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Technical Specification

Digital cellular telecommunications system (Phase 2+);
Location Services (LCS);
Serving Mobile Location Centre – Base Station System (SMLC-BSS) interface
Layer 3 specification
(GSM 08.71 version 7.0.0 Release 1998)

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Contents

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Foreword

This Technical Specification (TS) has been produced by the Special Mobile Group (SMG).

The present document defines the coding of information necessary for support of location service operation on the SMLC-BSS interface layer 3 within the digital cellular telecommunications system.

The contents of the present document are subject to continuing work within SMG and T1P1 and may change following formal SMG and T1P1 approval. Should SMG or T1P1 modify the contents of the present document it will then be re-issued with an identifying change of release date and an increase in version number as follows:

Version 7.x.y

where:

7 GSM Phase 2+ Release 1998;

x the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.;

y the third digit is incremented when editorial only changes have been incorporated in the specification.

1 Scope

The present document contains the coding of information necessary for support of location service operation on the SMLC-BSS interface layer 3.

Clause 2 gives the functional definitions and contents of messages for location service operations. Clause 3 gives the general format and coding for messages used for location service and the format and coding of information elements used for location service operations.

1.1 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, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 03.71: ” Digital cellular telecommunications system (Phase 2+); Location Services (LCS); (Functional description) - Stage 2”

[3] GSM 04.07: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface signalling layer 3; General aspects".

[4] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[5] GSM 05.08: "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control".

[6] GSM 08.08: ” Digital cellular telecommunications system (Phase 2+); Mobile-services Switching Centre – Base Station System (MSC-BSS) interface; Layer 3 specification”

[7] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

1.2 Abbreviations

Abbreviations used in the present document are listed in GSM 01.04.

2 Messages functional definitions and contents

2.1 General

This clause defines the structure of the messages of the SMLC-BSS layer 3 protocol defined in GSM 03.71.

Each definition includes:

a) a brief description of the message;

b) a table listing the information elements in the order of their appearance in the message.

For each IE the table indicates:

1) the name of the IE (which gives an idea of the semantics of the element), which is used in this and other specifications as a reference to the IE within the message;

2) the name of the type of the IE (which indicates the coding of the value part of the IE), and a reference to a description of the value part of the IE;

3) the presence requirement indication (M, C or O) for the IE, as defined in GSM 04.07;

4) the format of the IE (T, V, TV, LV, TLV) as defined in GSM 04.07;

5) the length of the IE (or permissible range of lengths), in octets, in the message.

c) subclauses specifying conditions for IEs with presence requirement C or O in the relevant message. Together with other conditions specified in GSM 03.71 this defines when the IE 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 GSM 03.71).

2.2 Messages

The following Location Services related messages are exchanged between the SMLC and the BSS, with the VMSC acting as a relay.

1. TA Request
2. TA Response
3. TOA Request
4. TOA Response
5. TOA Reject
6. TOA Reset
7. TOA Abort
8. TOA Resume

On the A interface the messages are contained in the Location Information IE which is encapsulated in the BSSMAP Location Information Command and Location Information Report messages as specified in GSM 08.08. On the Ls interface the messages are contained in the Location Information parameter which is encapsulated in the MAP LCS Information Request and MAP LCS Information Report messages as specified in GSM 09.02.

2.2.1 TA Request

The TA Request is a message from the SMLC to the BSS, requesting BSS to return the timing advance (or access delay) of the MS.

Table 2.1: TA Request message content.

Information element	*Type/Reference*	*Presence*	*Format*	*Length*
Message Type	Message Type IE 3.1	M	V	1

2.2.2 TA Response

The TA Response is a message from the BSS to the SMLC. It is a response to TA Request message and contains the following information elements.

Table 2.2: TA Response message content.

Information element	*Type/Reference*	*Presence*	*Format*	*Length*
Message Type	Message Type IE 3.1	M	V	1
Serving Cell Identity	Cell Identity IE 3.4	M	TV	3
Timing Advance	Timing Advance IE 3.2	M	TV	2
Measurement Report	Measurement Report IE 3.12	O	TV	17

2.2.3 TOA Request

The TOA Request is a message from the SMLC to the BSS. It contains the following information elements.

Table 2.3: TOA Request message content

Information element	*Type/Reference*	*Presence*	*Format*	*Length*
Message Type	Message Type IE 3.1	M	V	1
Delta Timer	Delta Timer IE 3.13	O	TV	2
Handover Type	Handover Type IE 3.3	M	TV	2
Serving Cell Identity	Cell Identity IE 3.4	M	TV	3
Serving Starting Time	Starting Time IE 3.5	M	TV	3
Neighbor Cell Identity	Neighbor Cell Identity IE 3.6	O	TLV	4-n
Neighbor Starting Time	Neighbor Starting Time IE 3.7	O	TLV	4-n

2.2.4 TOA Acknowledge

The TOA Response is a message from the BSS to the SMLC. It is a response to the TOA Request message. It contains the following information elements.

Table 2.4: TOA Response message content

Information element	*Type/Reference*	*Presence*	*Format*	*Length*
Message Type	Message Type IE 3.1	M	V	1
Channel Description	Channel Description IE 3.8	M	TV	4
Frequency List	Frequency List IE 3.9	M	TLV	3-n
Handover Reference	Handover Reference IE 3.10	M	TV	2
Target Cell Identity	Cell Identity IE 3.4	M	TV	3
Serving Cell Identity	Cell Identity IE 3.4	M	TV	4
Timing Advance	Timing Advance IE 3.2	M	TV	2
MS Power	MS Power IE 3.11	M	TV	2
Measurement Report	Measurement Report IE 3.12	O	TV	17

2.2.5 TOA Reject

The TOA Reject is a message from the BSS to the SMLC. It is a response to TOA Request message and contains the following information elements.

Table 2.5: TOA Reject message content

Information element	*Type/Reference*	*Presence*	*Format*	*Length*
Message Type	Message Type IE 3.1	M	V	1
Cause	Cause IE 3.14	M	TV	2

2.2.6 TOA Reset

The TOA Reset is a message from the BSS to the SMLC. It is sent when the TOA Response message contents are invalidated (e.g. due to handover) before the positioning procedure was completed.

Table 2.6: TOA Reset message content

Information element	*Type/Reference*	*Presence*	*Format*	*Length*
Message Type	Message Type IE 3.1	M	V	1
Cause	Cause IE 3.14	M	TV	2

2.2.7 TOA Resume

The TOA Resume is a message from the BSS to the SMLC. It is sent when an event (e.g. handover) temporary stopping the positioning procedure was completed and signals that the procedure can be restarted from the SMLC. It contains the following information elements.

Table 2.7: TOA Resume message content

Information element	*Type/Reference*	*Presence*	*Format*	*Length*
Message Type	Message Type IE 3.1	M	V	1
Cell ID	Cell Identity IE 3.4	O	TV	3
Timing Advance	Timing Advance IE 3.2	O	TV	2
Measurement Report	Measurement Report IE 3.12	O	TV	17

2.2.8 TOA Abort

The TOA Abort is a message from the SMLC to the BSS. It signals that BSS shall abort any ongoing positioning procedure.

Table 2.8: TOA Abort message content

Information element	*Type/Reference*	*Presence*	*Format*	*Length*
Message Type	Message Type IE 3.1	M	V	1

3 Information element encodings

This paragraph contains the coding of the signalling elements used.

The following conventions are assumed for the sequence of transmission of bits and bytes:

- Each bit position is marked as 1 to 8. Bit 1 is the least significant bit and is transmitted first.
- In an element octets are identified by number, octet 1 is transmitted first, then octet 2 etc.

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.

- For variable length elements a length indicator is included, this indicates the number of octets following in the element.
- All fields within Information Elements are mandatory unless otherwise specified. The Information Element Identifier shall always be included.

All spare bits are set to 0.

The elements used and their coding are:

Element Identifier Coding	Element name	Reference
0000 0001	Timing Advance	3.2
0000 1000	Handover Type	3.3
0000 1001	Cell Identity	3.4
0000 1010	Starting Time	3.5
0000 1011	Neighbor Cell Identity	3.6
0000 1100	Neighbor Starting Time	3.7
0001 0000	Channel Description	3.8
0001 0001	Frequency List	3.9
0001 0010	Handover Reference	3.10
0001 0011	MS Power	3.11
0001 0100	Measurement Report	3.12
0001 0101	Delta Timer	3.13
0001 1000	Cause	3.14

All unassigned codes are spare.

3.1 Message Type IE

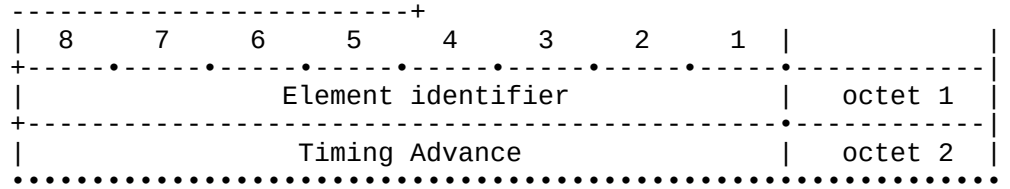
Message Type uniquely identifies the message being sent. It is a single octet element, mandatory in all messages.

All unassigned codes are spare.

8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	Reserved.
0 0 0 0 0 0 0 1	TA REQUEST
0 0 0 0 0 0 1 0	TA RESPONSE
0 0 0 0 0 1 0 0	TOA
0 0 0 0 0 1 0 1	TOA RESPONSE
0 0 0 0 1 0 1 0	TOA REJECT
0 0 0 0 1 0 1 1	TOA RESET
0 0 0 0 1 1 0 0	TOA RESUME
0 0 0 0 1 1 0 1	TOA ABORT

3.2 Timing Advance IE

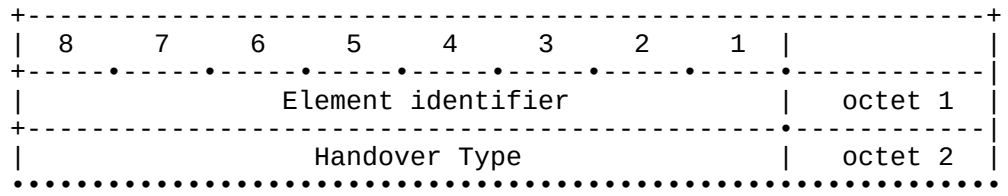
This element contains the Timing Advance measured by the BTS.



The coding of the timing advance value field is the binary representation of the timing advance in bit periods; 1 bit period = 48/13 us, as described in GSM 04.08 with the difference that all 8 bits are significant (instead of the normal 6 bits), which is necessary in order to report TA from extended range cells. To be correct, values over 63 do not correspond to a TA used by the MS (maximum is 63). Instead values over 63 correspond to the access delay measured by the BTS.

3.3 Handover Type IE

This IE defines the preferred type of handover for positioning.



The coding of the handover type field is as follows:

0000 0000 Intra-cell handover to same channel

0000 0001 Intra-cell handover to new channel

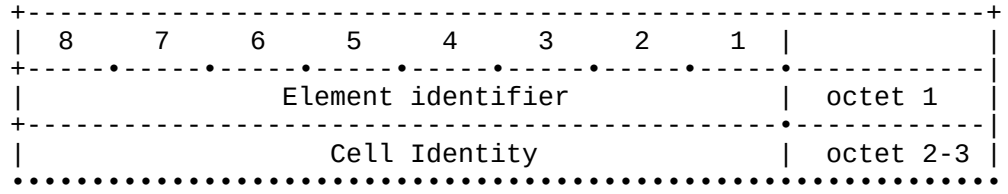
0000 0010 Inter-cell handover

0000 0011 BSS selects handover type

All other values reserved.

3.4 Cell Identity IE

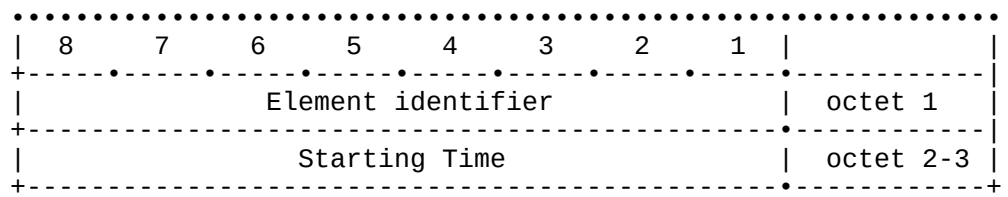
This element defines the cell identity of the MS serving cell.



The coding of the Cell Identity field is as defined in GSM 04.08 clause 10.5.1.1 Cell Identity (excluding IEI).

3.5 Starting Time IE

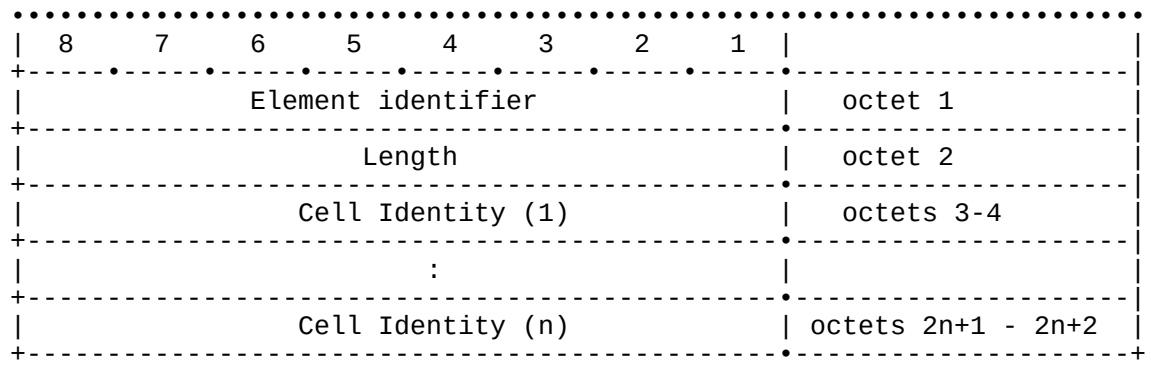
This element defines the starting frame number for handover.



The coding of the Starting Time field is as defined in GSM 04.08 clause 10.5.2.38 Starting Time (excluding IEI).

3.6 Neighbor Cell Identity IE

This element defines the cell identity of the candidate neighbor cells for positioning handover.



The coding of the Cell Identity field is as defined in in GSM 04.08 clause 10.5.1.1 Cell Identity (excluding IEI's).

3.7 Neighbor Starting Time IE

This element defines the starting frame number for handover to neighboring cells.

8	7	6	5	4	3	2	1		
Element identifier								octet 1	
Length								octet 2	
Starting Time (1)								octets 3-4	
:									
Starting Time (n)								octets 2n+1 - 2n+2	

The coding of the Starting Time field is as defined in GSM 04.08 clause 10.5.2.38 Starting Time (excluding IEI).

3.8 Channel Decription IE

This element defines the physical channel allocation of the MS.

8	7	6	5	4	3	2	1		
Element identifier								octet 1	
Channel Description								octets 2-4	

The coding of Channel Description field is as defined in GSM 04.08 clause 10.5.2.5a Channel Description (excluding IEI).

3.9 Frequency List IE

The Frequency List IE contains a list of frequencies used by the MS.

8	7	6	5	4	3	2	1		
Element identifier								octet 1	
Length								octet 2	
Frequency List								octets 3-n	

The coding of Frequency List field is as defined in GSM 04.08 clause 10.5.2.13 Frequency List (excluding IEI and length field).

3.10 Handover Reference IE

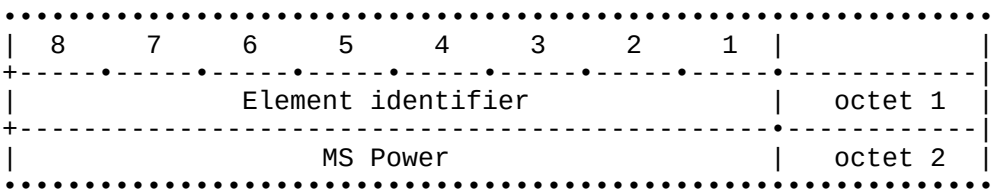
This element defines the handover reference number used by the MS.

8	7	6	5	4	3	2	1		
Element identifier								octet 1	
Handover Reference								octet 2	

The coding of Handover Reference field is as defined in GSM 04.08 clause 10.5.2.15 Handover Reference (excluding IEI).

3.11 MS Power IE

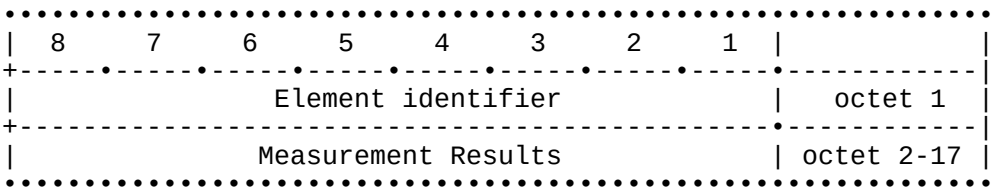
This element contains the MS power.



The MS Power field is encoded as in GSM 04.08 clause 10.5.2.28 Power Command (excluding IEI) and GSM 05.08.

3.12 Measurement Report IE

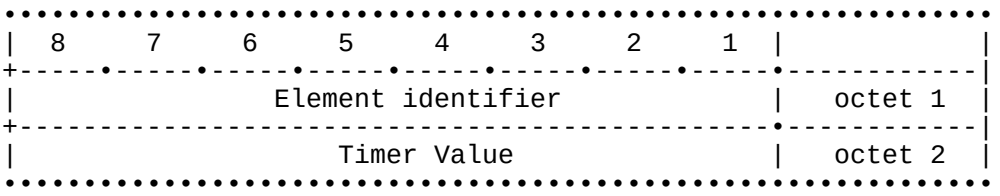
This element contains the measurement report from the BSS.



The Measurement Results field is encoded as in GSM 04.08 clause 10.5.2.20 Measurement Result (excluding IEI).

3.13 Delta Timer

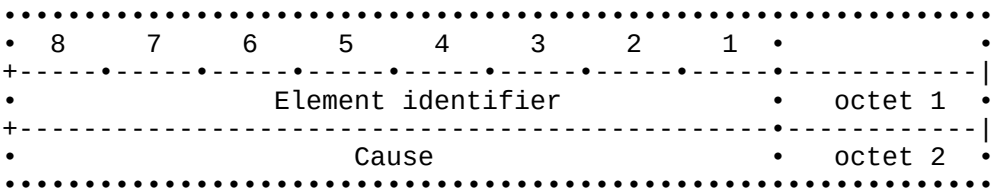
This element contains the value of the delta timer. The coding is as follows.



The Timer Value field is expressed in units of 0.05s.

3.14 Cause IE

This element contains the cause value.



The cause field is coded as follows:

0000 0000 Normal Event
0000 0001 Ongoing intra-BSS handover
0000 0010 Ongoing inter-BSS handover
0000 0011 Ongoing inter-MSC handover

All unassigned codes are spare.

Annex A (informative): Status of Technical Specification GSM 08.71

Status of Technical Specification GSM 08.71		
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