

The Fine Timing Advance is a type 3 information element with 3 octets length.

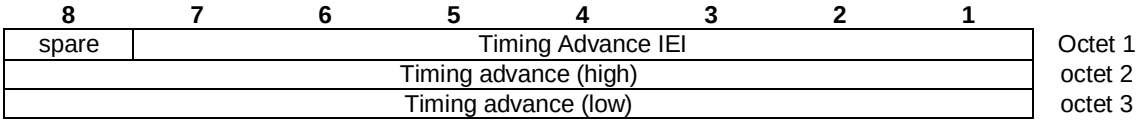

Figure 11.5.2.22: Fine Timing Advance Information Element Format

Table 11.5.2.22: Fine Timing Advance Information Element Coding Standard

Fine Timing advance value (octet 2 and 3) The coding of the timing advance value field is the binary representation of the timing advance in return quarter-bit periods; 1 return quarter-bit period = 48 /13 us.

11.5.2.41 Time Difference

This clause does not apply to the GMR-2 system.

11.5.2.42 TMSI

This clause does not apply to the GMR-2 system.

11.5.2.43 Wait indication

The purpose of the Wait Indication information element is to provide the time the MES shall wait before attempting another channel request.

The Wait Indication information element is coded as shown in figure 11.5.2.23 and table 11.5.2.23.

The Wait Indication is a type 3 information element with 2 octets length.

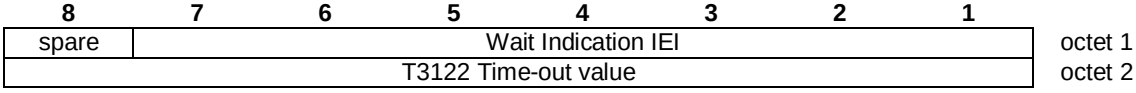

Figure 11.5.2.23: Wait Indication Information Element Format

Table 11.5.2.23: Wait Indication Information Element Coding Standard

T 3122 Time-out Value (octet 2) This field is coded as the binary representation of the T 3l22 time-out value in seconds

11.5.2.44 Satellite system code

The Satellite System Code Information Element provides the Satellite System Country code (SSC) and Satellite Network Code (SNC) associated the information broadcast on the Type 7 System information message.

The information is coded as shown in figure 11.5.2.24 and table 11.5.2.24.

The Satellite System Code Information Element is a type 3 element with 4 octets.

8	7	6	5	4	3	2	1	
spare	Satellite System Code IEI							octet 1
SSC 2				SSC 1				octet 2
1	1	1	1	SSC 3				octet 3
SNC 2				SNC 1				octet 4

Figure 11.5.2.24: Satellite System Code Information Element Format

Table 11.5.2.24: Satellite System Code Information Element Coding Standard

SSC (Octets 2 and 3) The SSC will be used to indicate the Satellite System country. This allows the terminal to know its Home Satellite System or a Visited Satellite System. SNC (Octet 4) The SNC allows the terminal to know which satellite in a multi-satellite system is providing the spotbeam.

11.5.2.45 CCS configuration parameters

The CCS Configuration Parameters information element provides the Coarse Timing Advance and S-RACH configuration required to establish a connection to the network. The Coarse Timing Advance, along with the Forward Epoch Delay, 11.5.2.46, are required to establish system time at the MES for transmissions in the MES - Network direction.

The information is coded as shown in figure 11.5.2.25 and table 11.5.2.25.

The CCS Configuration Parameters information element is a type 3 element with 5 octets.

8	7	6	5	4	3	2	1	
	CCS Configuration Parameters IEI							octet 1
CTA (high)								octet 2
CTA (middle)								octet 3
CTA (low)	S-RACH Configuration			S-BCCH Power Reference				octet 4
SB-RACH-0		SB-RACH-1		SB-RACH-2		SB-RACH-3		octet 5

Figure 11.5.2.25: CCS Configuration Parameters Information Element Format

Table 11.5.2.25: CCS Configuration Parameters Information Element Coding Standard

CTA-Coarse Timing Advance Value (Octet 2, 3 and bit 8 of Octet 4)

The Coarse Timing Advance value is in the range of 0 to 260 ms encoded in Forward Bit Period units of 48/13 usec. The most significant digit is in bit 8 of octet 2, the middle digits are in octet 3 while the least significant digit is in bit 8 of octet 4. See GMR-2 05.010 [27] for further details.

S-RACH Configuration (Octet 4, bits 7 ,6 and 5)

The S-RACH configuration parameter specifies the size of the S-RACH slot in terms of Frame Periods (60/13 msec) used on a S-RACH Return Subcarrier Frequency.

Bits

7	**6**	**5**	
0	0	0	9 Frame Periods per S-RACH slot
0	0	1	2 Frame Periods per S-RACH slot
0	1	0	3 Frame Periods per S-RACH slot
0	1	1	4 Frame Periods per S-RACH slot
1	0	0	5 Frame Periods per S-RACH slot
1	0	1	6 Frame Periods per S-RACH slot
1	1	0	7 Frame Periods per S-RACH slot
1	1	1	8 Frame Periods per S-RACH slot

S-RACH transmissions are at the beginning of the S-RACH slot on the S-RACH Return Subchannel Frequency.

S-BCCH Power Reference (Octet 4, bits 4, 3, 2, 1)

The S-BCCH Power Reference parameter specifies the power of the S-BCCH with respect to a nominal TCH channel. It is a binary number with MSB in bit 4. The units are 0.2 dB.

SB-RACH (Octet 5)

The subcarrier frequencies for CCCH-0, CCCH-Ext-1, CCCH-Ext-2 and CCCH-Ext-3, are encoded in SB-RACH-0, SB-RACH-1, SB-RACH-2, and SB-RACH-3, respectively. The mapping between forward TNs and return TNs (sub-channel frequencies) is shown in GMR-2 05.002 [23], table 5.3.4. Each parameter is a binary number representing the actual subcarrier from the set 0, 1, 2, and 3. The MSB for the SB-RACH-0 parameter is in octet 5 bit 8, the MSB for the SB-RACH-1 parameter is in octet 5 bit 6, the MSB for the SB-RACH-2 parameter is in octet 5 bit 4 and the MSB for the SB-RACH-3 parameter is in octet 5 bit 2.

11.5.2.46 Forward epoch delay

The Forward Epoch Delay information element provides the value of the time offset of the ground transmission relative to the ground system time for the basic TN structure. The Coarse Timing Advance (see clause 11.5.2.45), and the Forward Epoch Delay are required to establish system time at the MES for transmissions in the MES - Network direction.

The information is coded as shown in figure 11.5.2.26 and table 11.5.2.26.

The Forward Epoch Delay information element is a type 3 element with 3 octets.

8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
	Forward Epoch Delay IEI							octet 1
CO (high)								octet 2
CO (low)	FSG		FO	Spare				octet 3

Figure 11.5.2.26: Forward Epoch Delay Information Element Format

Table 11.5.2.26: Forward Epoch Delay Information Element Coding Standard

CO-Channel Offset (Octet 2 and 3) The Channel Offset value is the binary representation of the number of Forward Burst Periods that the ground network applied to the transmission. The Channel Offset value is in the range of 0 to 407 (8 x 51-1) Forward Slot Periods (15/26 ms). The most significant digit is in bit 8 of octet 2 while the least significant digit is in bit 8 of octet 3. FSG-Forward Stagger Group (Octet 3) The Forward Stagger Group parameter specifies the number of "quarter" burst periods that the ground network applied to the transmission. The value is either 0, 1, 2, or 3. The most significant digit is in bit 7 of octet 3 while the least significant digit is in bit 6 of octet 3. FO-Frequency Offset (Octet 3) The Frequency Offset parameter specifies the offset that is applied to the basic channel plan in the spotbeam. Binary 0 indicates the nominal channel plan. Binary one indicates the offset is applied to the nominal channel plan.

11.5.2.47 HPA/HMS Configuration

The purpose of HPA/HMS Configuration information element is to provide the definition of the HPA/HMS configuration for the S-HPACH and S-HMSCH channels.

The HPA Configuration information element is coded as shown if figure 11.5.2.27 and table 11.5.2.27.

The HPA Configuration is a type 3 information element with 6 octets length.

8	7	6	5	4	3	2	1	
	HPA Configuration IEI							octet 1
BLKS_RES	SB_HPA_EXT_RES					HPA Timer (high)		octet 2
HPA Timer (low)								octet 3
S-HMSCH Power Reference								octet 4
M-MO								octet 5
M-MT								octet 6

Figure 11.5.2.27: HPA Configuration Information Element Format

Table 11.5.2.27: HPA Configuration Information Element Coding Standard

BLKS_RES (octet 2, bit 8)
SB_HPA_BLKS_RES specifies the number of S-HPACH Subgroups in each TN. If zero, it specifies 5 paging subgroups per TN and if it is one, it specifies 8 paging subgroups per TN.

SB_HPA_EXT_RES (octet 2, bits 7 to 3)
A bit map that specifies which TNs are used for HPA. If the following bits are set to one, the specified TNs are used for HPA:

bit	TN
7	4
6	2
5	3
4	5
3	6

HPA Timer (Octet 2 and 3)
This parameter specifies the binary value of the amount of time, in steps of one second, the user has to respond to the last page attempt in a sequence of page attempts before the paging process is terminated. See table 4.3-2 and figure 4.3-3 for how to set HPA Timer. The most significant digit is in bit 2 of octet 2 with the least significant digit is in bit 1 of octet 3.

S-HMSCH Power Reference (Octet 4)
The S-HMSCH Power Reference parameter specifies the level of the S-HMSCH signal with respect to a nominal TCH channel. It is a binary number with MSB in bit 8. The units are 0.2 dB.

M-MO (Octet 5)
This parameter specifies the amount of time that the Originating MES transmits the FTC bursts for a single hop MES connection. It is a binary number with MSB in bit 8. It has units of 0.5 seconds.

M-MT (Octet 5)
This parameter specifies the amount of time that the Terminating MES transmits the FTC bursts for a single hop MES connection. It is a binary number with MSB in bit 8. It has units of 0.5 seconds.

11.5.2.48 Location area code

The purpose of Location Area Code information element is to provide an unambiguous identification of spotbeams and primary gateway servicing the spotbeam within the area covered by the system.

The Location Area Code information element is coded as shown if figure 11.5.2.28 and table 11.5.2.28.

The Location Area Code is a type 3 information element with 3 octets length.

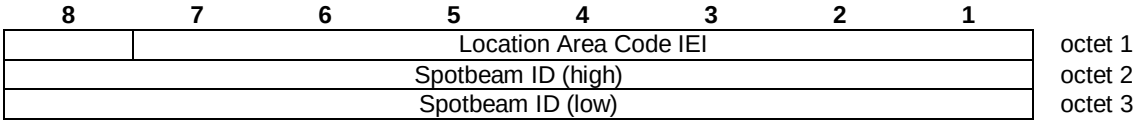

Figure 11.5.2.28: Location Area Code Information Element Format

Table 11.5.2.28: Location Area Code Information Element Coding Standard

Spotbeam ID (octets 2 and 3) The Spotbeam ID is a binary number used to identify either a single spotbeam or a beam pair for inclined orbit operations. The most significant bit is Octet 2, bit 8, while the least significant bit is bit 1 of Octet 3. If a LAI has to be deleted, then all bits of the LAC shall be set to one with the exception of the least significant bit which shall be set to zero. If a SIM is inserted in a MES Equipment with the location are code containing all zeros, then the terminal shall recognize this LAC as part of a deleted LAI.

11.5.2.49 Beam pair LU timer

The purpose of Beam Pair LU Timer information element is to provide an unambiguous identification of spotbeams and primary gateway servicing the spotbeam within the area covered by the system.

The Beam Pair LU Timer information element is coded as shown in figure 11.5.2.29 and table 11.5.2.29.

The Beam Pair LU Timer is a type 3 information element with 2 octets length.

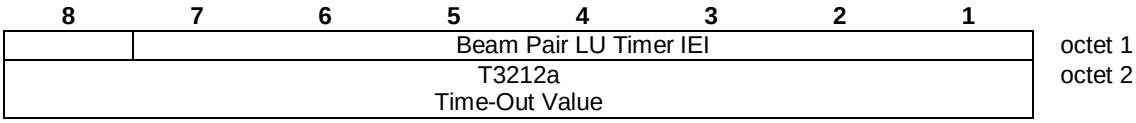

Figure 11.5.2.29: Beam Pair LU Timer Information Element Format

Table 11.5.2.29: Beam Pair LU Timer Information Element Coding Standard

T 3212a Time-Out Value (octet 2) The T 3212a time-out value field is coded as the binary representation of the time-out value for updating in decihours. Range: 1 to 255 The value 0 is used for infinite time-out value (i.e. updating shall not be used in the spotbeam type).

11.5.2.50 Paging request reference

The purpose of the Paging Request Reference information element is to provide a method to uniquely identify MES responses to paging messages.

The Request Reference information element is coded as shown in figure 11.5.2.30 and table 11.5.2.30.

The Request Reference is a type 3 information element with 3 octets length.

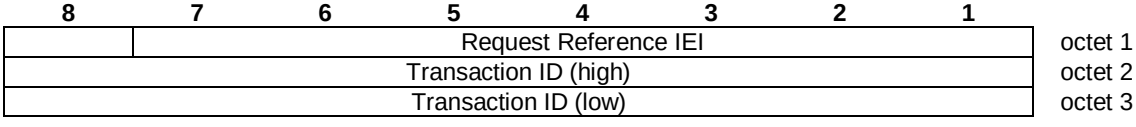

Figure 11.5.2.30: Request Reference Information Element Format

Table 11.5.2.30: Request Reference Timer Information Element Coding Standard

Transaction Id (octet 2 and 3) A 16 bit binary word generated by the network to uniquely identify MES responses to paging messages. Bit 8 of octet 2 is the MSB. Bit 1 of octet 3 is the LSB

11.5.2.51 (Deleted)

11.5.2.52 Satellite Frequency List

The purpose of the Satellite Frequency Information Element is to provide an active frequency list and a pending frequency list. The active frequency list provides the CCS (control channel) frequency used by each spotbeam. For the active list, the Satellite Frequency IE is coded as shown in figure 11.5.2.31a and table 11.5.2-31.

The pending frequency list provides spotbeam number and new CCS frequency for each spotbeam. For the pending list, the Satellite Frequency IE is coded as shown in figure 11.5.2.31b and table 11.5.2.32.

The Satellite Frequency is a type 3 information element with 22 octet length.

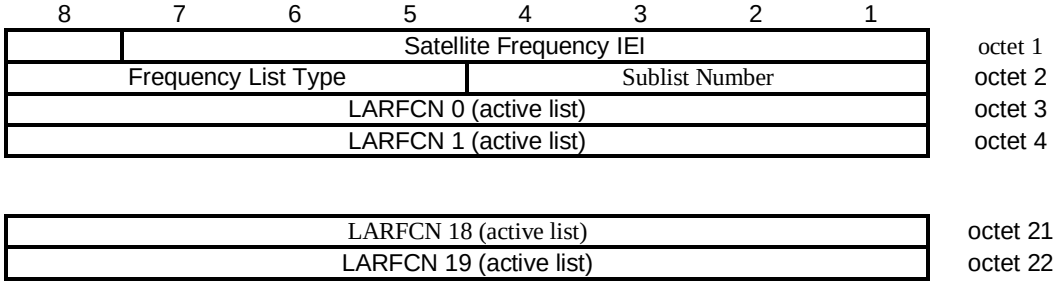

Figure 11.5.2.31a: Satellite Frequency Information Element/Active Frequency List

Table 11.5.2.31: Satellite Frequency Information Element/Active Frequency List

Frequency List Type (Octet 2, bits 8 to 5)Fill with All '0's to Indicate Active Frequency List Sublist Number (Octet 2, bits 4 to 1) There is an assumed order to the list of frequencies sent in this message. The number of spotbeams are numbered from 1 to 140. Each spotbeam has an associated CCS frequency. The entire list is divided into groups of twenty using the equation, {spotbeam number-1} mod 20 and inserted into the appropriate octets. The sublist number is , {spotbeam number-1} div 20. Hence the absolute spotbeam number and associated frequency can be reconstructed from the sublist number and the order of the frequency in the IEI. The sublist number is a 4 bit binary number with MSB in bit 4. LAFRCN (Octet 3 to 22) Binary 255 indicates a spotbeam that does not have a CCS frequency

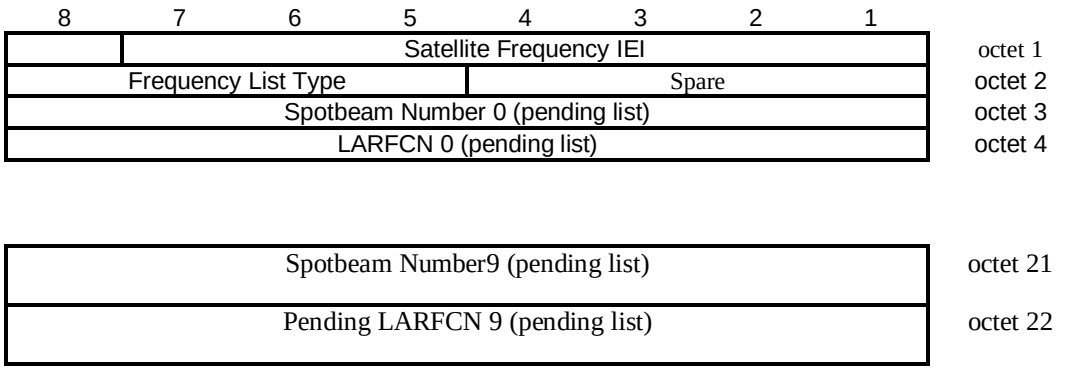

Figure 11.5.2.31b: Satellite Frequency Information Element/Pending Frequency List

Table 11.5.2.32: Satellite Frequency Information Element/Pending Frequency List

Frequency List Type (Octet 2, bits 8 to 5) Fill With All '1's to Indicate Pending Frequency List Spare Bits (Octet 2, bits 4 to 1) All '1's. Spotbeam Number x (Odd octets, 3 up to octet 21) The binary presentation of a spotbeam number, from 1 to 140. Pending LAFRCN x (Even octets, 4 up to octet 22) Pending new LARFCN for the spotbeam with the Number x. For the rest of the Octets : If the pending changes do not fill the whole IE then they should be coded as hexadecimal 'FE'.

11.5.2.52.1 Implementation Requirement

The implementation of the creation and maintenance of the CCS list in the network and in the User Terminals shall be as follows:

a) The System Information type 8 message, indicating a Pending Frequency List, shall only be sent by the network when changes in the current list are planned in the system. It is suggested that the network start sending this list one week before performing the changes.

b) (Deleted)

c) The network shall perform all changes, announced in a Pending Frequency List with a particular Sequence Number (in the H-BCCH Version Number message) at the same time.

d) The User Terminal shall, upon receiving a new Pending Frequency List, associate the announced pending LARFCNs to the active ones for the Spotbeams contained in the list. The associated LARFCNs shall be scanned in addition to the active ones, until they become active.

11.5.3 Mobility Management information elements

For the Mobility Management information elements listed below, the default coding of the information element identifier bits is summarized in table 11.5.3.1.

Table 11.5.3.1: Information Element Identifier Coding for Mobility Management Information Elements

8	7	6	5	4	3	2	1		Reference clause
								Type 1 Info Elements	
1	0	0	1	-	-	-	-	Note	
1	1	0	0	-	-	-	-	Note	
1	1	1	0	-	-	-	-	Note	
1	0	1	0	-	-	-	-	Type 2 info elements	
0	0	0	1					Follow-on Proceed	11.5.3.7
								Type 3 and 4 info elements	
0	1	0	0	0	0	0	1	Note	
0	1	0	0	0	0	1	0	Note	
0	1	0	0	0	1	0	0	Note	

All other values are reserved

NOTE: Reserved

11.5.3.1 Authentication parameter RAND

The purpose of the Authentication Parameter RAND information element is to provide the MES with a non-predictable number to be used to calculate the authentication response signature SRES and the ciphering key Kc.

The Authentication Parameter RAND information element is coded as shown in figure 11.5.3.1 and table 11.5.3.2.

The Authentication Parameter RAND is a type 3 information element with 17 octets length.

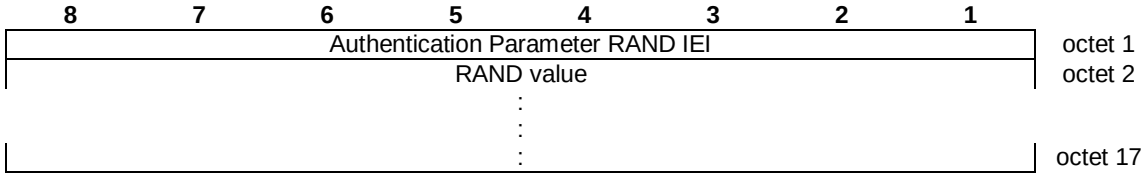

Figure 11.5.3.1: Authentication Parameter RAND Information Element Format

Table 11.5.3.2: Authentication Parameter RAND Information Element Coding Standard

RAND value (octet 2, 3,... and 17) The RAND value consists of 128 bits. Bit 8 of octet 2 is the most significant bit while bit 1 of octet 17 is the least significant bit.

11.5.3.2 Authentication parameter SRES

The purpose of the authentication parameter SRES information element is to provide the network with the authentication response signature calculated in the MES.

The Authentication Parameter SRES information element is coded as shown in figure 11.5.3.2 and table 11.5.3.3.

The Authentication Parameter SRES is a type 3 information element with 5 octets length.

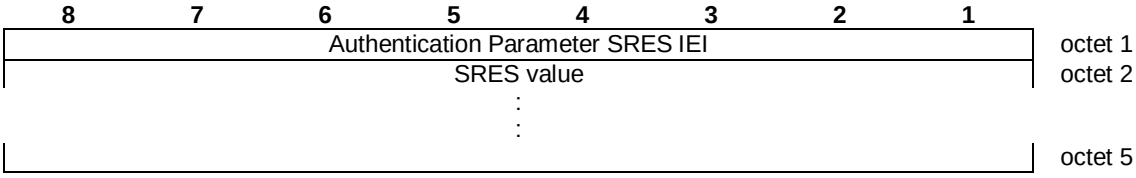

Figure 11.5.3.2: Authentication Parameter SRES Information Element Format

Table 11.5.3.3: Authentication Parameter SRES Information Element Coding Standard

SRES value (octet 2, 3, 4 and 5) The SRES value consists of 32 bits. Bit 8 of octet 2 is the most significant bit while bit 1 of octet 5 is the least significant bit.

11.5.3.3 CM service type

The purpose of the CM Service Type information element is to specify which service is requested from the network.

The CM Service Type information element is coded as shown in figure 11.5.3.3 and table 11.5.3.4.

The CM Service Type is a type 1 information element

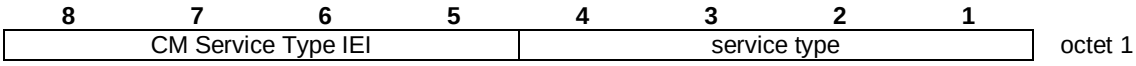

Figure 11.5.3.3: CM Service Type Information Element Format

Table 11.5.3.4: CM Service Type Information Element Coding Standard

Service type (octet 1)

Bits

4	3	2	1	
0	0	0	1	MES originating call establishment or packet mode connection establishment
0	0	1	0	Emergency call establishment
0	1	0	0	Short Message Service
1	0	0	0	Supplementry service activation

All other values are reserved

11.5.3.4 Identity type

The purpose of the Identity Type information element is to specify which identity is requested.

The Identity Type information element is coded as shown in figure 11.5.3.4 and table 11.5.3.5.

The Identity Type is a type 1 information element.

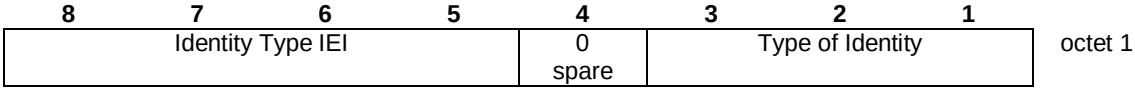

Figure 11.5.3.4: Identity Type Information Element Format

Table 11.5.3.5: Identity Type Information Element Coding Standard

Type of Identity (octet 1)			
Bits			
3	**2**	**1**	
0	0	1	IMSI
0	1	0	IMEI
0	1	1	IMEISV
1	0	0	Reserved
All other values are reserved			

11.5.3.5 Location updating type

The purpose of the Location Updating Type information element is to indicate whether a normal updating or a periodic updating is wanted. It may also indicate that a follow-on request has been received from the MES CM layer.

The Location Updating Type information element is coded as shown in figure 11.5.3.5 and table 11.5.3.6.

The Location Updating Type is a type 1 information element.

8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
Location Updating Type IEI				FOR	0 spare	LUT		octet 1

Figure 11.5.3.5: Location Updating Type Information Element Format

Table 11.5.3.6: Location Updating Type Information Element Coding Standard

LUT (octet 1)		
Bits		
2	**1**	
0	0	Normal Location Updating
0	1	Periodic Location Updating
1	0	Reserved
1	1	Reserved
FOR (octet 1)		
The Follow-On Request bit (FOR) is coded as follows		
Bit		
4		
0		No follow-on request pending
1		Follow-on request pending

11.5.3.6 Reject cause

The purpose of the Reject Cause information element is to indicate the reason why a request from the MES is rejected by the network.

The Reject Cause information element is coded as shown in figure 11.5.3.6 and table 11.5.3.7.

The Reject Cause is a type 3 information element with 2 octets length.

8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
Reject Cause IEI								octet 1
Reject Cause Value								octet 2

Figure 11.5.3.6: Reject Cause Information Element Format

Table 11.5.3.7: Reject Cause Information Element Coding Standard

Reject cause value (octet 2)
Bits

8	7	6	5	4	3	2	1	
0	0	0	0	0	0	1	0	IMSI unknown in HLR
0	0	0	0	0	0	1	1	Illegal MES
0	0	0	0	0	1	0	0	IMSI unknown in VLR
0	0	0	0	0	1	0	1	IMEI not accepted
0	0	0	0	0	1	1	0	Illegal ME-MES
0	0	0	0	0	1	1	1	Local Transmit Disable by the network
0	0	0	0	1	0	1	1	PSMN Not allowed
0	0	0	0	1	1	0	0	Location Area not allowed
0	0	0	0	1	1	0	1	National roaming not allowed in this location area
0	0	0	1	0	0	0	1	Network failure
0	0	0	1	0	1	1	0	Congestion
0	0	1	0	0	0	0	0	Service option not supported
0	0	1	0	0	0	0	1	Requested service option not subscribed
0	0	1	0	0	0	1	0	Service option temporarily out of order
0	0	1	0	0	1	1	0	Call cannot be identified
0	1	0	1	1	1	1	1	Semantically incorrect message
0	1	1	0	0	0	0	0	Invalid mandatory information
0	1	1	0	0	0	0	1	Message type non-existent or not implemented
0	1	1	0	0	0	1	0	Message type not compatible with the protocol state
0	1	1	0	0	0	1	1	Information element non-existent or not implemented
0	1	1	0	0	1	0	0	Conditional IE error
0	1	1	0	0	1	0	1	Message not compatible with the protocol state
0	1	1	0	1	1	1	1	Protocol error, unspecified

Any other value received by the MES shall be treated as 0010 0010, 'Service option temporarily out of order'. Any other value received by the network shall be treated as 0110 1111, 'Protocol error, unspecified'.

NOTE: The listed reject cause values are described in Annex G

11.5.3.7 Follow-On proceed

The purpose of the Follow-on Proceed information element is to indicate that a MM connection may be established on an existing RR connection.

The Follow-on Proceed information element is coded as shown in figure 11.5.3.7. The Follow-on Proceed is a type 2 information element.

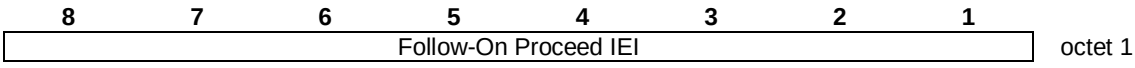

Figure 11.5.3.7: Follow-On Proceed Information Element Format

11.5.4 Call Control information elements

For the call control information elements listed below, the default coding of the information element identifiers is defined in table 11.5.4.1.

Table 11.5.3.1: Information Element Identifier Coding for Call Control Information Elements

8	7	6	5	4	3	2	1		Reference clause
1	:	:	:	-	-	-	-	Type 1 info elements	
	0	0	1	-	-	-	-	Shift	11.5.4.2 and 11.5.4.3
	0	1	1	-	-	-	-	Note	
	1	0	1	-	-	-	-	Repeat indicator	11.5.4.22
1	0	1	1	:	:	:	:	Type 2 info elements	
				0	0	0	0	Mode data	11.5.4.19
				0	0	0	1	CLIR Suppression	11.5.4.11a
				0	0	1	0	CLIR Invocation	11.5.4.11b
				0	0	1	1	Reverse call setup direction	11.5.4.22a
0	:	:	:	:	:	:	:	Type 3 and 4 info elements	
	0	0	0	0	1	0	0	Bearer capability	11.5.4.5
	0	0	0	1	0	0	0	Cause	11.5.4.11
	0	0	1	0	1	0	0	Note	
	0	0	1	0	1	0	1	Call Control Capabilities	11.5.4.5a
	0	0	1	1	1	0	0	Facility	11.5.4.15
	0	0	1	1	1	1	0	Progress Indicator	11.5.4.21
	0	1	0	0	1	0	0	Auxiliary states	11.5.4.4
	0	1	0	0	1	1	1	Note	
	0	1	0	1	1	0	0	Keypad facility	11.5.4.17
	0	1	1	0	1	0	0	Signal	11.5.4.23
	1	0	0	1	1	0	0	Connected number	11.5.4.13
	1	0	0	1	1	0	1	Connected subaddress	11.5.4.14
	1	0	1	1	1	0	0	Calling party BCD number	11.5.4.9
	1	0	1	1	1	0	1	Calling party subaddress	11.5.4.10
	1	0	1	1	1	1	0	Called party BCD number	11.5.4.7
	1	1	0	1	1	0	1	Called party subaddress	11.5.4.8
	1	1	1	1	1	0	0	Low layer compatibility	11.5.4.18
	1	1	1	1	1	0	1	High layer compatibility	11.5.4.16
	1	1	1	1	1	1	0	User – user	11.5.4.25
	1	1	1	1	1	1	1	SS version indicator	11.5.4.24

NOTE: Reserved

11.5.4.1 Extensions of codesets

There is a certain number of possible information element identifier values using the formatting rules described in clause 11.5: 128 from the Type 3 & 4 information element format and at least 8 from the Type 1 & 2 information element format.

One value in the Type 1 format is specified for shift operations described below. One other value in both the Type 3 & 4 and Type 1 format is reserved. This leaves 133 information element identifier values available for assignment.

It is possible to expand this structure to eight codesets of 133 information element identifier values each. One common value in the Type 1 format is employed in each codeset to facilitate shifting from one codeset to another. The contents of this shift information element identifies the codeset to be used for the next information element or elements. The codeset in use at any given time is referred to as the "active codeset." By convention, codeset 0 is the initially active codeset.

Two codeset shifting procedures are supported: locking shift and non-locking shift.

Codeset 5 is reserved for information elements reserved for national use.

Codeset 6 is reserved for information elements specific to the local network (either public or private).

Codeset 7 is reserved for user-specific information elements.

The coding rules specified in clause 11.5 shall apply for information elements belonging to any active codeset.

Transitions from one active codeset to another (i.e., by means of the locking shift procedure) may only be made to a codeset with a higher numerical value than the codeset being left.

An information element belonging to codeset 5, 6 or 7 may appear together with information elements belonging to codeset 0, by using the non-locking shift procedure (see clause 11.5.4.3).

A user or network equipment shall have the capability to recognize a shift information element and to determine the length of the following information element, although the equipment need not be able to interpret and act on the content of the information element. This enables the equipment to determine the start of the subsequent information element.

Only use of Codeset 0 is required.

11.5.4.2 Locking shift procedure (Not applicable to current GMR-2 system - specified for future use)

The locking shift procedure employs an information element to indicate the new active codeset. The specified codeset remains active until another locking shift information element is encountered which specifies the use of another codeset. For example, codeset 0 is active at the start of message content analysis. If a locking shift to codeset 5 is encountered, the next information elements will be interpreted according to the information element identifiers assigned in codeset 5, until another shift information element is encountered. This procedure is used only to shift to a higher order codeset than the one being left.

The locking shift is valid only within that message which contains the locking shift information element. At the start of every message content analysis, the active codeset is codeset 0.

The locking shift information element uses the Type 1 information element format and coding shown in figure 11.5.4.1 and table 11.5.4.2.

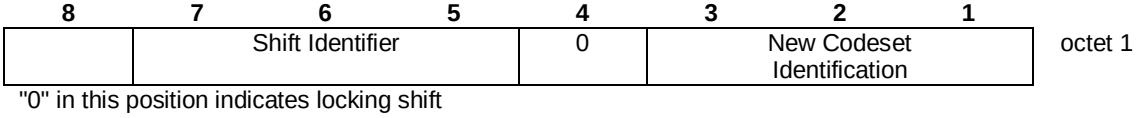

Figure 11.5.4.1: Locking Shift Element Format

Table 11.5.4.2: Locking Shift Element Coding Standard

Codeset identification (octet 1)					
bits	**3**	**2**	**1**		
	0	0	0	not applicable	
	0	0	1		
to	1	0	0	reserved	
	1	0	1	codeset 5 :	information elements for national use
	1	1	0	codeset 6 :	information elements specific to the local network (either public or private)
	1	1	1	codeset 7 :	user-specific informative elements

11.5.4.3 Non-locking shift procedure (Not applicable to current GMR-2 system - specified for future use)

The non-locking shift procedure provides a temporary shift to the specified lower or higher codeset. The non-locking shift procedure uses a Type 1 information element to indicate the codeset to be used to interpret the next information element. After the interpretation of the next information element, the active codeset is again used for interpreting any following information elements. For example, codeset 0 is active at the beginning of message content analysis. If a non-locking shift to codeset 6 is encountered, only the next information element is interpreted according to the information element identifiers assigned in codeset 6. After this information element is interpreted, codeset 0 will again be used to interpret the following information elements. A non-locking shift information element indicating the current codeset shall not be regarded as an error.

A locking shift information element shall not follow directly a non-locking shift information element. If this combination is received, it shall be interpreted as though a locking shift information element had been received.

The non-locking shift information element uses the Type 1 information format and coding shown in figure 11.5.4.2 and table 11.5.4.3.

8	7	6	5	4	3	2	1	
	Shift Identifier			1	Temporary Codeset Identification			octet 1

"1" in this position indicates non-locking shift

Figure 11.5.4.2: Locking Shift Element Format

Table 11.5.4.3: Locking Shift Element Coding Standard

Codeset identification (octet 1)					
bits	**3**	**2**	**1**		
	0	0	0	codeset 0	(initially active)
				GMR-2 information elements	
	0	0	1		
to	1	0	0	reserved	
	1	0	1	codeset 5 :	information elements for national use
	1	1	0	codeset 6 :	information elements specific to the local network (either public or private)
	1	1	1	codeset 7 :	user-specific informative elements

11.5.4.4 Auxiliary states

The purpose of the auxiliary states information element is to describe the current status of the auxiliary states of a call in the call control states "active" and "mobile originating modify" (See GMR-2 04.083 [21] and GMR-2 04.084 [22]).

The auxiliary states information element is coded as shown in figure 11.5.4.3, table 11.5.4.4 and table 11.5.4.5.

The auxiliary states is a Type 4 information element with 3 octets length.

8	7	6	5	4	3	2	1	
	Auxilary States IEI							octet 1
	Length of Auxilary states contents							octet 2
1 ext	0	0 spare	0	hold aux. state		MPTY aux. state		octet 3

Figure 11.5.4.3: Auxilary States Information Element Format

Table 11.5.4.4: Auxilary States Information Element Coding Standard

Hold auxiliary state (octet 3)			
Bits			
4	**3**		
0	0	idle	Note 1
0	1	hold request	Note 1
1	0	call held	Note 1
1	1	retreive request	Note 1
NOTE 1: These states are defined in GMR-2 04.083 [21]			

NOTE: Only the state "hold request" shall be processed by the MSC and the network

Table 11.5.4.5: Auxilary States Information Element Coding Standard (Not supported by MSC)

Multi party auxiliary state (octet 3)			
Bits			
2	**1**		
0	0	idle	Note 2
0	1	MPTY request	Note 2
1	0	call in MPTY	Note 2
1	1	split request	Note 2
NOTE 2: These states are defined in GMR-2 04.084 [22]			

11.5.4.5 Bearer capability

The purpose of the bearer capability information element is to describe a bearer service. The use of the bearer capability information element in relation to compatibility checking is described in Annex B.

The bearer capability information element is coded as shown in figure 11.5.4.4 and tables 11.5.4.6 through 11.5.4.13.

The bearer capability is a Type 4 information element with a minimum length of 3 octets and a maximum length of 10 octets.

8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
	Bearer capability IEI							octet 1
Length of the bearer capability contents								octet 2
1 ext	radio channel requirement		coding standard	transfer mode	information transfer capability			octet 3
1 ext	0 spare	structure		duplex mode	configura tion	NIRR	establish ment	octet 4*
1 ext	0 access	0 id.	rate adaption		signalling access protocol			octet 5*
0/1 ext	0 layer 1	1 id.	User information layer 1 protocol				sync/ async	octet 6*
0/1 ext	number stop bits	negotiati on	number data bits	User rate				octet 6a*
0/1 ext	Intermediate rate		NIC on TX	NIC on RX	Parity			octet 6b*
1 ext	connection element		Modem type					octet 6c*
1 ext	1 layer	0 2 id.	User information layer 2 protocol					octet 7*

Figure 11.5.4.3: Bearer Capability Information Element Format

Table 11.5.4.6: Bearer Capability Information Element Coding Standard

Radio channel requirement (octet 3)
Network to MES direction

Bits 6 and 7 are spare bits

Radio channel requirement (octet 3)
MES to Network direction

Bits		MSC only	MES and GSC only
7	**6**		
0	0	Reserved	Reserved
0	1	Full rate channel	Basic rate
1	0	Dual rate / Half rate preferred	Dual rate / Enhanced rate preferred
1	1	Dual rate / Full rate preferred	Dual rate / Basic rate preferred

Coding Standard (octet 3)

Bit	
5	
0	GSM / system standardization as described below
1	Reserved

Transfer mode (octet 3)

Bit	
4	
0	circuit mode
1	packet mode

Information transfer capability (octet 3)

Bits			
3	**2**	**1**	
0	0	0	speech
0	0	1	unrestricted digital information
0	1	0	3.1 kHz audio, ex PLMN
0	1	1	facsimile group 3
1	1	1	reserved, to be used in the network

All other values are reserved

Table 11.5.4.7: Bearer Capability Information Element Coding Standard

Structure (octet 4)
Bits

6	**5**	
0	0	service data unit integrity
1	1	unstructured

All other values are reserved

Duplex mode (octet 4)
Bit

4	
0	half duplex
1	full duplex

Configuration (octet 4)
Bit

3	
0	point to point

All other values are reserved

NIRR (octet 4)
(Negotiation of Intermediate Rate Requested)
Bit

2	
0	No meaning is associated with this value
1	Data up to and including 4.8 kb/s, full rate, non-transparent, 6kb/s radio interface rate is requested

Establishment (octet 4)
Bit

1	
0	demand

All other values are reserved

Table 11.5.4.8: Bearer Capability Information Element Coding Standard

Access Identity (octet 5)
Bits

7	**6**	
0	0	octet identifier

All other values are reserved

Rate adaptation (octet 5)
Bits

5	**4**	
0	0	no rate adaptation
0	1	v.110/X.30 [54] rate adaptation
1	0	ITU-T Recommendation X.31 [55] flag stuffing

All other values are reserved

Signalling access protocol (octet 5)
Bits

3	**2**	**1**	
0	0	1	I.440 [39] and I.450 [40]
0	1	0	X.21 [51]
0	1	1	X.28 [53] – dedicated PAD, individual NUI
1	0	0	X.28 [53] – dedicated PAD, universal NUI
1	0	1	X.28 [53] – non dedicated PAD
1	1	0	X.38

All other values are reserved

Table 11.5.4.9: Bearer Capability Information Element Coding Standard

Layer 1 identity (octet 6)
Bits

7	**6**	
0	1	octet identifier

All other values are reserved

User information Layer 1 protocol (octet 6)
Bits

5	**4**	**3**	**2**	
0	0	0	0	default Layer 1 protocol

All other values are reserved

Synchronous / asynchronous (octet 6)
Bit

1	
0	synchronous
1	asynchronous

Table 11.5.4.10: Bearer Capability Information Element Coding Standard

Number of Stop Bits (octet 6a)
Bit
7
0 1 bit (This value is also used in the case of synchronous mode)
1 2 bits

Negotiation (octet 6a)
Bit
6
0 in-band negotiation is not possible

see Note

All other values are reserved

Number of data bits excluding parity bit if present (octet 6a)
Bit
5
0 7 bits
1 8 bits (this value is also used in the case of bit orientated protocols)

User rate (octet 6a)
Bits

4	**3**	**2**	**1**	
0	0	1	1	2.4 kbit/s Recommendation X.1 and V.110 [50]
0	1	0	0	4.8 kbit/s Recommendation X.1 and V.110 [50]
0	1	0	1	9.6 kbit/s Recommendation X.1 and V.110 [50]

All other values are reserved

For facsimile group 3 calls the user rate indicates the first and maximum speed the MES is using.

NOTE: See Recommendation V.110 [50] and X.30 [54]

Table 11.5.4.11: Bearer Capability Information Element Coding Standard

Intermediate rate (octet 6b)
Bits

7	**6**	
0	0	Reserved
0	1	Reserved
1	0	8 kbits/s
1	1	16 kbits/s

Network independent clock (NI C) on transmission (Tx) (octet 6b)
(See Rec V.110 [50] and X.30 [54])
Bit

5	
0	Does not requires to send data with network independent clock
1	Requires to send data with network independent clock

Network independent clock (NI C) on reception (Rx) (octet 6b)
(See Rec V.110 [50] and X.30 [54])
Bit

4	
0	Cannot accept data with network independent clock (i.e. sender does not support this optional procedure
1	Can accept data with network independent clock (i.e. send does support this optional procedure)

Parity information (octet 6b)
Bits

3	**2**	**1**	
0	0	0	odd
0	1	0	even
0	1	1	none
1	0	0	forced to 0
1	0	1	forced to 1

All other values are reserved

Table 11.5.4.12: Bearer Capability Information Element Coding Standard

Connection element (octet 6c)

Bits

7	6	
0	0	transparent
0	1	non transparent (RbP)
1	0	both, transparent preferred
1	1	both, non-transparent preferred

The requesting end (e.g. the one sending the SETUP message) should use the 4 values depending on its capabilities to support the different modes. The answer-ring party shall only use the codings 00 or 01, based on its own capabilities and the proposed choice if any.
If both MES and network support both transparent and non transparent, priority should be given to the MES preference.

Modem type (octet 6c)

Bits

5	4	3	2	1	
0	0	0	0	0	none
0	0	0	0	1	V.21 [44]
0	0	0	1	0	V.22 [45]
0	0	0	1	1	V.22 [46] bis
0	0	1	0	0	V.23 [47]
0	0	1	0	1	V.26 [48] ter
0	0	1	1	0	V.32 [49]
0	0	1	1	1	modem for undefined interface
0	1	0	0	0	reserved

All other values are reserved

Table 11.5.4.13: Bearer Capability Information Element Coding Standard

Layer 2 identity (octet 7)

Bits

7	6	
1	0	octet identifier

All other values are reserved

User information layer 2 protocol (octet 7)

Bits

5	4	3	2	1	
0	0	1	1	0	recommendation X.25 [52], link level
0	1	0	0	0	ISO 6429 [32], codeset 0 (DC1/DC3)
0	1	0	0	1	X.75 [57] layer 2 modified (teletex)
0	1	0	1	0	videotex profile 1
0	1	1	0	0	COPnoFlCt (Character Oriented Protocol with no Flow Control mechanism)

All other values are reserved

11.5.4.5.1 Static conditions for the bearer capability IE contents

If the information transfer capability field (octet 3) indicates "speech", octets 4 5, 6, 6a, 6b, 6c, and 7 shall not be included.

If the information transfer capability field (octet 3) indicates a value different from "speech", octets 4 5, 6, 6a, 6b, and 6c shall be included.

If the information transfer capability field (octet 3) indicates "facsimile group 3", the modem type field (octet 6c) shall indicate "none".

The modem type field (octet 6c) shall not indicate "autobauding type 1" unless the connection element field (octet 6c) indicates "non transparent" (Reserved).

11.5.4.5a Call control capabilities

The purpose of the call control capabilities information element is to identify the call control capabilities of the user terminal.

The call control capabilities information element is coded as shown in figure 11.5.4.5 and table 11.5.4.14.

The call control capabilities is a type 4 information element with a length of 3 octets.

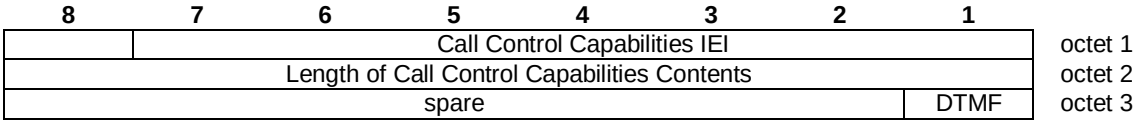

Figure 11.5.4.5: Call Control Capabilities Information Element Format

Table 11.5.4.14: Call Control Capabilities Information Element Coding Standard

DTMF (octet 3)	
Bit	
1	
0	This value is reserved for the earlier versions of the protocol
1	This value indicates that the user terminal supports DTMF as specified in clause 6.3.3 of the present document

11.5.4.6 Call state

The purpose of the call state information element is to describe the current status of a call, (see clause 6.1).

The call state information element is coded as shown in figure 11.5.4.6 and table 11.5.4.15.

The call state is a type 3 information element with 2 octets length.

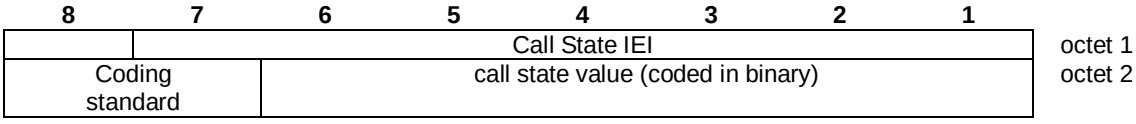

Figure 11.5.4.6: Call State Information Element Format

Table 11.5.4.15: Call State Information Element Coding Standard

Coding standard (octet 2)
Bits

8	**7**	standardized coding as described in
0	0	ITU-T Recommendation. Q.931
0	1	reserved for other international standards
1	0	national standard
1	1	standard defined for the GSM/System PLMNS as described below

Coding standards other than "1 1 - Standard defined for the GSM PLMNSî shall not be used if the call state can be represented with the GSM/system standardized coding.

The MES or Network need not support any other coding standard than "1 1 - Standard defined for the GSM/system PLMNS".

If a call state IE indicating a coding standard not supported by the receiver is received, call state "active" shall be assumed.

Call state value (octet 2)
Bits

6	**5**	**4**	**3**	**2**	**1**		
0	0	0	0	0	0	U0 – null	N0 – null
0	0	0	0	1	0	U0.1 – MM connection pending	N0.1 – MM connection pending
0	0	0	0	0	1	U1 – call initiated	N1 – call initiated
0	0	0	0	1	1	U3 – mobile originating call proceeding	N3 – mobile originateing call proceeding
0	0	0	1	0	0	U4 – call delivered	N4 – call delivered
0	0	0	1	1	0	U6 – call present	N6 – call present
0	0	0	1	1	1	U7 – call present	N7 – call received
0	0	1	0	0	0	U8 – connect request	N8 – connect request
0	0	1	0	0	1	U9 – mobile terminating call confirmed	N9 – mobile terminating call confirmed
0	0	1	0	1	0	U10 – active	N10 – active
0	0	1	0	1	1	U11 – disconnect request	
0	0	1	1	0	0	U12 – disconnect indication	N12 – disconnect indication
0	1	0	0	1	1	U19 – release request	N19 – release request
0	1	1	0	1	0	U26 – mobile originating modify	N26 – mobile originating modify
0	1	1	0	1	1	U27 – mobile terminating modify	N27 – mobile terminating modify
0	1	1	1	0	0		N28 – connect indication

NOTE: Only "11" shall be used as the "Coding standard" value and the Call States U26, U27, N26, N27 are not required and supported by the network

11.5.4.7 Called party BCD number

The purpose of the called party BCD number information element is to identify the called party.

The called party BCD number information element is coded as shown in figure 11.5.4.7 and table 11.5.4.16.

The called party BCD number is a type 4 information element with a minimum length of 3 octets and a maximum length of 13 octets.

8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
	Called Party BCD Number IEI							octet 1
Length of called party BCD number contents								octet 2
1 ext	type of number			numbering plan identification				octet 3
Number digit 2				Number digit 1				octet 4*
Number digit 4				Number digit 3				octet 5*
								:
Note 2								:

Figure 11.5.4.7: Called Party BCD Number Information Element Format

NOTE 1: The number digit(s) in octet 4 precedes the digit(s) in octet 5 etc. The number digit that would be entered first is located in octet 4, bits 1 to 4

NOTE 2: If the called party BCD number contains an odd number of digits, bits 5 to 8 of the last octet shall be filled with an end mark coded as "1111".

Since the information element must contain the complete called party BCD number, there is no need for an additional complete indication.

Table 11.5.4.16: Called Party BCD Number Information Element Coding Standard

Type of number (octet 3) (Note 1)			
Bits			
7	**6**	**5**	
0	0	0	unknown (Note 2)
0	0	1	international number (Note 3, Note 5)
0	1	0	national number (Note 3)
0	1	1	network specific number (Note 4)
1	0	0	dedicated access, short code
1	0	1	reserved
1	1	0	reserved
1	1	1	reserved for extension

NOTE 1: For the definition of "number" see ITU-T Recommendation I.330 [38] and GMR-2 03.003 [7].

NOTE 2: The type of number "unknown" is used when the user or the network has no knowledge of the type of number, e.g. international number, national number, etc. In this case the number digits field is organized according to the network dialling plan, e.g. prefix or escape digits might be present.

NOTE 3: Prefix or escape digits shall not be included.

NOTE 4: The type of number "network specific number" is used to indicate administration/service number specific to the serving network, e.g., used to access an operator.

NOTE 5: The international format shall be accepted by the MSC when the call is destined to a destination in the same country as the MSC.

NOTE 6: Only the values "000" (unknown), "001" (international number) and "010" (national number) shall be used.

Table 11.5.4.17: Called Party BCD Number Information Element Coding Standard

Numbering plan (octet 3)				
Number plan (applies for type of number = 000, 001, 010 and 100)				
Bits				
4	**3**	**2**	**1**	
0	0	0	0	unknown
0	0	0	1	ISDN / telephony numbering plan (Rec. E.163 [34]/E.164 [35])
0	0	1	1	data numbering plan (Rec. X.121 [58])
0	1	0	0	telex numbering plan (Rec. F.69 [37])
1	0	0	0	national numbering plan
1	0	0	1	private numbering plan
1	1	1	1	reserved for extension
All other values reserved				
NOTE: only the values "000" (unknown), "001" (ISDN / telephony numbering plan) shall be used.				

When a MES is the recipient of number information from the network, any incompatibility between the number digits and the number plan identification shall be ignored and a STATUS message shall not be sent to the network.

In the case of numbering plan "unknown", the number digits field is organized according to the network dialling plan, e.g., prefix or escape digits might be present.

Table 11.5.4.18: Called Party BCD Number Information Element Coding Standard

Numbering digits (octet 4, etc.)				
Bits				Number digit value
4	**3**	**2**	**1**	or
8	**7**	**6**	**5**	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	*
1	0	1	1	#
1	1	0	0	a
1	1	0	1	b
1	1	1	0	c
1	1	1	1	used as an endmark in case of an odd number of number digits

11.5.4.8 Called party subaddress

The purpose of the Called party subaddress is to identify the subaddress of the called party of a call. For the definition of a subaddress see ITU-T Recommendation I.330 [38] .

The Called party subaddress information element is coded as shown in figure 11.5.4.8 and table 11.5.4.19.

The called party subaddress is a type 4 information element with a minimum length of 2 octets and a maximum length of 23 octets.

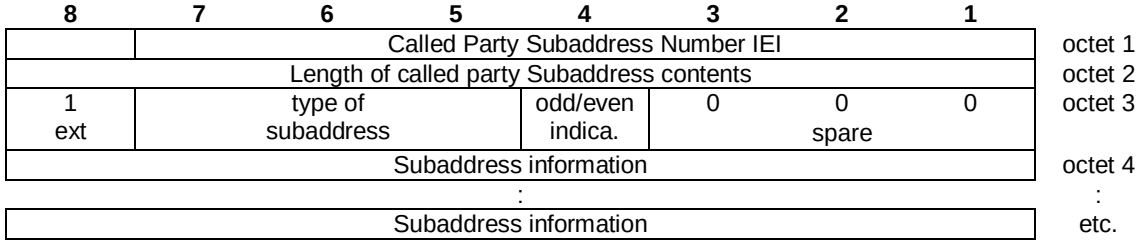

Figure 11.5.4.7: Called Party Subaddress Information Element Format

Table 11.5.4.19: Called Party Subaddress Information Element Coding Standard

Type of subaddress (octet 3) Bits **7 6 5** 0 0 0 NASP (X.213 / ISO 8348 AD2 [33]) 0 1 0 User specified All other values are reserved Odd / even idicator Bit **4** 0 even number of address signals 1 odd number of address signals NOTE: The odd/even indicator is used when the type of subaddress is "user specified" and the coding is BCD. Subaddress information (octet 4, etc...) The NSAP X.213/ISO8348AD2 [33] address shall be formatted as specified by octet 4 which contains the Authority and Format Identifier (AFI). The encoding is made according to the "preferred binary encoding" as defined in X.213 / ISO8348AD2 [33]. For the definition of this type of subaddress, see Rec. ITU-T Recommendation I.334. A coding example is given in ANNEX A. For User-specific subaddress, this field is encoded according to the user specification, subject to a maximum length of 20 octets. When interworking with X.25 [52] networks BCD coding should be applied. NOTE: It is recommended that users apply NSAP subaddress type since this subaddress type allows the use of decimal, binary and IA5 characters in a standardized manner

11.5.4.9 Calling party BCD number

The purpose of the calling party BCD number information element is to identify the origin of a call.

This information element shall never be sent by the network (refer to clause 11.3.23.1, SETUP message).

The calling party BCD number information element is coded as shown in figure 11.5.4.9 and table 11.5.4.20.

The calling party BCD number is a type 4 information element. In the Network to MES direction, it has a minimum length of 3 octets and a maximum length of 14 octets. (This information element is not used in the MES to Network direction.)

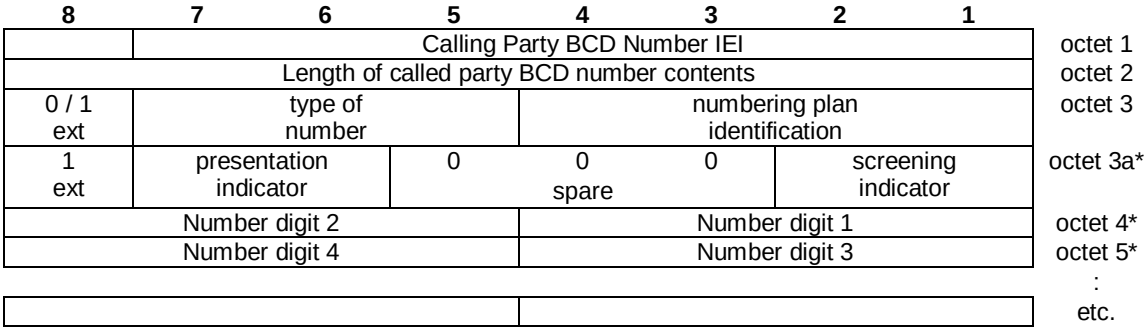

Figure 11.5.4.9: Calling Party BCD Number Information Element Format

The contents of octets 3, 4, etc., are coded as shown in tables 11.5.4.16 to 11.5.4.18. The coding of octet 3a is defined in table 11.5.4.20.

If the calling party BCD number contains an odd number of digits, bits 5 to 8 of the last octet shall be filled with an end mark coded as "1111".

Table 11.5.4.20: Calling Party BCD Number Information Element Coding Standard

Presentation indicator (octet 3a)		
Bits		
7	**6**	
0	0	Presentation allowed
0	1	Presentation restricted
1	0	Number not available due to interworking
1	1	Reserved
If octet 3a is omitted the value "00 – Presentation allowed" is assumed.		
Screening indicator (octet 3a)		
Bits		
2	**1**	
0	0	user-provided, not screened
0	1	user-provided, verified and passed
1	0	user-provided, verified and failed
1	1	network provided
If octet 3a is omitted the value "00 – user provided, not screened" is assumed.		

11.5.4.10 Calling party subaddress

The purpose of the Calling party subaddress is to identify a subaddress associated with the origin of a call. For the definition of a subaddress see ITU-T Recommendation I.330 [38].

The Calling party subaddress information element is coded as shown in figure 11.5.4.10 and table 11.5.4.21.

The Calling party subaddress is a type 4 information element with a minimum length of 2 octets and a maximum length of 23 octets.

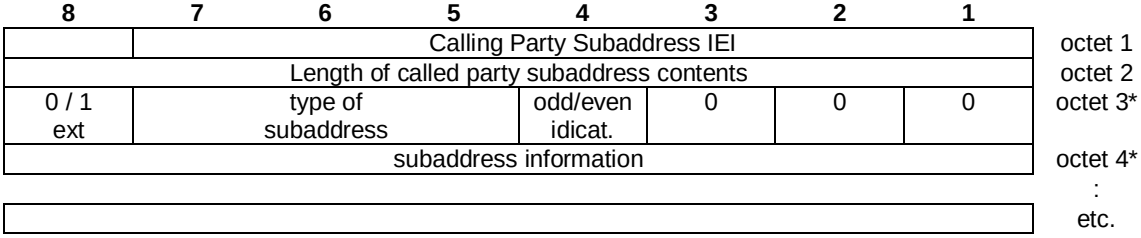

Figure 11.5.4.10: Calling Party Subaddress Information Element Format

Table 11.5.4.21: Calling Party Subaddress Information Element Coding Standard

Type of subaddress (octet 3)
Bits

7	6	5	
0	0	0	NASP (X.213 / ISO 8348 AD2 [33])
0	1	0	User specified

All other values are reserved
Odd / even idicator
Bit

4	
0	even number of address signals
1	odd number of address signals

NOTE: The odd/even indicator is used when the type of subaddress is "user specified" and the coding is BCD.

Subaddress information (octet 4, etc...)

The NSAP X.213/ISO8348AD2 [33] address shall be formatted as specified by octet 4 which contains the Authority and Format Identifier (AFI). The encoding is made according to the "preferred binary encoding" as defined in X.213 / ISO8348AD2 [33]. For the definition of this type of subaddress, see ITU-T Recommendation I.332.

A coding example is given in ANNEX A.

For User-specific subaddress, this field is encoded according to the user specification, subject to a maximum length of 20 octets. When interworking with X.25 [52] networks BCD coding should be applied.

NOTE 1: It is recommended that users apply NSAP subaddress type since this subaddress type allows the use of decimal, binary and IA5 characters in a standardized manner.

NOTE 2: Only "000" (NSAP) and "010" (User specified) shall be accepted as values of the "Type of subaddress." In the case of (NSAP), octet 4, corresponding to the AFI field, shall have one of the following values ('36'H to '59'H). In the case of (User specified), octet 4 shall not be checked. Encoding of other octets of the subaddress shall not be checked.

11.5.4.11 Cause

The purpose of the cause information element is to describe the reason for generating certain messages, to provide diagnostic information in the event of procedural errors, and to indicate the location of the cause originator.

Some of the cause values need not be used. The diagnostic information need not be sent and therefore, may be ignored if received.

The cause information element is coded as shown in figure 11.5.4.11 and tables 11.5.4.22 and 11.5.4.23.

The cause is a type 4 information element with a minimum length of 4 octets and a maximum length of 32 octets.

The cause information element may be repeated in a message.

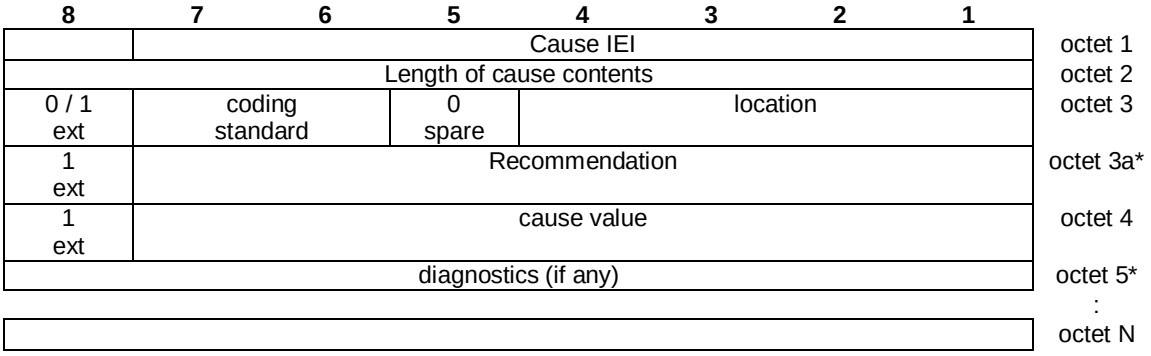

Figure 11.5.4.11: Cause Information Element Format

If the default value applies for the recommendation field, octet 3a shall be omitted.

Table 11.5.4.22: Calling Party Subaddress Information Element Coding Standard

Coding standard (octet 3)
Bits

7	6	
0	0	Coding as specified in ITU-T Recommendation Q.931 [43]
0	1	Reserved for other international standards
1	0	National Standard
1	1	Standard defined for the GSM / PLMNS as described below and in table 11.5.4.23

Coding standards other than "1 1 - Standard defined for the GSM/system PLMNS" shall not be used if the cause can be represented with the GSM/system standardized coding.
The MES or network need not support any other coding standard than "1 1 - Standard defined for the GSM/system PLMNS".
If a cause IE indicating a coding standard not supported by the receiver is received, cause "interworking, unspecified" shall be assumed.

Location (octet 3)
Bits

4	3	2	1	
0	0	0	0	User
0	0	0	1	private network serving the local user
0	0	1	0	public network serving the local user
0	0	1	1	transit network
0	1	0	0	public network serving the remote user
0	1	0	1	private network serving the remote user
0	1	1	1	international network
1	0	1	0	network beyond the interworking point

All other values are reserved.

Recommendation (octet 3a)
Octet 3a shall not be included if the coding standard is coded as "1 1 - Standard defined for GSM/system PLMNS".
If the coding standard is different from "1 1 – Standard defined for GSM/system PLMNS", the coding of octet 3a, if included, and octets 4 to N is according to that coding standard.

Cause value (octet 4)
The cause value is divided in two fields: a class (bits 5 through 7) and a value within the class (bits 1 through 4).
The class indicates the general nature of the event.

Class (000) : normal event
Class (001) : normal event
Class (010) : resource unavailable
Class (011) : service or option not available
Class (100) : service or option not implemented
Class (101) : invalid message (e.g. parameter out of range)
Class (110) : protocol error (e.g. unknown message)
Class (111) : Interworking

The cause values are listed in table 11.5.4.23 below
and defined in Annex H.

Diagnostic(s) (octet 5)
Diagnostic information is not available for every cause, see table 11.5.4.23 below.
When available, the diagnostic(s) is coded in the same way as the corresponding information element in clause 11.
The inclusion of diagnostic(s) is optional.

Table 11.5.4.23: Cause Information Elements Values

Cause Class			Value				Cause num.	Cause	Diagnostic	Remarks
7	**6**	**5**	**4**	**3**	**2**	**1**				
0	0	0	0	0	0	1	1.	Unassigned (unallocated) number	Note 9	
0	0	0	0	0	1	1	3.	No route to destination	Note 9	
0	0	0	0	1	1	0	6.	Channel unacceptable	-	
0	0	0	1	0	0	0	8.	Operator determined barring	-	
0	0	1	0	0	0	0	16.	Normal call clearing	Note 9	
0	0	1	0	0	0	1	17.	User busy	-	
0	0	1	0	0	1	0	18.	No user responding	-	
0	0	1	1	0	1	1	19.	User alerting, no answer	-	
0	0	1	0	1	0	1	21.	Call rejected	Note 9 – user supplied siagnostic (note 4)	
0	0	1	0	1	1	0	22.	Number changed	New destination (note 5)	
0	0	1	1	0	1	0	26.	Non selected user clearing	-	
0	0	1	1	0	1	1	27.	Destination out of order	-	
0	0	1	1	1	0	0	28.	Invalid number format (incomplete number)	-	
0	0	1	1	1	0	1	29.	Facility rejected	Note 1	
0	0	1	1	1	1	0	30.	Response to STATUS ENQUIRY	-	
0	0	1	1	1	1	1	31.	Normal, unspecified	-	
0	1	0	0	0	1	0	34.	No circuit / channel available	-	
0	1	0	0	1	1	0	38.	Network out of order	-	
0	1	0	1	0	0	1	41.	Temporary failure	-	
0	1	0	1	0	1	0	42.	Switching equipment congestion	-	
0	1	0	1	0	1	1	43.	Access information discarded	Discarded information element identifiers (note 6)	
0	1	0	1	1	0	0	44.	Requested circuit / channel unavailable	-	
0	1	0	1	1	1	1	47.	Resources unavailable, unspecified	-	
0	1	1	0	0	0	1	49.	Quality of service unavailable	Note 9	
0	1	1	0	0	1	0	50.	Requested facility not subscribed	Note 1	
0	1	1	0	1	1	1	55.	Incoming calls barred within the CUG	Note 1	
0	1	1	1	0	0	1	57.	Bearer capability not authorized	Note 3	
0	1	1	1	0	1	0	58.	Bearer capability not presently available	Note 3	
0	1	1	1	1	1	1	63.	Service or option not available, unspecified	-	
1	0	0	0	0	0	1	65.	Bearer service not implemented	Note 3	
1	0	0	0	1	0	0	68.	ACM equal to or greater than ACM max		
1	0	0	0	1	0	1	69.	Requested facility not implemented	Note 1	
1	0	0	0	1	1	0	70.	Only restricted digital information bearer capability is available		
1	0	0	1	0	1	1	75.	MES to MES CC release		
1	0	0	1	1	1	1	79.	Service or option not implemented, unspecified		
1	0	1	0	0	0	1	81.	Invalid transaction identifier value		
1	0	1	0	1	1	1	87.	User not member of CUG	Note 1	
1	0	1	1	0	0	0	88.	Incompatible destination	Incompatible parameter (Note 2)	
1	0	1	1	0	1	1	91.	Invalid transit network selection	-	
1	0	1	1	1	1	1	95.	Semantically incorrect message	-	
1	1	0	0	0	0	0	96.	Invalid mandatory data	Information element identifier(s)	
1	1	0	0	0	0	1	97.	Message type non-existent or not implemented	Message Type	
1	1	0	0	0	1	0	98.	Message type not compatible with protocol state	Message Type	
1	1	0	0	0	1	1	99.	Information element non-existent or not implemented	Information element identifier(s) (Notes 6,7)	
1	1	0	0	1	0	0	100.	Conditional IE error	Information element identifier(s) (Note 6)	

Cause Class			Value				Cause num.	Cause	Diagnostic	Remarks
7	**6**	**5**	**4**	**3**	**2**	**1**				
1	1	0	0	1	0	1	101.	Message not compatible with protocol state	Message Type	
1	1	0	0	1	1	0	102.	Recovery on timer expiration	Timer Number (note 8)	
1	1	0	1	1	1	1	111.	Protocol error, unspecified	-	
1	1	1	1	1	1	1	127.	Interworking, unspecified	-	

All other values in the range 0 to 31 shall be treated as cause 31.
All other values in the range 32 to 47 shall be treated as cause 47.
All other values in the range 48 to 63 shall be treated as cause 63.
All other values in the range 64 to 79 shall be treated as cause 79.
All other values in the range 80 to 95 shall be treated as cause 95.
All other values in the range 96 to 111 shall be treated as cause 111.
All other values in the range 112 to 127 shall be treated as cause 127.

NOTE 1: Diagnostics for supplementary services are handled as follows:

octet 5, bit 8:

This is an extension bit as defined in the preliminary part of clause 11.5. In this version of this protocol, this bit shall be set to 1. If it is set to zero, the contents of the following octets shall be ignored.

octet 5, bits 7-1:

0000001 - Outgoing calls barred within CUG

0000010 - No CUG selected

0000011 - Unknown CUG index

0000100 - CUG index incompatible with requested basic service

0000101 - CUG call failure, unspecified

0000110 - CLIR not subscribed

All other values shall be ignored.

NOTE 2: The incompatible parameter is composed of the incompatible information element identifier.

NOTE 3: The format of the diagnostic field for cause numbers 57, 58 and 65 is as shown in figure 11.5.4.4 and tables 11.5.4.6 to 11.5.4.13.

NOTE 4: The user supplied diagnostics field is encoded according to the user specification, subject to the maximum length of the cause information element. The coding of user supplied diagnostics should be made in such a way that it does not conflict with the coding described in Note 9 below.

NOTE 5: The new destination is formatted as the called party BCD number information element, including information element identifier.

NOTE 6: Locking and non-locking shift procedures described in clause 11.5.4.2 and 11.5.4.3 are applied. In principle, information element identifiers are ordered in the same order as the information elements in the received message. (Not applicable to current GMR-2 system - details specified are for future use).

NOTE 7: When only the locking shift information element is included and no information element identifier follows, it means that the codeset in the locking shift itself is not implemented. (Not applicable to current GMR-2 system - details specified are for future use).

NOTE 8: The timer number is coded in lAS characters, e.g., T308 is coded as "3" "0" "8". The following coding is used in each octet:

bit 8: spare "0"

bits 7-1: lAS character

Octet 5 carries "3", octet 5a carries "0", etc.

NOTE 9: The following coding is used for octet 5:

bit 8: 1

bits 7-3: 00000

bits 2-1: condition as follows:

00 - unknown

01 - permanent

10 - transient

11.5.4.11a CLIR suppression (Not applicable to current GMR-2 system - specified for future use)

The CLIR suppression information element may be sent by the MES to the network in the SETUP message. The use is defined in GSM 04.81 [20].

The CLIR suppression information element is coded as shown in figure 11.5.4.12. The CLIR suppression is a type 2 information element.

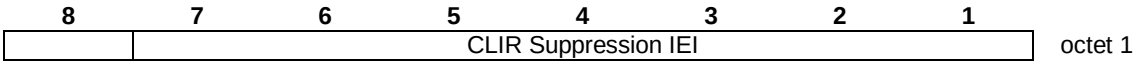

Figure 11.5.4.12: CLIR Suppression Information Element Format

11.5.4.11b CLIR invocation (Not applicable to current GMR-2 system - specified for future use)

The CLIR invocation information element may be sent by the MES to the network in the SETUP message. The use is defined in GSM 04.81 [20].

The CLIR invocation information element is coded as shown in figure 11.5.4.13.

The CLIR invocation is a type 2 information element.

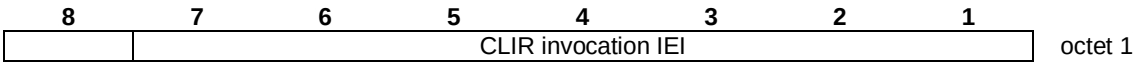

Figure 11.5.4.13: CLIR Invocation Information Element Format

11.5.4.12 Congestion level (Not applicable to current GMR-2 system - specified for future use)

The purpose of the congestion level information element is to describe the congestion status of the call.

The congestion level information element is coded as shown in figure 11.5.4.14 and table 11.5.4.24.

The congestion level is a type 1 information element.

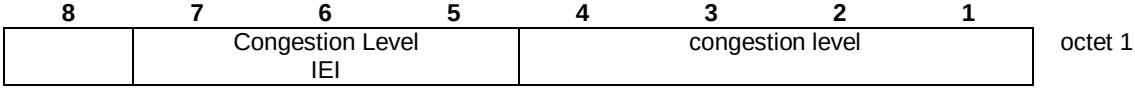

Figure 11.5.4.14: Congestion Level Information Element Format

Table 11.5.4.24: Congestion Level Information Element Coding Standard

Congestion level (octet 1)				
Bits				
4	**3**	**2**	**1**	
0	0	0	0	receiver ready
1	1	1	1	receiver not ready
All other values are reserved				

11.5.4.13 Connected number (Not applicable to current GMR-2 system - specified for future use)

The purpose of the connected number information element is to identify the connected party of a call.

The connected number information element is coded as shown in figure 11.5.4.15.

The connected number is a type 4 information element with a minimum length of 3 octets and a maximum length of 14 octets.

8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
	Connected Number IEI							octet 1
Length of connected number contents								octet 2
0 / 1 ext	type of number			numbering plan identification				octet 3 (note 1)
1 ext	presentation indicator		0	0 spare		0	screening indicator	octet 3a (note 1)*
Number digit 2				Number digit 1				octet 4* (note 1)
Number digit 4				Number digit 3				octet 5* (note 1)
(note 2)								: :

Figure 11.5.4.9: Calling Party BCD Number Information Element Format

The contents of octets 3, 4, 5, etc., are coded as shown in table 11.5.4.16. The coding of octet 3a is defined in table 11.5.4.18.

If the connected number contains an odd number of digits, bits 5 to 8 of the last octet shall be filled with the end mark coded as "1111".

11.5.4.14 Connected subaddress (Not applicable to current GMR-2 system - specified for future use)

The purpose of the connected subaddress information element is to identify a subaddress associated with the connected party of a call.

The connected subaddress information element is coded as shown in figure 11.5.4.16.

The connected subaddress is a type 4 information element with a minimum length of 2 octets and a maximum length of 23 octets.

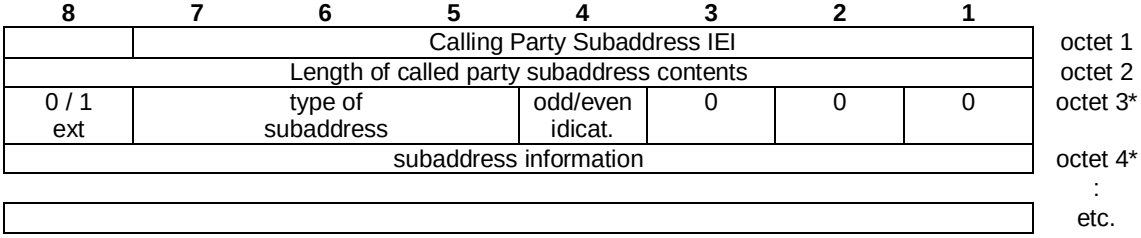

Figure 11.5.4.16: Connected Subaddress Information Element Format

The coding for Type of subaddress, odd/even indicator, and subaddress information is in table 11.5.4.17.

11.5.4.15 Facility

The purpose of the facility information element is to transport supplementary service related information. Within the scope of the present document, the content of the Facility information field is an array of octets. The usage of this transportation mechanism is defined in GSM 04.80 [19].

The facility information element is coded as shown in figure 11.5.4.17.

The facility is a type 4 information element with a minimum length of 2 octets. No upper length limit is specified, except for that given by the maximum number of octets in a L3 message (see GMR-2 04.006 [15]).

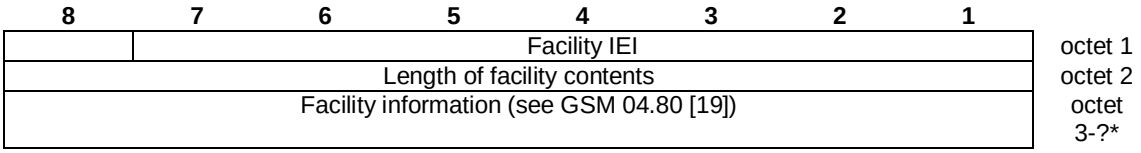

Figure 11.5.4.17: Facility Information Element Format

11.5.4.16 High layer compatibility

The purpose of the high layer compatibility information element is to provide a means which should be used by the remote user for compatibility checking. See Annex B.

The high layer compatibility information element is coded as shown in figure 11.5.4.18 and table 11.5.4.25.

The high layer compatibility is a type 4 information element with a minimum length of 2 octets and a maximum length of 5 octets.

NOTE 1: The high layer compatibility information element is transported transparently by a PLMN between a call originating entity (e.g., a calling user) and the addressed entity (e.g., a remote user or a high layer function network node addressed by the call originating entity). However, if explicitly requested by the user (at subscription time), a network which provides some capabilities to realize teleservices may interpret this information to provide a particular service.

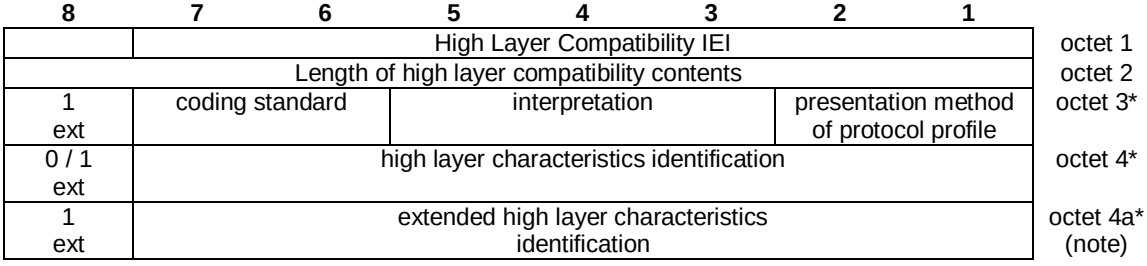

Figure 11.5.4.18: High Layer Compatibility Information Element Format

If the value part of the IE is empty, the IE indicates "not applicable".

NOTE 2: Octet 4a may be present, e.g., when octet 4 indicates Maintenance or Management.

Table 11.5.4.25: High Layer Compatibility Information Element Coding Standard

Coding standard (octet 3) see ITU-T Recommendation Q.931 [43]. Interpretation (octet 3) see ITU-T Recommendation Q.931 [43]. Presentation method of protocol profile (octet 3) see ITU-T Recommendation Q.931 [43]. High layer characteristics identification (octet 4) see ITU-T Recommendation Q.931 [43]. Extended high layer characteristics identification (octet 4a) see ITU-T Recommendation Q.931 [43].

11.5.4.16.1 Static conditions for the high layer compatibility IE contents

Either the value part of the IE is empty, or it contains at least octet 3 and 4.

11.5.4.17 Keypad facility

The purpose of the keypad facility information element is to convey IA5 characters, e.g., entered by means of a terminal keypad. (see note).

The keypad facility information element is coded as shown in figure 11.5.4.19.

The keypad facility is a type 3 information element with 2 octets length.

8	7	6	5	4	3	2	1	
	Keypad facility IEI							octet 1
0 spare	Keypad information (IA5 character)							octet 2

Figure 11.5.4.19: Keypad Facility Information Element Format

NOTE: In the system, this information element is only used to transfer one DTMF digit (0, 1 ... 9, A, B, C, D, *, #) as one IA5 character.

11.5.4.18 Low layer compatibility

The purpose of the low layer compatibility information element is to provide a means which should be used for compatibility checking by an addressed entity (e.g., a remote user or an interworking unit or a high layer function network node addressed by the calling user). The low layer compatibility information element is transferred transparently by a Gateway between the call originating entity (e.g., the calling user) and the addressed entity.

Except for the information element identifier, the low layer compatibility information element is coded as in ETS 300 102-1 [59].

The low layer compatibility is a type 4 information element with a minimum length of 2 octets and a maximum length of 15 octets.

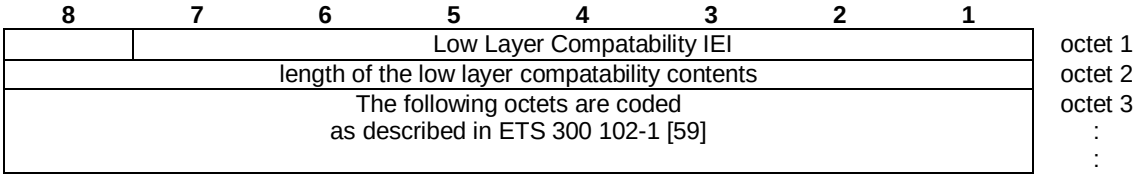

Figure 11.5.4.20: Low Layer Compatability Information Element Format

If the value part of the IE is empty, the IE indicates "not applicable".

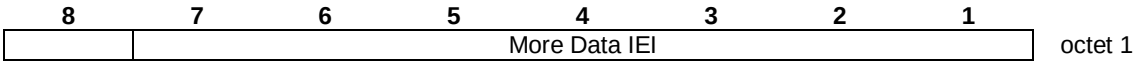

Figure 11.5.4.21: More Data Information Element Format

11.5.4.19 More data (Not applicable to current GMR-2 system - specified for future use)

The more data information element is sent by the MES to the Network or to the Network to the MES in a USER INFORMATION message. The presence of the more data information element indicates to the destination remote user/MES that another USER INFORMATION message will follow containing information belonging to the same block.

The use of the more data information element is not supervised by the network.

The more data information element is coded as shown in figure 11.5.4-21.

The more data is a type 2 information element.

11.5.4.20 Notification indicator (Not applicable to current GMR-2 system - specified for future use)

The purpose of the notification indicator information element is to indicate information pertaining to a call.

The notification indicator information element is coded as shown in figure 11.5.4.22 and Table 11.5.4.26.

The notification indicator is a type 3 information element with 2 octets length.

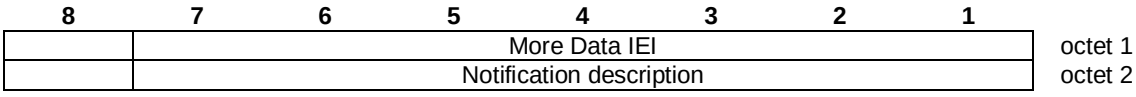

Figure 11.5.4.21: Notification Indicator Information Element Format

Table 11.5.4.26: Notification Indicator Information Element Coding Standard

Notification description (octet 2)							
Bits							
7	**6**	**5**	**4**	**3**	**2**	**1**	
0	0	0	0	0	0	0	user suspended
0	0	0	0	0	0	1	user resumed
0	0	0	0	0	1	0	bearer change
All other values are reserved							

11.5.4.21 Progress indicator

The purpose of the progress indicator information element is to describe an event which has occurred during the life of a call.

The progress indicator information element is coded as shown in figure 11.5.4.23 and Table 11.5.4.27.

The progress indicator is a type 4 information element with a length of 4 octets.

8	7	6	5	4	3	2	1	
	Progress Indicator IEI							octet 1
length of the progress indicator contents								octet 2
1 ext	coding standard		0 spare	Location				octet 3
1 ext	progress description							octet 4

Figure 11.5.4.22: Progress Indicator Information Element Format

Table 11.5.4.27: Progress Indicator Information Element Coding Standard

Coding standard (octet 3)
Bits

7	6	
0	0	Standardised coding, as described in ITU-T Recommendation Q.931 [43].
0	1	Reserved for other international standards.
1	0	National standard.
1	1	Standard defined for the GSM/system PLMNS as described below

Coding standards other than "1 1 - Standard defined for the GSM/system PLMNS" shall not be used if the progress description can be represented with the GSM standardized coding.

The MES or Network need not support any other coding standard than "1 1 - Standard defined for the GSM PLMNS".
If a progress indicator IE indicating a coding standard not supported by the receiver is received, progress description "Unspecific" shall be assumed.

Location (octet 3)
Bits

4	3	2	1	
0	0	0	0	User
0	0	0	1	Private network serving the local user
0	0	1	0	Public network serving the local user
0	1	0	0	Public network serving the remote user
0	1	0	1	Private network serving the remote user
1	0	1	0	Network beyond the interworking point

All other values are reserved

NOTE: Depending on the location of the users, the local public network and remote public network may be the same network.

Progress description (octet 4)
Bits

7	6	5	4	3	2	1	No.	
0	0	0	0	0	0	1	1.	Call is not end-to-end PLMN/ISDN, further call progress information may be available in-band
0	0	0	0	0	1	0	2.	Destination address in non-PLMN/ISDN
0	0	0	0	0	1	1	3.	Origination address in non-PLMN/ISDN
0	0	0	1	0	0	0	8.	In-band information or appropriate pattern now available
0	1	0	0	0	0	0	32.	Call is end-to-end PLMN/ISDN
All other values								Unspecific

NOTE: Only the value "11" shall be used as the "Coding Standard" value. {GSM standard}

Only the value "0100" shall be used as the "Location" value. {Public network serving the remote user}

11.5.4.22 Repeat indicator

The purpose of the repeat indicator information element is to indicate how the associated repeated information elements shall be interpreted, when included in a message. The repeat indicator information element is included immediately before the first occurrence of the associated information element which will be repeated in a message. "Mode 1" refers to the first occurrence of that information element, "mode 2" refers to the second occurrence of that information element in the same message.

The repeat indicator information element is coded as shown in figure 11.5.4.24 and Table 11.5.4.28.

The repeat indicator is a type 1 information element.

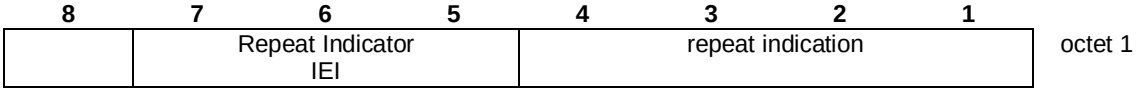

Figure 11.5.4.24: Repeat Indicator Information Element Format

Table 11.5.4.28: Progress Indicator Information Element Coding Standard

Repeat indication (octet 1)				
Bits				
4	**3**	**2**	**1**	
0	0	0	1	Circular for successive selection "mode 1 alternate mode 2"
0	0	1	1	Sequential for successive selection "mode 1 and then mode 2"
All other values are reserved				

11.5.4.22a Reverse call setup direction

This information element may be included in a MODIFY and MODIFY COMPLETE message to indicate that the direction of the data call to which the MODIFY message relates is opposite to the call setup direction.

The reverse call setup direction information element is coded as shown in figure 11.5.4.25.

The reverse call setup direction is a type 2 information element

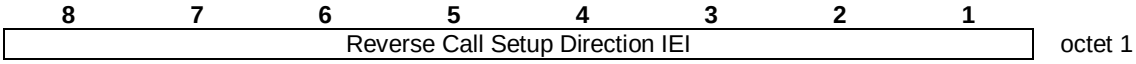

Figure 11.5.4.25: Reverse Call Setup Direction Information Element Format

11.5.4.23 Signal

The purpose of the signal information element is to allow the network to convey information to a user regarding tones and alerting signals (see clauses 6.2.2.3.2 and 8.3.3).

The signal information element is coded as shown in figure 11.5.4.26 and Table 11.5.4.29.

The signal is a type 3 information element with 2 octets length.

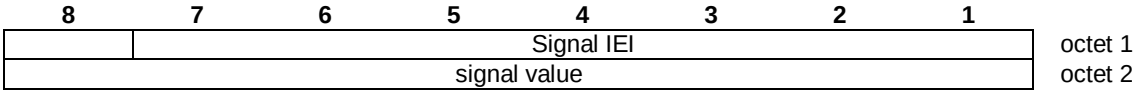

Figure 11.5.4.25: Signal Information Element Format

Table 11.5.4.29: Signal Information Element Coding Standard

Signal value (octet 2) Bits								
8	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
0	0	0	0	0	0	0	0	dial tone on
0	0	0	0	0	0	0	1	ring back tone on
0	0	0	0	0	0	1	0	intercept tone on
0	0	0	0	0	0	1	1	network congestion tone on
0	0	0	0	0	1	0	0	busy tone on
0	0	0	0	0	1	0	1	confirm tone on
0	0	0	0	0	1	1	0	answer tone on
0	0	0	0	0	1	1	1	call waiting tone on
0	0	0	0	1	0	0	0	off-hook warning tone on
0	0	1	1	1	1	1	1	tones off
0	1	0	0	1	1	1	1	alerting off
All other values are reserved								

NOTE: Only the following values shall be used:

"00000001" { intercept tone on}

"00000111" {call waiting tone on}

11.5.4.24 SS version indicator

The purpose of the SS version indicator information element is to aid the decoding of the Facility information element as described in GSM 04.10 [17]. Within the scope of the present document, the contents of the SS Version information field is an array of one or more octets. The usage of the SS version information field is defined in GSM 04.80 [19].

The SS version indicator information element is coded as shown in figure 11.5.4.27.

The SS version indicator is a type 4 information element with a minimum length of 2 octets. No upper length limit is specified except for that given by the maximum number of octets in a L3 message (see GMR-2 04.006 [15]).

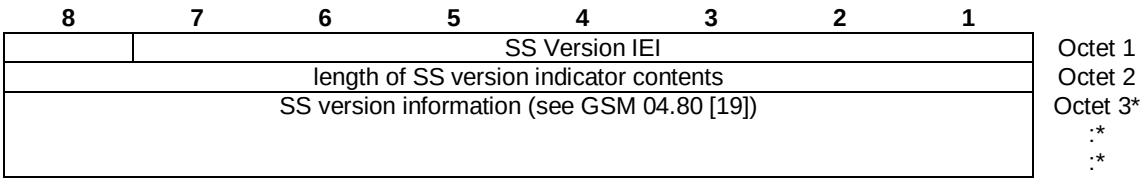

Figure 11.5.4.27: SS Version Information Element Format

NOTE: Usually, this information element has only one octet of content.

11.5.4.25 User-user (Not applicable to current GMR-2 system - specified for future use)

The purpose of the user-user information element is to convey information between the MES and the remote ISDN user.

The user-user information element is coded as shown in figure 11.5.4.28 and Table 11.5.4.30. There are no restrictions on the content of the user-user information field.

The User-User is a type 4 information element with a minimum length of 3 octets and a maximum length of either 35 or 131 octets. In the SETUP, ALERTING, CONNECT, DISCONNECT, RELEASE and RELEASE COMPLETE messages, the user-user information element has a maximum size of 35. In USER INFORMATION messages, the user-user information element has a maximum size of 131 octets.

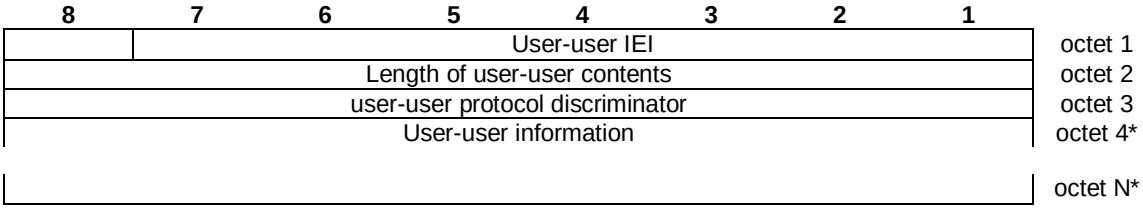

Figure 11.5.4.27: SS Version Information Element Format

Table 11.5.4.29: Signal Information Element Coding Standard

User-user protocol discriminator (octet 3)

Bits 8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	0	User specific protocol (Note 1)
0	0	0	0	0	0	0	1	OSI high layer protocols
0	0	0	0	0	0	1	0	X.244 (Note 2)
0	0	0	0	0	0	1	1	Reserved for system management convergence function
0	0	0	0	0	1	0	0	IAS characters (Note 3)
0	0	0	0	0	1	1	1	Rec. V.120 rate adaption
0	0	0	0	1	0	0	0	Q.931 [43] (I.451) user-network call control messages
0	0	0	1	0	0	0	0	Reserved for other network layer or layer 3 protocols including Rec. X.25 [52]
			through					
0	0	1	1	1	1	1	1	(Note 4)
0	1	0	0	0	0	0	0	Reserved for other network layer or layer 3 protocols including Rec. X.25 [52]
			through					
1	1	1	1	1	1	1	0	(Note 4)

All other values are reserved

NOTE 1: The user information is structured according to user needs.
NOTE 2: The user information is structured according to Rec.X.244 which specifies the structure of X.25 [52] call user data.
NOTE 3: The user information consists of IAS characters.
NOTE 4: These values are reserved to discriminate these protocol discriminators from the first octet of a X.25 [52] packet including general format identifier.

12 List of system parameters

The description of timers in the following tables should be considered a brief summary. The precise details are found in clauses 4 through 7, which should be considered the definitive descriptions.

12.1 Timers

12.1.1 Timers on the Mobile Earth Station side

T3122: This timer is used during random access, after the receipt of an IMMEDIATE ASSIGN REJECT message.

Its value is given by the network in the IMMEDIATE ASSIGN REJECT message.

T3124: NOT USED

T3126: This timer is started either:

after sending the maximum allowed number of CHANNEL REQUEST messages during an immediate assignment procedure;

or

on receipt of an IMMEDIATE ASSIGNMENT REJECT message;

Whichever occurs first.

It is stopped at receipt of an IMMEDIATE ASSIGNMENT message

At its expiration, the immediate assignment procedure is aborted.

The minimum value of this timer is equal to the time taken by T + 2S slots of the MESs S-RACH.

S and T are defined in clause 4.3.1.2. The maximum value of this timer is 5 seconds.

T3110: This timer is used to delay the channel deactivation after the receipt of a (full) CHANNEL RELEASE. Its purpose is to let some time for disconnection of the main signalling link.

Its value is set to such that the DISC frame is sent twice in case of no answer from the network.

(It should be chosen to obtain a good probability of normal termination (i.e., no time out of T3109) of the channel release procedure.)

12.1.2 Timers on the Network side

T3101: This timer is started when a channel is allocated with an IMMEDIATE ASSIGNMENT message. It is stopped when the MES has correctly seized the channels.

Its value is network dependent.

NOTE: It could be higher than the maximum time for a L2 establishment attempt.

T3103: NOT USED.

T3105: NOT USED

T3107: This timer is started by the sending of an ASSIGNMENT COMMAND message and is normally stopped when the MES has correctly seized the new channels.

Its purpose is to keep the old channel sufficiently long for the MES to be able to return to the old channels, and to release the channels if the MES is lost.

Its value is network dependent.

NOTE: It could be higher than the maximum transmission time of the ASSIGNMENT COMMAND message plus twice the maximum duration of an attempt to establish a data link multiframe mode.

T3109: This timer is started when a lower layer failure is detected by the network, when it is not engaged in a RF procedure. It is also used in the channel release procedure.

Its purpose is to release the channels in case of loss of communication.

Its value is network dependent.

Note: Its value should be large enough to ensure that the MES detects a radio link failure.

T3111: This timer is used to delay the channel deactivation after disconnection of the main signalling link. Its purpose is to let some time for possible repetition of the disconnection.

Its value is equal to the value of T3110.

T3113: This timer is started when the network has sent a PAGING REQUEST message and is stopped when the network has received the CHANNEL REQUEST message.

Its value is network dependent.

NOTE: The value could allow for repetitions of the CHANNEL REQUEST message and the requirements associated with T3101.

12.1.3 Other parameters

Ny1: NOT USED

12.2 Timers of Mobility Management

Table 12.2.1: Mobility Management Timers – MES side

TIMER NUM.	MM STATE	TIME OUT VALUE	CAUSE FOR START	NORMAL STOP	AT THE EXPIRATION
T3210	3	20 s	- LOC_UPD_REQ sent	- LOC_UPD_ACC - LOC_UPD_REJ - AUTH_REJ - Lower layer failure	Start T3211
T3211	1, 2	15 s	- LOC_UPD_REJ with cause #17 network failure - lower layer failure or RR conn. released after RR conn. Abort during loc. updating	- Time out - spotbeam change - request for MM connection establishment - change of LA	Restart the Location up-date procedure
T3212	1, 2	Note	- termination of MM service or MM signalling	- initiation of MM service or MM signalling	initiate periodic updating
T3213	1, 2, 11	4 s	- location up-dating failure	- expiry - change of S-BCCH parameter	new random attempt
T3220	7	5 s	Reserved		
T3230	5	15 s	- CM_SERV_REQ	- Cipher mode setting - CM_SERV_REJ - CM_SERV_ACC	provide release ind.
T3240	9, 10	10 s	see clause 12.2.1	clause 12.2.1	abort the RR connection
NOTE: the time-out value is broadcast in a SYSTEM INFORMATION message					

Table 12.2.2: Mobility Management Timers – Network Side

TIMER NUM.	MM STATE	TIME OUT VALUE	CAUSE FOR START	NORMAL STOP	AT THE FIRST EXPIRATION	AT THE SECOND EXPIRATION
T3250	6	5 s	Reserved			
T3255		Note	LOC_UPD_ACC sent with "Follow on Proceed"	CM SERVICE REQUEST	Release RR connection or use for mobile station terminating call	
T3260	5	5 s	AUTHENT REQUEST sent	AUTHENT RESPONSE received	optionally release RR connection	
T3270	4	5 s	IDENTITY REQUEST sent	IDENTITY RESPONSE received	Optionally release RR connection	
NOTE: The value of this timer is not specified by this recommendation						

12.2.1 Timer T3240

Timer T3240 is started in the MES when:

a) The MES receives a LOCATION UPDATING ACCEPT message completing a location updating procedure in the cases specified in clauses 5.4.4.6 and 5.4.4.8;

b) The MES receives a LOCATION UPDATING REJECT message in the cases specified in clause 5.4.4.7;

c) The MES has sent a CM SERVICE ABORT message as specified in clause 5.5.1.7;

d) The MES has released or aborted all MM connections in the cases specified in clauses 5.3.2.5, 5.3.5.2, 5.5.1.1, and 5.5.3.1.

Timer T3240 is stopped, reset, and started again at receipt of an MM message.

Timer T3240 is stopped and reset (but not started) at receipt of a CM message that initiates establishment of an CM connection (an appropriate SETUP, REGISTER, or CP-DATA message as defined in the present document, GSM 04.10 [17] or GSM 04.11 [18]).

12.3 Timers of Circuit-Switched Call Control

Table 12.3.1: Call Control Timers – MES Side

TIM. NUM.	TIM VAL	STATE OF CALL	CAUSE OF START	NORMAL STOP	AT FIRST EXPIRATION	AT SECOND EXPIRATION
T303	30 s	CALL INITIATED	CM SER RQ sent	CALL PROC, or REL COMP received	Clear the call	Timer is not restarted
T305	30 s	Disconnect Request	DISC sent	REL or DISC received	REL sent	Timer is not restarted
T308	30 s	Release request	REL sent	REL COMP or REL received	Retrans. RELEASE restart T308	Call ref. Release
T310 Note	30 s	Outgoing call Proceeding	CALL PROC received	ALERT,CONN, DISC or PROG rec.	Send DISC	Timer is not restarted
T313	30 s	Connect Request	CONN sent	CONNect ACKnowledge received	Send DISC	Timer is not restarted
T323	30 s	Modify Request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
NOTE: T310 is not started if progress indicator #1 or #2 has been delivered in the CALL PROCEEDING message or in a previous PROGRESS message.						

Table 12.3.2: Call Control Timers – Network Side

TIM. NUM.	DFT TIM VAL	STATE OF CALL	CAUSE OF START	NORMAL STOP	AT FIRST EXPIRATION	AT SECOND EXPIRATION
T301 Note 1	Min 180 s	Call received	ALERT received	CONN received	Clear the call	Timer is not restarted
T303	Note 2 15s	Call present	SETUP sent	CALL CONF or REL COMP received	Clear the call	Timer is not restarted
T305	30 s	Disconnect Indication	DISC without progress indic. #8 sent	REL or DISC received	Network sends RELEASE	Timer is not restarted
T306	30 s	Disconnect Indication	DISC with progress indic. #8 sent	REL or DISC received	Stop the tone/ announc. Send REL	Timer is not restarted
T308	Note 2 15 s	Release request	REL sent	REL COMP or REL received	Retrans RELEASE restart T308	Release call reference
T310	Note 2 25 s	Incoming call proceeding	CALL CONF received	ALERT, CONN or DISC received	Clear the call	Timer is not restarted
T313	Note 2 15 s	Connect Indication	CON sent	CON ACK received	Clear the call	Timer is not restarted
T322	5 s	See clause 6.5.3.1				
T323	30 s	Modify request	MOD sent	MOD COMP or MOD REJ received	Clear the call	Timer is not restarted
NOTE 1: The network may already have applied an internal alerting supervision function, e.g., incorporated within call control. If such a function is known to be operating on the call, then timer T301 is not used. NOTE 2: These time values are set by the network operator. General: The MSC starts on MM connection establishment a timer for 10s (OCT1) while it waits for the reception of the SETUP message.						

Annex A (informative): Example of subaddress information element coding

This annex gives an example of how the Called Party Subaddress IE is encoded to carry subaddress digits that use IA5 characters. This example is also applicable to the Calling Party Subaddress IE.

8	7	6	5	4	3	2	1	
0	1	1	0	1	1	0	1	octet 1
			Called Party Subaddress IEI					
0	0	0	0	0	1	1	1	octet 2
			Length					
1 not ext	0	0	0	X odd/even Note 1	0	0	0	octet 3
	NASP (X.213/ISO 8348 AD2 [33])				Note 2			
0	1	0	1	0	0	0	0	octet 4
			AFI (Note 3)					
IA5 Character (Note 4)								octet 5
IA5 Character (Note 4)								octet 6
IA5 Character (Note 4)								octet 9 (Note 5)

NOTE 1: The value of this bit has no significance when the type of subaddress is NSAP".

NOTE 2: These bits are spare.

NOTE 3: The Authority and Format Identifier code 50 (in BCD) indicates that the subaddress consists of IA5 characters (see ISO standard 8348 AD2 [33]).

NOTE 4: IA5 character as defined in ITU-T Recommendation T.50 [42]/ISO 646 [31] and then encoded into two semi-octets according to the "preferred binary encoding" defined in X.213/ISO 8348 AD2 [33]. (Each character is converted into a number in the range 32 to 127 using the ISO 646 [31] encoding with zero parity and the parity bit in the most significant position. This number is then reduced by 32 to give a new number in the range 0 to 95. The new number is then treated as a pair of decimal digits with the value of each digit being encoded in a semi-octet.)

NOTE 5: The number of IA5 characters in the subaddress may vary, subject to an upper limit of 19 IA5 characters.

Annex B (normative): Compatibility Checking

B.1 Introduction

This annex describes the various compatibility checks which shall be carried out to ensure that the best matched MES and network capabilities are achieved on a call between a Gateway and the ISDN.

Three different processes of compatibility checking shall be performed:

a) At the user-to-network interface on the calling side (see clause B.2);

b) At the network-user interface on the called side (see clause B.3.2);

c) User-to-user (see clause B 3.3).

NOTE: In this context, and throughout this annex, the term "called user" is the end point entity which is explicitly addressed.

For details on the coding of the information required for compatibility checking, see Annex C.

B.2 Calling Side Compatibility Checking

B.2.1 Compatibility Checking of the CM SERVICE REQUEST Message

The network shall check if the service requested in the CM SERVICE REQUEST message is permitted for that subscriber.

B.2.2 Compatibility Subscription Checking of the SETUP Message

At the calling side, the network shall check that the basic service(s) requested by the calling MES in the Bearer Capability information element(s) match(es) with the basic services provided to that subscriber by the Gateway. If for at least one bearer capability information element contained in the SETUP message a mismatch is detected, then the network shall proceed as follows:

a) If the SETUP message contained two bearer capability information elements for only one of which a mismatch is detected, the network shall either:

   i) Under the conditions specified in GSM 07.01 [28], accept the SETUP message with a CALL PROCEEDING message containing the, possibly negotiated, bearer capability information element for which no mismatch is detected;

   ii) Reject the call using one of the causes listed in Annex H.

b) Otherwise the network shall reject the call using one of the causes listed in Annex H.

Network services are described in GMR-2 02.002 [2] and GMR-2 02.003 [3] as bearer services and teleservices, respectively.

B.3 Called Side Compatibility Checking

In this clause, the word "check" means that the MES examines the contents of the specified information element.

B.3.1 Compatibility Checking with Addressing Information

If an incoming SETUP message is offered to the MES with addressing information (i.e., sub-address or called party number), the following shall occur:

a) If the MES has a DDl number or a sub-address, then the information in any Called Party BCD Number or any Called Party subaddress information elements of the incoming SETUP message shall be checked by the MES against the corresponding part of the number assigned to the user (e.g., for DDI) or the user's own sub-address.

   In the cases of a mismatch, the MES shall release the call. In the case of a match, the compatibility checking described in clauses B.3.2 and B.3.3 shall be performed.

b) If the MES has no DDl number and no sub-address, then the Called Party BCD Number and Called Party subaddress information element shall be ignored for the purposes of compatibility checking. The compatibility checking described in clauses B.3.2 and B.3.3 shall be performed.

NOTE: According to the user's requirements, compatibility checking can be performed in various ways from the viewpoint of execution order and information to be checked, e.g., first DDI number/sub-address and then bearer capability or vice versa.

B.3.2 Network-to-MES Compatibility Checking

When the network is providing a basic service at the called side, the MES shall check that the basic service(s) offered by the network in the Bearer Capability information element(s) match(es) the basic services that the MES is able to support. If a mismatch is detected, then the MES shall proceed as follows:

a) If the SETUP message contained two bearer capability information elements for only one of which a mismatch is detected, the MES shall either:

   i) Under the conditions specified in GSM 07.01 [28], accept the SETUP message with a CALL CONFIRMED message containing the, possibly negotiated, bearer capability information element for which no mismatch is detected;

   ii) Reject the call using cause No. 88 "incompatible destination"

b) Otherwise the MES shall reject the offered call using a RELEASE COMPLETE message with cause No. 88 "incompatible destination".

When interworking with existing networks, limitations in network or distant user signalling (e.g., in the case of an incoming call from a PSTN or a call from an analogue terminal) may restrict the information available to the called MES in the incoming SETUP message (e.g., missing Bearer Capability Information Element or missing High Layer Compatibility Information Element). For compatibility checking, and handling of such calls see GSM 07.01 [28].

B.3.3 User-to-User Compatibility Checking

See GSM 07.01 [28].

B.4 High Layer Compatibility Checking

See GSM 07.01 [28].

Annex C (normative): Low layer information coding principles

C.1 Purpose

This annex describes principles that shall be used when the calling MES specifies information during call setup regarding low layer capabilities required in the network and by the destination terminal. Refer also to GSM 07.01 [28].

NOTE: In this context, and throughout this annex, the term "called user" is the end point entity which is explicitly addressed. This may also be an explicitly addressed interworking unit (lWU) (see ITU-T Recommendation I.500-Series Recommendations and ITU-T Recommendation X.31 [55] case a).

C.2 Principles

C.2.1 Definition of Types of Information

There are three different types of information that the calling user may specify during call setup to identify low layer capabilities needed in the network and in the destination terminal:

a) Type I information is information about the calling terminal which is only used at the destination end to allow a decision regarding terminal compatibility. An example would be the user information layer 3 protocol. Type I information is encoded in octets 5 to 7 of the low layer compatibility information element;

b) Type II information is only used by the network to which the calling user is connected for selection of specific network resources, e.g., channel type or specific functionality within the interworking function (IWF, see GSM 09.07 [30]). This type of information is always present. An example is the connection element. Type II information is coded in:

   i) Octet 3 of the bearer capability information element when the information transfer capability required by the calling user is speech;

   ii) Octets 3, 4, 5, and optionally octet 7 of the bearer capability information element when the information transfer capability required by the calling user is not speech;

c) Type III information is required for selection of a basic service from the choice of basic services offered by the network and together with type II information for selection of an appropriate interworking function (lWF, see GSM 09.07 [30]), as well as for terminal compatibility checking at the destination terminal. An example is the information transfer capability. Type Ill information is always present and is encoded in:

   i) Octet 3 of the bearer capability information element when the information transfer capability required by the calling user is speech;

   ii) Octets 3, 5, 6, 6a, 6b and 6c of the bearer capability information element when the information transfer capability required by the calling user is not speech.

C.2.2 Examination by Network

Type I information is user-to-user (i.e., at the calling side not examined by network) while type II and Ill information should be available for examination by the destination user and the network.

NOTE: In the case of a mobile terminated call, if the type II and type Ill information is not sufficient for the selection of an appropriate interworking function, the type I information will also examined by the network.

C.2.3 Location of Type I Information

Type I information (i.e., terminal information only significant to the called user) shall, when used, be included in the low layer compatibility information element.

C.2.4 Location of Types II and Ill Information

Type II information is included in the bearer capability information element. Type III information is also included in the bearer capability information element. The network may use and modify type Ill information (e.g., to provide interworking).

In any case, a modification of the bearer capability information element has to be performed when interworking to the fixed network (e.g., ISDN) is required, where the signalling of the radio interface has to be mapped to fixed network signalling (e.g., mapping of GSM BClE to ISDN BCIE, see GSM 09.07 [30]).

C.2.5 Relationship Between Bearer Capability and Low Layer Compatibility Information Elements

There shall be no contradiction of information between the low layer compatibility and the bearer capability at the originating side. However, as some bearer capability code points may be modified during the transport of the call (e.g., by the interworking function). This principle implies that there should be minimal duplication of information between the bearer capability information element and the low layer compatibility information element.

NOTE: If as a result of duplication, a contradiction occurs at the terminating side between the bearer capability information element and the low layer compatibility information element at the terminating side, the receiving entity shall ignore the conflicting information in the low layer compatibility information element.

Annex D (informative): Examples of bearer capability information element coding

This annex does not apply to the GMR-2 system.

Annex E (informative): Comparison between call control procedures specified in GMR-2 04.008 and ITU-T Recommendation Q.931

This annex does not apply to the GMR-2 system.

Annex F (informative): Specific cause values for Radio Resource Management

Cause value = 0 Normal event:

indicates that the channel is released because of a normal event or that an assignment or handover is successfully, and normally, completed.

Cause value = 1 Abnormal release, unspecified:

indicates that the channel is released because of an abnormal event without specifying further reasons.

Cause value = 2 Abnormal release, channel unacceptable:

indicates that the channel type or channel characteristics are not acceptable.

Cause value = 3 Abnormal release, timer expired:

indicates that the release is caused by a timer expiration.

Cause value = 4 Abnormal release, no activity on the radio path:

indicates that some supervisory function has detected that the channel is not active.

Cause value = 5 Preemptive release:

indicates that the channel is released in order to be allocated to a call with priority (e.g., an emergency call).

Cause value = 8 Local Transmit Disable:

Indicates the network has issued a MES Transmit Disable in response to a local interference complaint from another system operating in the same frequency band.

Cause value = 9 Channel mode unacceptable:

indicates that the MES does not have the capability to handle the requested mode or type of channel

Cause value = 10 Frequency not implements:

indicates that the MES does not have the capability to operate on (at least one of) the requested frequency(ies).

Cause value = 65 Call already cleared:

indicates that a handover is unsuccessful because the connection has been released by the network or the remote user.

Cause value = 95 Semantically incorrect message:

See Annex H, clause H5.10.

Cause value = 96 Invalid mandatory information:

See Annex H, clause H6.1.

Cause value = 97 Message type nonexistent or not implemented:

See Annex H, clause H6.2.

Cause value = 98 Message type not compatible with protocol state:

See Annex H, clause H6.3.

Cause value = 100 Conditional lE error:

See Annex H, clause H6.5.

Cause value = 101 No spotbeam allocation available:

indicates that an assignment or handover is unsuccessful because the MES has no current CA.

Cause value = 111 Protocol error unspecified:

See Annex H, clause H6.8.

Annex G (Informative): Specific cause values for Mobility Management

G.1 Causes Related to Mobile Earth Station Identification

Cause value = 2 IMSI unknown in HLR:

This cause is sent to the MES if the MES is not known (registered) in the HLR.

Cause value = 3 Illegal MES:

This cause is sent to the MES when the network refuses service to the MES either because an identity of the MES is not acceptable to the network or because the MES does not pass the authentication check, i.e., the SRES received from the MES is different from that generated by the network.

Cause value = 4 IMSI unknown in VLR:

This cause is sent to the MES when the given IMSI is not known at the VLR.

Cause value = 5 IMEl not accepted:

This cause is sent to the MES if the network does not accept emergency call establishment using an IMEl.

Cause value = 6 Illegal ME-MES:

This cause is sent to the MES if the ME-MES used is not acceptable to the network, e.g., blacklisted.

G.2 Causes Related to Subscription Options

Cause value = 8 Local Transmit Disable:

This cause is sent to the MES when the network receives a request to limit MES transmissions at a selected location to limit interference into other systems operating in the same frequency band.

Cause value = 11 PLMN not allowed:

This cause is sent to the MES if it requests location updating in a PLMN where the MES, by subscription or due to operator determined barring, is not allowed to operate.

Cause value = 12 Location Area not allowed:

This cause is sent to the MES if it requests location updating in a location area where the MES, by subscription, is not allowed to operate.

Cause value = 13 National roaming not allowed in this location area:

This cause is sent to an MES which requests location updating in a location area of a PLMN which offers national roaming to that MES, but not in that specific location area.

G.3 Causes Related to PLMN Specific Network Failures and Congestion

Cause value = 17 Network failure:

This cause is sent to the MES if the MSC cannot service an MES generated request because of PLMN failures, e.g. problems in MAP.

Cause value = 22 Congestion:

This cause is sent if the service request cannot be actioned because of congestion (e.g., no channel, facility busy/congested etc.).

G.4 Causes Related to Nature of Request

Cause value = 32 Service option not supported:

This cause is sent when the MES requests a service/facility in the CM SERVICE REQUEST message which is not supported by the PLMN.

Cause value = 33 Requested service option not subscribed:

This cause is sent when the MES requests a service option for which it has no subscription.

Cause value = 34 Service option temporarily out of order:

This cause is sent when the MSC cannot service the request because of temporary outage of one or more functions required for supporting the service.

Cause value = 38 Call cannot be identified:

This cause is sent when the network cannot identify the call associated with a call re-establishment request.

G.5 Causes Related to Invalid Messages

Cause value = 95 Semantically incorrect message:

See Annex H, clause H.5.10.

Cause value = 96 Invalid mandatory information:

See Annex H, clause H.6.1.

Cause value = 97 Message type non-existent or not implemented:

See Annex H, clause H.6.2.

Cause value = 98 Message not compatible with protocol state:

See Annex H, clause H.6.3.

Cause value = 99 Information element non-existent or not implemented:

See Annex H, clause H.6.4.

Cause value = 100 Conditional IE error:

See Annex H, clause H.6.5.

Cause value = 101 Message not compatible with protocol state:

See Annex H, clause H.6.6.

Cause value = 111 Protocol error, unspecified:

See Annex H, clause H.6.8.

Annex H (informative): Specific cause values for Call Control

H.1 Normal Class

H.1.1 Cause No. 1 "Unassigned (Unallocated) Number"

This cause indicates that the destination requested by the User Terminal cannot be reached because, although the number is in a valid format, it is not currently assigned (allocated).

H.1.2 Cause No. 3 "No Route To Destination"

This cause indicates that the called user cannot be reached because the network through which the call has been routed does not serve the destination desired.

H.1.3 Cause No. 6 "Channel Unacceptable"

This cause indicates the channel most recently identified is not acceptable to the sending entity for use in this call.

H.1.4 Cause No. 8 "Operator Determined Barring"

This cause indicates that the MES has tried to access a service that the MESs network operator or service provider is not prepared to allow.

H.1.5 Cause No. 16 "Normal Call Clearing"

This cause indicates that the call is being cleared because one of the users involved in the call has requested that the call be cleared.

Under normal situations, the source of this cause is not the network.

H.1.6 Cause No. 17 "User Busy"

This cause is used when the called user has indicated the inability to accept another call.

It is noted that the user equipment is compatible with the call.

H.1.7 Cause No. 18 "No User Responding"

This cause is used when a user does not respond to a call establishment message with either an alerting or connect indication within the prescribed period of time allocated (defined by the expiration of either timer T303 or T310).

H.1.8 Cause No. 19 "User Alerting, No Answer"

This cause is used when a user has provided an alerting indication but has not provided a connect indication within a prescribed period of time.

H.1.9 Cause No. 21 "Call Rejected"

This cause indicates that the equipment sending this cause does not wish to accept this call, although it could have accepted the call because the equipment sending this cause is neither busy nor incompatible.

H.1.10 Cause No. 22 "Number Changed"

This cause is returned to a calling MES when the called party number indicated by the calling MES is no longer assigned. The new called party number may optionally be included in the diagnostic field. If a network does not support this capability, cause No. 1 "unassigned (unallocated) number" shall be used.

H.1.11 Cause No. 26 "Non-Selected User Clearing"

Not supported. Treated as cause no. 31.

H.1.12 Cause No. 27 "Destination Out Of Order"

This cause indicates that the destination indicated by the MES cannot be reached because the interface to the destination is not functioning correctly. The term "not functioning correctly" indicates that a signalling message was unable to be delivered to the remote user, e.g., a physical layer or data link layer failure at the remote user, user equipment off-line, etc.

H.1.13 Cause No. 28 "Invalid Number Format (Incomplete Number)"

This cause indicates that the called user cannot be reached because the called party number is not a valid format or is not complete.

H.1.14 Cause No. 29 "Facility Rejected"

This cause is returned when a facility requested by user can not be provided by the network.

H.1.15 Cause No. 30 "Response To STATUS ENQUIRY"

This cause is included in STATUS messages if the message is sent in response to a STATUS ENQUIRY message. See also clause 6.5.3.

H.1.16 Cause No. 31 "Normal, Unspecified"

This cause is used to report a normal event only when no other cause in the normal class applies.

H.2 Resource Unavailable Class

H.2.1 Cause No. 34 "No Circuit/Channel Available"

This cause indicates that there is no appropriate circuit/channel presently available to handle the call.

H.2.2 Cause No. 38 "Network Out of Order"

This cause indicates that the network is not functioning correctly and that the condition is likely to last a relatively long period of time; e.g., immediately re-attempting the call is not likely to be successful.

H.2.3 Cause No. 41 "Temporary Failure"

This cause indicates that the network is not functioning correctly and that the condition is not likely to last a long period of time, e.g., the MES may wish to try another call attempt almost immediately.

H.2.4 Cause No. 42 "Switching Equipment Congestion"

This cause indicates that the switching equipment generating this cause is experiencing a period of high traffic.

H.2.5 Cause No. 43 "Access Information Discarded"

This cause indicates that the network could not deliver access information to the remote user as requested, i.e., a user-to-user information, low layer compatibility, high layer compatibility, or sub-address as indicated in the diagnostic.

It is noted that the particular type of access information discarded is optionally included in the diagnostic.

H.2.6 Cause No. 44 "Requested Circuit/Channel Not Available"

This cause is returned when the circuit or channel indicated by the requesting entity cannot be provided by the other side of the interface.

H.2.7 Cause No. 47 "Resource Unavailable, Unspecified"

This cause is used to report a resource unavailable event only when no other cause in the resource unavailable class applies.

H.3 Service or Option Not Available Class

H.3.1 Cause No. 49 "Quality of Service Unavailable"

This cause indicates to the User Terminal that the requested quality of service, as defined in ITU-T Recommendation X.21 [51], cannot be provided.

H.3.2 Cause No. 50 "Requested Facility Not Subscribed"

This cause indicates that the requested supplementary service could not be provided by the network because the user has no completed the necessary administrative arrangements with its supporting networks.

H.3.3 Cause No. 55 "Incoming Calls Barred within the CUG"

This cause indicates that although the called party is a member of the CUG for the incoming CUG call, incoming calls are not allowed within this CUG.

H.3.4 Cause No. 57 "Bearer Capability Not Authorized"

This cause indicates that the MES has requested a bearer capability which is implemented by the equipment which generated this cause but the MES is not authorized to use.

H.3.5 Cause No. 58 "Bearer Capability Not Presently Available"

This cause indicates that the MES has requested a bearer capability which is implemented by the equipment which generated this cause but which is not available at this time.

H.3.6 Cause No. 63 "Service or Option Not Available, Unspecified"

This cause is used to report a service or option not available event only when no other cause in the service or option not available class applies.

H.3.7 Cause No. 68 "ACM Equal To or Greater Than ACMmax"

This cause is used by the mobile to indicate that call clearing is due to ACM being greater than or equal to ACMmax.

H.4 Service or Option Not Implemented Class

H.4.1 Cause No. 65 "Bearer Service Not Implemented"

This cause indicates that the equipment sending this cause does not support the bearer capability requested.

H.4.2 Cause No. 69 "Requested Facility Not Implemented"

This cause indicates that the equipment sending this cause does not support the requested supplementary service.

H.4.3 Cause No. 70 "Only Restricted Digital Information Bearer Capability Is Available"

This cause indicates that one equipment has requested an unrestricted bearer service, but that the equipment sending this cause only supports the restricted version of the requested bearer capability.

H.4.4 Cause No. 79 "Service or Option Not Implemented, Unspecified"

This cause is used to report a service or option not implemented event only when no other cause in the service or option not implemented class applies.

H.5 Invalid Message (e.g., Parameter Out of Range) Class

H.5.1 Cause No. 81 "Invalid Transaction Identifier Value"

This cause indicates that the equipment sending this cause has received a message with a transaction identifier which is not currently in use on the MES-Network interface.

H.5.2 Cause No. 87 "User Not Member of CUG"

This cause indicates that the called user for the incoming CUG call is not a member of the specified CUG.

H.5.3 Cause No. 88 "Incompatible Destination"

This cause indicates that the equipment sending this cause has received a request to establish a call which has low layer compatibility, high layer compatibility, or other compatibility attributes (e.g., data rate) which cannot be accommodated.

H.5.4 Cause No. 91 "Invalid Transit Network Selection"

For further study. Treated as cause no. 95.

H.5.5 Cause No. 95 "Semantically Incorrect Message

This cause is used to report receipt of a message with semantically incorrect contents (see clause 9.8).

H.6 Protocol Error (e.g., Unknown Message) Class

H.6.1 Cause No. 96 "Invalid Mandatory Information"

This cause indicates that the equipment sending this cause has received a message with a non-semantical mandatory lE error (see clause 9.5).

H.6.2 Cause No. 97 "Message Type Non-Existent or Not Implemented"

This cause indicates that the equipment sending this cause has received a message with a message type it does not recognize either because this is a message not defined, or defined but not implemented by the equipment sending this cause.

H.6.3 Cause No. 98 "Message Type Not Compatible With Protocol State"

This cause indicates that the equipment sending this cause has received a message not compatible with the protocol state (see clause 9.4).

H.6.4 Cause No. 99 "Information Element Non-Existent or Not Implemented"

This cause indicates that the equipment sending this cause has received a message which includes information elements not recognized because the information element identifier is not defined or it is defined but not implemented by the equipment sending the cause. However, the information element is not required to be present in the message in order for the equipment sending the cause to process the message.

H.6.5 Cause No. 100 "Conditional IE Error"

This cause indicates that the equipment sending this cause has received a message with conditional lE errors (see clause 9.7.2).

H.6.6 Cause No. 101 "Message Not Compatible With Protocol State"

This cause indicates that a message has been received which is incompatible with the protocol state or that a STATUS message has been received indicating an incompatible call state.

H.6.7 Cause No. 102 "Recovery On Timer Expiry"

This cause indicates that a procedure has been initiated by the expiration of a timer in association with GMR-2 error handling procedures.

H.6.8 Cause No. 111 "Protocol Error, Unspecified"

This cause is used to report a protocol error event only when no other cause in the protocol error class applies.

H.7 Interworking Class

H.7.1 Cause No. 127 "Interworking, Unspecified"

This cause indicates that there has been interworking with a network which does not provide causes for actions it takes; thus, the precise cause for a message which is being sent cannot be ascertained.

History

Document history		
V1.1.1	March 2001	Publication