

**ETSI EN 301 502 V12.5.1 (2016-07)**



**Global System for Mobile communications (GSM);  
Base Station (BS) equipment;  
Harmonised Standard covering the essential requirements  
of article 3.2 of the Directive 2014/53/EU**

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Reference

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**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

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## Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Mobile Standards Group (MSG).

For non EU countries the present document may be used for regulatory (Type Approval) purposes.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.10] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

National transposition dates	
Date of adoption of this EN:	20 April 2016
Date of latest announcement of this EN (doa):	31 July 2016
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2017
Date of withdrawal of any conflicting National Standard (dow):	31 January 2018

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## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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## Introduction

The present document is part of a set of standards developed by ETSI that are designed to fit in a modular structure to cover radio equipment within the scope of the Radio Equipment Directive [i.1]. The present document is produced following the guidance in ETSI EG 203 336 [i.2] as applicable.

# 1 Scope

The present document applies to the following radio equipment type:

- 1) GSM base stations.

**Table 1-1: GSM Base Station System frequency bands**

GSM band	Direction of transmission	GSM Base Station System relevant frequency bands
P-GSM 900	Transmit	935 MHz to 960 MHz
	Receive	890 MHz to 915 MHz
E-GSM 900	Transmit	925 MHz to 960 MHz
	Receive	880 MHz to 915 MHz
R-GSM 900	Transmit	921 MHz to 960 MHz
	Receive	876 MHz to 915 MHz
ER-GSM 900	Transmit	918 MHz to 960 MHz
	Receive	873 MHz to 915 MHz
DCS 1 800	Transmit	1 805 MHz to 1 880 MHz
	Receive	1 710 MHz to 1 785 MHz
GSM 450	Transmit	460,4 MHz to 467,6 MHz
	Receive	450,4 MHz to 457,6 MHz
GSM 480	Transmit	488,8 MHz to 496 MHz
	Receive	478,8 MHz to 486 MHz

The present document contains requirements to demonstrate that that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

In regards to interference to systems operating in adjacent bands guidance for single carrier BTS and multicarrier BTS is provided in ECC Report 146 [i.3].

## 2 References

### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 301 908-18 (V11.1.1) (07-2016): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Radio Equipment Directive 2014/53/EU; Part 18: E-UTRA, UTRA and GSM/EDGE Multi-Standard Radio (MSR) Base Station (BS)".
- [2] ETSI TS 151 021 (V12.3.0) (01-2015): "Digital cellular telecommunications system (Phase 2+); Base Station System (BSS) equipment specification; Radio aspects (3GPP TS 51.021 version 12.3.0 Release 12)".
- [3] ETSI TS 145 002 (V12.4.0) (04-2015): "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path (3GPP TS 45.002 version 12.4.0 Release 12)".
- [4] ETSI TS 145 004 (V12.0.0) (10-2014): "Digital cellular telecommunications system (Phase 2+); Modulation (3GPP TS 45.004 version 12.0.0 Release 12)".



- [5] ETSI TS 145 005 (V12.5.0) (04-2015): "Digital cellular telecommunications system (Phase 2+); Radio Transmission and reception (3GPP TS 45.005 version 12.5.0 Release 12)".
- [6] ETSI TS 145 010 (V12.0.0) (10-2014): "Digital cellular telecommunications system (Phase 2+); Radio subsystem synchronization (3GPP TS 45.010 version 12.0.0 Release 12)".
- [7] ETSI EN 300 019-1-0 (V2.1.2) (09-2003): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-0: Classification of environmental conditions; Introduction".
- [8] ETSI EN 300 019-1-3 (V2.4.1) (04-2014): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weather protected locations".
- [9] ETSI EN 300 019-1-4 (V2.2.1) (04-2014): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weather protected locations".
- [10] ETSI TS 124 022 (V12.0.0) (10-2014): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Radio Link Protocol (RLP) for circuit switched bearer and teleservices (3GPP TS 24.022 version 12.0.0 Release 12)".
- [11] ETSI TS 148 020 (V12.0.0) (10-2014): "Digital cellular telecommunications system (Phase 2+); Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS-MSC) interface (3GPP TS 48.020 version 12.0.0 Release 12)".
- [12] Recommendation ITU-T O.153 (10-1992): "Basic Parameters for the measurement of error performance at bit rates below the primary rate".
- [13] Recommendation ITU-R SM.329-12 (09-2012): "Unwanted emissions in the spurious domain".
- [14] ETSI EN 300 019-2-3 (V2.3.1) (04-2013): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-3: Specification of environmental tests; Stationary use at weather protected locations".
- [15] ETSI EN 300 019-2-4 (V2.3.1) (08-2013): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-4: Specification of environmental tests; Stationary use at non-weather protected locations".
- [16] IEC EN 60721-1 (ed.2.2, 10-2002): "Classification of environmental conditions: Part 1: Environmental parameters and their severities".
- [17] IEC EN 60721-2-1 (ed.2.0, 06-2013): "Classification of environmental conditions - Part 2-1: Environmental conditions appearing in nature - Temperature and humidity".
- [18] IEC EN 60721-2-4 (ed.1.1, 10-2002): "Classification of environmental conditions - Part 2-4: Environmental conditions appearing in nature - Solar radiation and temperature".
- [19] IEC EN 60721-3-0 (ed.1.1, 10-2002): "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Introduction".
- [20] ETSI EN 301 908-1 (V11.1.1) (07-2016): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Radio Equipment Directive 2014/53/EU; Part 1: Introduction and common requirements".
- [21] ETSI TS 145 008 (V12.4.0) (01-2015): "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control (3GPP TS 45.008 version 12.4.0 Release 12)".

## 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Directive 2014/53/EU of the European parliament and of the council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.
- [i.2] ETSI EG 203 336: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Guide for the selection of technical parameters for the production of Harmonised Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".
- [i.3] ECC Report 146, 6<sup>th</sup> July 2010: "Compatibility between GSM MCBTS and other services (TRR, RSBN/PRMG, HC-SDMA, GSM-R, DME, MIDS, DECT) operating in the 900 and 1800 MHz frequency bands".
- [i.4] ETSI TS 144 060 (V12.5.0) (07-2015): "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control / Medium Access Control (RLC/MAC) protocol (3GPP TS 44.060 version 12.5.0 Release 12)".
- [i.5] CEPT/ERC/Recommendation 74-01E (01-2011): "Unwanted emissions in the spurious domain".
- [i.6] ETSI TR 100 028 (all parts) (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.7] ETSI TS 145 001 (V12.1.0) (01-2015): "Digital cellular telecommunications system (Phase 2+); Physical layer on the radio path; General description (3GPP TS 45.001 version 12.1.0 Release 12)".
- [i.8] ETSI TR 145 050 (V12.2.0) (04-2015): "Digital cellular telecommunications system (Phase 2+); Background for Radio Frequency (RF) requirements (3GPP TR 45.050 version 12.2.0 Release 12)".
- [i.9] ETSI TR 121 905 (V12.0.0) (10-2014): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Vocabulary for 3GPP Specifications (3GPP TR 21.905 version 12.0.0 Release 12)".
- [i.10] Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.
- [i.11] ETSI TR 100 028-2: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics Part 2".

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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI TR 121 905 [i.9] and the following apply:

**8-PSK:** Modulation type as defined in ETSI TS 145 004 [4], clause 3.

**16-QAM:** Modulation type as defined in ETSI TS 145 004 [4], clause 4 for EGPRS2-A and clause 5 for EGRPS2-B.

**32-QAM:** Modulation type as defined in ETSI TS 145 004 [4], clause 4 for EGPRS2-A and clause 5 for EGRPS2-B.

**ancillary RF amplifier:** piece of equipment, which when connected by RF coaxial cables to the BTS, has the primary function to provide amplification between the transmit and/or receive antenna connector of a BTS and an antenna without requiring any control signal to fulfil its amplifying function

**AQPSK:** Modulation type as defined in ETSI TS 145 004 [4], clause 6.

**base station RF bandwidth:** instantaneous bandwidth in which a BTS belonging to a multicarrier BTS class transmits or transmits and receives multiple carriers simultaneously

**Base Station System Test Equipment (BSSTE):** See annex B in ETSI TS 151 021 [2].

**BSS:** BTS or integrated BSS

NOTE: If a separate BSC is required to perform tests on a BTS, the BSC may be regarded as test equipment and the environmental conditions of the BSC need not be controlled.

**carrier frequency:** centre of the ARFCN under test

**circuit switched logical channels:** all the standard GSM logical channels, including traffic channels (TCH), common control channels (RACH) and dedicated control channels (SDCCH, SACCH)

**E-GSM:** extended GSM 900 band (includes P-GSM band)

**ECSD:** any subset of the E-TCH traffic channels and related control channels

**EGPRS:** any subset of the packet traffic channels PDTCH/MCS-1 to MCS-9 and related control channels

**EGPRS2:** any of EGPRS2-A and EGPRS2-B

**EGPRS2-A:** packet traffic channels utilizing any subset of the packet traffic channels MCS-1 to 6 and PDTCH/UAS-7 to UAS-11 in uplink, together with MCS-1 to 4 and PDTCH/DAS-5 to DAS-12 in downlink, and related control channels

NOTE: In addition, MCS-7 and MCS-8 may be used in downlink when either the USF or the PAN or both are addressed to one or more EGPRS mobile stations.

**EGPRS2-B:** packet traffic channels utilizing any subset of the packet traffic channels MCS-1 to 4 and PDTCH/UBS-5 to UBS-12 in uplink, together with MCS-1 to 4 and PDTCH/DBS-5 to DBS-12 in downlink, and related control channels

NOTE: In addition, MCS-6 to MCS-9, DAS-5, DAS-6, DAS-8, DAS-9, DAS-10 pad, DAS-11, and DAS-12pad may be used in downlink under the conditions specified in ETSI TS 144 060 [i.4].

**enclosure port:** physical boundary of the apparatus through which electromagnetic fields may radiate or impinge

**environmental profile:** range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

**ER-GSM 900:** extended Railway GSM 900 band (includes R-GSM band)

**GMSK:** Modulation type as defined by ETSI TS 145 004 [4], clause 2.

**GPRS:** any subset of the packet traffic channels PDTCH/CS-1 to CS-4 and related control channels

**GSM:** unless otherwise specified, references to GSM include GSM 400, GSM 900, ER-GSM 900 and DCS 1 800

**GSM 400:** unless otherwise specified, references to GSM 400 include GSM 450 and GSM 480 band

**GSM 900:** unless otherwise specified, references to GSM 900 include P-GSM, E-GSM and R-GSM band

**GSM-R:** GSM Railway communication, operated in the R-GSM or ER-GSM band, respectively

**Local Area (LA) multicarrier BTS:** class of multicarrier BTS with both multicarrier transmitter and multicarrier receiver, characterized by requirements derived from pico cell scenarios

**manufacturer:** in the present document, a reference to a manufacturer also applies to an agent of the manufacturer

**maximum base station RF bandwidth:** maximum bandwidth in which a BTS belonging to a multicarrier BTS class transmits or transmits and receives multiple carriers simultaneously

**maximum transmit filter bandwidth:** maximum bandwidth of the duplexer or the transmit filter used in a BTS belonging to a multicarrier BTS class transmitting carriers simultaneously

**Medium Range (MR) multicarrier BTS:** class of multicarrier BTS with both multicarrier transmitter and multicarrier receiver, characterized by requirements derived from micro cell scenarios

**micro-BTS:** low-power BTS with performance requirements defined in ETSI TS 145 005 [5]

NOTE: In the present document, this also includes a BSS which incorporates a micro-BTS.

**minimum carrier frequency spacing:** minimum spacing between the centre frequencies of simultaneously transmitted or received GSM carriers of a BTS belonging to a multicarrier BTS class

NOTE: The minimum carrier frequency spacing is 600 kHz.

**multicarrier BTS:** BTS, characterized by the ability to, in addition to single carrier operation, process two or more carriers in common active components simultaneously

**multicarrier BTS equipped with multicarrier receiver:** subgroup of multicarrier BTS, characterized by the ability to, in addition to single carrier operation, process two or more carriers in common active components simultaneously, in both multicarrier transmitter and multicarrier receiver

**normal BTS:** any BTS or BSS as defined by ETSI TS 145 005 [5] which is not a micro-BTS, pico-BTS or multicarrier BTS

**operating band:** transmit and receive operating bands together comprise the frequency band supported by the BSS

NOTE: As defined in clause B.1.2.

**P-GSM:** primary GSM 900 band

**packet switched logical channels:** all the General Packet Radio Services (GPRS) packet data logical channels, including packet traffic channels (PDTCH and PACCH) and packet common control channels (PRACH)

**pico-BTS:** low-power BTs with performance requirements defined in ETSI TS 145 005 [5]

NOTE: In the present document, this also includes a BSS which incorporates a pico-BTS.

**port:** particular interface, of the specified equipment (apparatus), with the electromagnetic environment

**QPSK:** Modulation type as defined ETSI TS 145 004 clause 5 [4], used in EGPRS2-B.

**R-GSM:** railways GSM 900 band (includes P-GSM band and E-GSM band)

**radio digital unit:** equipment which contains base band and functionality for controlling radio unit

**radio equipment:** equipment which contains radio digital unit and radio unit

**radio unit:** equipment which contains transmitter and receiver

**relevant RX band (or relevant receive band):** receive band for the frequency band of BTS declared by the manufacturer

NOTE: As defined in clause 1.

**relevant TX band (or relevant transmit band):** transmit band for the frequency band of BTS declared by the manufacturer

NOTE: As defined in clause 1.

**SCPIR\_UL:** As defined in ETSI TS 145 005 [5], clause 1.3.

**sub-block:** contiguous allocated block of spectrum for use by the same Base Station

NOTE: There may be multiple instances of sub-blocks within an RF bandwidth.

**sub-block bandwidth:** bandwidth of one sub-block

**sub-block gap:** frequency gap between two consecutive sub-blocks within an RF bandwidth, where the RF requirements in the gap are based on co-existence for un-coordinated operation

**VAMOS mode:** As defined in ETSI TS 145 001 [i.7], clause 13.1.

**VAMOS sub-channel:** As defined in ETSI TS 145 001 [i.7], clause 13.1.

**Wide Area (WA) multicarrier BTS:** class of multicarrier BTS with either multicarrier transmitter only, or both multicarrier transmitter and receiver, characterized by requirements derived from macro cell scenarios

## 3.2 Symbols

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

$\Delta f$	frequency offset from the edge of the relevant TX band when measuring spurious emissions
$f_0$	frequency of wanted signal
$RF_{BW Max}$	maximum Base Station RF bandwidth

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TR 121 905 [i.9] and the following apply:

AM	Amplitude Modulation
AMR	Adaptive Multi-Rate
AFS	AMR Full-rate Speech
AHS	AMR Half-rate Speech
AQPSK	Adaptive Quadrature Phase Shift Keying
ARFCN	Absolute Radio Frequency Channel Number
B	Bottom
BCCH	BroadCast Control CHannel
BER	Bit Error Ratio
BLER	Block Error Ratio
BS	Base Station
BSC	Base Station Controller
BSS	Base Station System
BSSTE	Base Station System Test Equipment
BTS	Base Transceiver Station
BTTI	Basic Transmission Time Interval
BW	BandWidth
DAS	EGPRS2 Downlink Level A modulation and coding Scheme
DBS	EGPRS2 Downlink Level B modulation and coding Scheme
DC	Direct Current
DCS	Digital Cellular System
DTX	Discontinuous Transmission
ECSD	Enhanced Circuit Switched Data
EGPRS	Enhanced GPRS
EGPRS2	Enhanced GPRS phase 2
E-TCH	Enhanced Traffic CHannel
FACCH	Fast Associated Control CHannel
FANR	Fast Ack/Nack Reporting
FER	Frame Erasure Ratio
FS	Full rate Speech
GMSK	Gaussian Minimum Shift Keying
GPRS	General Packet Radio Service
GSM-R	GSM Railway
IM	InterModulation
IMT	International Mobile Telecommunications
LA	Local Area
M	Middle

MCBTS	MultiCarrier BTS
MCS	Modulation Coding Scheme
MFS	Multipath Fading Simulator
MR	Medium Range
MS	Mobile Station
MSC	Mobile service Switching Centre
NT	Non Transparent
PACCH	Packet Associated Control CHannel
PAN	Piggy-backed Ack/Nack message
PDTCH	Packet Data Traffic CHannel
PSK	Phase Shift Keying
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RACH	Random Access CHannel
RBER	Residual Bit Error Ratio
RF	Radio Frequency
RFBW	Radio Frequency BandWidth
RMS	Root Mean Square
RTTI	Reduced Transmission Time Interval
RX	Reception
SACCH	Slow Associated Control CHannel
SCPIR	Sub-Channel Power Imbalance Ratio
SCPIR_UL	Sub-Channel Power Imbalance Ratio on UpLink
SDCCH	Stand alone Dedicated Control Channel
SFH	Slow Frequency Hopping
SM	Spectrum Management
T	Top
TCH	Traffic CHannel
TCH/FS	Traffic CHannel/Full rate Speech
TCH/HS	Traffic CHannel/Half rate Speech
TRX	Transceiver
TSC	Training Sequence Code
TU	Typical Urban
TX	Transmission
UAS	EGPRS2 Uplink level A modulation and coding Scheme
UBS	EGPRS2 Uplink level B modulation and coding Scheme
UE	User Equipment
UTRA	Universal Terrestrial Radio Access
VAMOS	Voice services over Adaptive Multi-user channels on One Slot
VUTS	VAMOS Uplink Test Scenario
WA	Wide Area
WFS	Wideband AMR full rate codec based on GMSK

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## 4 Technical requirements specifications

### 4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

For guidance on how a manufacturer can declare the environmental profile see annex C.

## 4.2 Conformance requirements

### 4.2.0 General

Support of certain functions of a BTS is optional in the GSM specifications. When specified in a test, the manufacturer shall declare the nominal value of a parameter, or whether an option is supported. A summary of such functions are included in annex B.

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], conformance with the technical requirements listed in table 4.2-1 can equally be demonstrated through the corresponding technical requirements and test suites in ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], as listed in table 4.2-1.

When conformance is demonstrated through the test suites in ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1] the technical requirements in table 4.2-1 shall apply. In this case, the corresponding test suites in the present document need not be performed.

**Table 4.2-1: Alternative technical requirements and test suites in ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1] that can equally be used for demonstrating conformance for MCBTS**

Technical requirement in the present document	Corresponding technical requirements in ETSI EN 301 908	Corresponding test suites in ETSI EN 301 908
4.2.5.2 Conducted spurious emissions from the transmitter antenna connector, outside the BTS transmit band (note 1)	4.2.4 Transmitter spurious emissions (in ETSI EN 301 908-18 [1])	5.3.3 Transmitter spurious emissions (in ETSI EN 301 908-18 [1])
4.2.5.3 Conducted spurious emissions from the transmitter antenna connector, in 3G bands outside the BTS transmit band	4.2.4 Transmitter spurious emissions (in ETSI EN 301 908-18 [1])	5.3.3 Transmitter spurious emissions (in ETSI EN 301 908-18 [1])
4.2.12 Blocking Characteristics (note 2)	4.2.9 Out-of-band blocking (in ETSI EN 301 908-18 [1])	5.3.8 Out-of-band blocking (in ETSI EN 301 908-18 [1])
4.2.15 Spurious emissions from the receiver antenna connector	4.2.7 Receiver spurious emissions (in ETSI EN 301 908-18 [1])	5.3.6 Receiver spurious emissions (in ETSI EN 301 908-18 [1])
4.2.16 Radiated spurious emissions	4.2.3 Radiated emissions (BS and repeater) (in ETSI EN 301 908-1 [20])	5.3.2 Radiated emissions (BS and repeater) (in ETSI EN 301 908-1 [20])
NOTE 1: Applicable for frequency offsets larger than 10 MHz outside the relevant transmit band.		
NOTE 2: Applicable for frequency offsets outside the relevant inband frequencies, as defined in table 5.3.12-2 in the present document.		

### 4.2.1 Introduction

To meet the essential requirement under article 3.2 of Directive 2014/53/EU [i.1], nine essential parameters have been identified. Table 4.2.1-1 provides a cross reference between these nine essential parameters and the corresponding fifteen technical requirements for equipment within the scope of the present document.

**Table 4.2.1-1: Essential parameters and corresponding technical requirements and test suites**

Essential parameters	Corresponding technical requirements	Corresponding test suites
Transmitter spectrum mask	4.2.4.1 Spectrum due to modulation and wideband noise	5.3.4.1
Transmitter unwanted emissions in the out of band domain	4.2.4.2 Switching transients spectrum	5.3.4.2
	4.2.8 Wideband noise and intra BSS intermodulation attenuation in multicarrier operation	5.3.8
Transmitter unwanted emissions in the spurious domain	4.2.5 Spurious emissions from the transmitter antenna connector	5.3.5
Transmitter power limits	4.2.2 Mean transmitted RF carrier power	5.3.2
Transmitter power accuracy		
Transmitter Intermodulation attenuation	4.2.6 Intermodulation attenuation	5.3.6
	4.2.7 Intra Base Station System intermodulation attenuation	5.3.7
	4.2.8 Wideband noise and intra BSS intermodulation attenuation in multicarrier operation	5.3.8
Receiver unwanted emissions in the spurious domain	4.2.15 Spurious emissions from the receiver antenna connector	5.3.15
Receiver blocking	4.2.12 Blocking characteristics	5.3.12
Receiver spurious response rejection		
Desensitization		
Receiver intermodulation	4.2.13 Intermodulation characteristics	5.3.13
	4.2.14 AM suppression	5.3.14
Receiver adjacent channel signal selectivity	4.2.11 Reference interference level	5.3.11
Receiver sensitivity	4.2.9 Receiver static sensitivity	5.3.9
Radiated emissions	4.2.16 Radiated spurious emissions	5.3.16

## 4.2.2 Mean transmitted RF carrier power

### 4.2.2.1 Definition

For GMSK modulation, the mean transmitted RF carrier power refers to the measure of the power when averaged over the useful part of the burst (the useful part of the burst shall be as specified in ETSI TS 145 004 [4]).

For QPSK, AQPSK, 8-PSK, 16-QAM and 32-QAM modulation, the mean transmitted RF carrier power refers to a measure that, with sufficient accuracy, is equivalent to the long term average of the power when taken over the useful part of the burst with any fixed TSC and with random encrypted bits. The useful part of the burst shall be as specified in ETSI TS 145 004 [4].

The purpose of the test to measure against maximum mean transmitted RF carrier power requirements is:

- To verify the accuracy of the maximum mean transmitted RF carrier power across the frequency range at the highest static power level.

### 4.2.2.2 Limit

The Highest Static Power Level corresponds to the maximum single carrier output power declared by the manufacturer. For a BTS belonging to a multicarrier BTS class, the Highest Static Power Level corresponds to maximum output power per carrier for each supported number of carriers declared by the manufacturer.

The power measured when the TRX is set to Highest Static Power Control Level shall have a tolerance of  $\pm 2$  dB under normal conditions and  $\pm 2,5$  dB under extreme conditions, relative to the maximum power declared by the manufacturer for the modulation under test. In this test, this measured power is termed the maximum BTS output power.

For BTS supporting other modulations than GMSK, the maximum output power of the respective modulation QPSK, AQPSK, 8-PSK, 16-QAM and 32-QAM, may be lower than the GMSK output power.



For BTS supporting operation in the ER-GSM 900 band, for the test in the frequency range 918 MHz to 921 MHz the BTS transmitter maximum rated output power per carrier, measured at the input of the transmitter combiner, shall be, according to its TRX power class, as defined in ETSI TS 145 004 [4], table 4.1-6. In addition the maximum allowed RF power levels, measured at the BTS transmit antenna connector, applicable to RF channels B', M' and T' (refer to clause 5.3.2.1) under test, shall be restricted to the power level entries in table 4.2.2-1, for different coexistence scenarios and two configured MCL values (67 dB for the uncoordinated case and 74 dB for the coordinated case). All power level entries in table 4.2.2-1 shall be tested and include all kind of output power tolerances.

**Table 4.2.2-1: Maximum allowed RF power levels for RF channels B', M' and T' in the ER-GSM 900 extension band**

Scenario	MCL	B'	M'	T'
Coexistence with GSM Normal BTS/MCBTS in E-GSM band	67 dB	26,6 dBm	35 dBm	43,4 dBm
	74 dB	33,6 dBm	42 dBm	50,4 dBm
Coexistence with UTRA/E-UTRA BS in E-GSM band	67 dB	8,3 dBm	23,7 dBm	39,1 dBm
	74 dB	15,3 dBm	30,7 dBm	46,1 dBm

#### 4.2.2.3 Conformance

Conformance tests described in clause 5.3.2 shall be carried out.

#### 4.2.3 Void

#### 4.2.4 Adjacent channel power

##### 4.2.4.0 General

The modulation, wideband noise and power level switching spectra can produce significant interference in the relevant TX and adjacent bands. The requirements for adjacent channel emissions are tested in two separate tests which intend to measure different sources of emission:

- 1) continuous modulation spectrum and wideband noise;
- 2) switching transients spectrum.

##### 4.2.4.1 Spectrum due to modulation and wideband noise

###### 4.2.4.1.1 Definition

The purpose of the test to measure against spectrum due to modulation and wideband noise requirements is to verify that the output RF spectrum due to modulation and wideband noise does not exceed the specified levels for an individual transceiver.

###### 4.2.4.1.2 Limit

###### 4.2.4.1.2.1 Normal BTS Conformance requirements

The test shall be performed for one TRX. The depicted steps in this clause refer to the test case described in clause 5.3.4.1.1.

For the highest static power step, the power measured in steps d) and e) of the test cases shall not exceed the limits shown in table 4.2.4-1 for the power level measured in step b), except where one or more of the following exceptions and minimum measurement levels applies:

- 1) For a GSM 400, GSM 900 or ER-GSM 900 BTS, if the limit according to table 4.2.4-1 is below -65 dBm, a value of -65 dBm shall be used instead.
- 2) For a DCS 1 800 BTS, if the limit according to table 4.2.4-1 is below -57 dBm, a value of -57 dBm shall be used instead.

- 3) In the combined range 600 kHz to 6 MHz above and below the carrier frequency, in up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz, exceptions at up to -36 dBm are allowed.
- 4) Above 6 MHz offset from the carrier frequency, in up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz, exceptions at up to -36 dBm are allowed.

**Table 4.2.4-1: Continuous modulation spectrum - maximum limits for BTS**

	Power Level (dBm) as measured in step b)	Maximum relative level (dB) at specified carrier offsets (kHz), using specified measurement (filter) bandwidths (kHz)							
		100	200	250	400	600 to < 1 200	1 200 to < 1 800	1 800 to < 6 000	> 6 000 (note 2)
		Measurement (filter) bandwidth; 30 kHz						Measurement (filter) bandwidth; 100 kHz	
Case 1	≥ 43	+0,5	-30	-33	-60 (note 1)	-70	-73	-75	-80
	41	+0,5	-30	-33	-60 (note 1)	-68	-71	-73	-80
	39	+0,5	-30	-33	-60 (note 1)	-66	-69	-71	-80
	37	+0,5	-30	-33	-60 (note 1)	-64	-67	-69	-80
	35	+0,5	-30	-33	-60 (note 1)	-62	-65	-67	-80
	≤ 33	+0,5	-30	-33	-60 (note 1)	-60	-63	-65	-80

NOTE 1: For equipment supporting QPSK, AQPSK, 8-PSK, 16-QAM or 32-QAM, at normal symbol rate, the requirement at these modulations is -56 dB.

NOTE 2: For equipment belonging to a multicarrier BTS class, the requirement also applies for the frequency offset of 6 MHz.

The requirements are specified, depending on symbol-rate and pulse-shaping filter used:

- Case 1: Normal symbol rate using linearized GMSK pulse-shaping filter and higher symbol rate using spectrally narrow pulse shaping filter.

The pulse-shaping filters shall be as defined in ETSI TS 145 004 [4]. The spectrally narrow pulse shaping filter in Case 1 is in the present document referred to as narrow pulse shaping filter.

The limit values in table 4.2.4-1, at the listed offsets from carrier frequency (kHz), are the ratio of the measured power to the measured power in step c) for the same static power step.

Table 4.2.4-1 provides requirements at discrete power levels. For powers between those specified, linear interpolation should be applied.

#### 4.2.4.1.2.2 Multicarrier BTS Conformance requirement

The test shall be performed with one carrier active for each transmitting antenna connector. The depicted steps in this clause refer to the test case described in clause 5.3.4.1.1.

For the highest static power step, the power measured in steps d) and e) of the test cases shall not exceed the limits shown in table 4.2.4-1 for the power level measured in step b), except where one or more of the following exceptions and minimum measurement levels applies:

- 1) Exceptions at up to -36 dBm, -42 dBm and -50 dBm are allowed for the Wide Area, Medium Range and Local Area multicarrier BTS classes, respectively. The measurement conditions as specified in clause 5.3.8 for exceptions apply. The number of allowable exceptions for the frequency offset range from 600 kHz up to 10 MHz outside the relevant transmit band is equal to 18 as defined in clause 5.3.8 for N = 1.
- 2) For all frequency bands, if the limit according to table 6.5-1 is below -47 dBm, -53 dBm and -61 dBm, for the Wide Area, Medium Range and Local Area multicarrier BTS class, respectively, this value shall be used instead.

#### 4.2.4.1.2.3 Micro and Pico-BTS Conformance requirement

The test shall be performed for one TRX. The depicted steps in this clause refer to the test case described in clause 5.3.4.1.1.

For the highest static power step, the power measured in steps d) of the test case shall not exceed the limits shown in table 4.2.4-1 for the power level measured in step b), except where one or more of the micro or pico-BTS exceptions and minimum measurement levels applies.

For the highest static power step, the ratio of the power measured in step e) of the test case to the power measured in step c) for the same static power step shall not exceed the limits specified in table 4.2.4-2 for GSM 900 and ER-GSM 900 and table 4.2.4-3 for DCS 1 800 systems, except where one or more of the micro or pico-BTS exceptions and minimum measurement levels applies.

**Table 4.2.4-2: Continuous modulation spectrum - maximum limits for GSM 900 and ER-GSM 900 Micro and Pico-BTS**

Power Class		Maximum relative level (dB) at specified carrier offsets (kHz), using specified measurement (filter) bandwidths (kHz)	
		1 800 to < 6 000	> 6 000
		Measurement (filter) bandwidth; 100 kHz	
M1 to M3	Case 1	-70	-70
P1	Case 1	-70	-80

**Table 4.2.4-3: Continuous modulation spectrum - maximum limits for DCS 1 800 Micro and Pico-BTS**

Power Class		Maximum relative level (dB) at specified carrier offsets (kHz), using specified measurement (filter) bandwidths (kHz)	
		1 800 to < 6 000	> 6 000
		Measurement (filter) bandwidth; 100 kHz	
M1 to M3	Case 1	-76	-76
P1	Case 1	-76	-80

The following exceptions and minimum measurement levels shall apply for the micro and pico-BTS:

- 1) In the combined range 600 kHz to 6 MHz above and below the carrier frequency, in up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz, exceptions at up to -36 dBm are allowed.
- 2) Above 6 MHz offset from the carrier frequency, in up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz, exceptions at up to -36 dBm are allowed.
- 3) If the limit as specified above is below the values in table 4.2.4-4, then the values in table 4.2.4-4 shall be used instead.

**Table 4.2.4-4: Continuous modulation spectrum - minimum levels for micro and pico-BTS**

Power Class	Maximum spectrum due to modulation and noise in 100 kHz	
	GSM 900 and ER-GSM 900 (dBm)	DCS 1 800 (dBm)
M1	-59	-57
M2	-64	-62
M3	-69	-67
P1	-68	-65

#### 4.2.4.1.3 Conformance

Conformance tests described in clause 5.3.4.1 shall be carried out.

## 4.2.4.2 Switching transients spectrum

### 4.2.4.2.1 Definition

The purpose of the test to measure against switching transients spectrum requirements is to verify that the output RF spectrum due to switching transients does not exceed the specified limits.

### 4.2.4.2.2 Limit

For all types of BTS, the power measured shall not exceed the limits shown in table 4.2.4-5, or -36 dBm, whichever value is less stringent.

**Table 4.2.4-5: Switching transients spectrum - maximum limits**

Offset (kHz)	Power (dBc): GSM 400, GSM 900 and ER-GSM 900 (GMSK)	Power (dBc): GSM 400, GSM 900 and ER-GSM 900 (8-PSK, QPSK, AQPSK, 16-QAM, 32-QAM)	Power (dBc): DCS 1 800 (GMSK)	Power (dBc): DCS 1 800 (8-PSK, QPSK, AQPSK, 16-QAM, 32-QAM)
400	-57	-52	-50	-50
600	-67	-62	-58	-58
1 200	-74	-74	-66	-66
1 800	-74	-74	-66	-66

### 4.2.4.2.3 Conformance

Conformance tests described in clause 5.3.4.2 shall be carried out.

## 4.2.5 Spurious emissions from the transmitter antenna connector

### 4.2.5.0 General

The test conditions for conducted emissions are defined separately for the BSS relevant transmit band, and elsewhere.

### 4.2.5.1 Conducted spurious emissions from the transmitter antenna connector, inside the BTS transmit band

#### 4.2.5.1.1 Definition

This test measures spurious emissions from the BSS transmitter antenna connector inside the BSS relevant transmit band, while one transmitter is in operation.

#### 4.2.5.1.2 Limit

The maximum power measured shall not exceed -36 dBm. In case of a BTS belonging to a multicarrier BTS class, the requirements stated in clause 4.2.4.1.2 for single carrier operation apply for the case of declared maximum output power.

#### 4.2.5.1.3 Conformance

Conformance tests described in clause 5.3.5.1 shall be carried out.

## 4.2.5.2 Conducted spurious emissions from the transmitter antenna connector, outside the BTS transmit band

### 4.2.5.2.0 General

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the requirement of the present clause or the Transmitter spurious emissions requirement in clause 4.2.4 of ETSI EN 301 908-18 [1] can be equally applied for frequency offsets larger than 10 MHz outside the relevant transmit band.

### 4.2.5.2.1 Definition

This test measures spurious emissions from the BSS transmitter antenna connector outside the BSS relevant transmit band, while the transmitters are in operation. It also tests the intra-BTS intermodulation requirements outside the BTS transmit and receive bands. In addition requirements in the operating receive band are tested for BTS belonging to a multicarrier BTS class. For BTS not belonging to a multicarrier BTS class the specified limits are tested according to test case in clause 5.3.5.2.1.1. For BTS belonging to a multicarrier BTS class the depicted steps refer to the test case in clause 5.3.5.2.2.1.

### 4.2.5.2.2 Limit

#### 4.2.5.2.2.1 For BTS not belonging to a multicarrier BTS class

- 1) The maximum power measured in the respective transmit band shall not exceed:
  - -47 dBm for a GSM 900, ER-GSM 900 or GSM 400 BSS in the frequency band 1 805 MHz to 1 880 MHz;
  - -57 dBm for a DCS 1 800 or GSM 400 BSS in the frequency band 921 MHz to 960 MHz;
  - -57 dBm for a DCS 1 800 or GSM 400 BSS in the band 918 MHz to 960 MHz when co-existing with ER-GSM 900 BTS.

In addition, if co-coverage with GSM 400 is supported by declaration:

- -57 dBm for a DCS 1 800, GSM 900 or ER-GSM 900 BSS in the frequency band 460,4 MHz to 467,6 MHz and 488,8 MHz to 496,0 MHz.
- 2) The maximum power measured outside the transmit bands in 1) and, if co-coverage with GSM 400 is not supported, in the frequency band 460,4 MHz to 467,6 MHz and 488,8 MHz to 496,0 MHz, shall not exceed:
    - -36 dBm for frequencies from 9 kHz up to 1 GHz;
    - -30 dBm for frequencies from 1 GHz to 12,75 GHz.

#### 4.2.5.2.2.2 For BTS belonging to a multicarrier BTS class

- 1) The maximum power measured at step c) shall not exceed:
  - -47 dBm for a GSM 900 or GSM 400 BSS in the frequency band 1 805 MHz to 1 880 MHz;
  - -57 dBm for a DCS 1 800 or GSM 400 BSS, in the frequency band 921 MHz to 960 MHz;
  - -57 dBm for a DCS 1 800 or GSM 400 BSS in the band 918 MHz to 960 MHz when co-existing with ER-GSM 900 BTS.

In addition, if co-coverage with GSM 400 is supported by declaration, the maximum power measured at step e) shall not exceed:

- -57 dBm for a DCS 1 800 or GSM 900 BSS in the frequency band 460,4 MHz to 467,6 MHz and 488,8 MHz to 496,0 MHz;

- 2) The maximum power measured at step d) and step f) outside the transmit bands in 1) and, if co-coverage with GSM 400 is not supported, in the frequency band 460,4 MHz to 467,6 MHz and 488,8 MHz to 496,0 MHz shall not exceed the values for the applicable multicarrier BTS class in table 4.2.5-1.  $\Delta f$  is the frequency offset from the edge of the relevant TX band. For offsets less than 10 MHz the power measured shall not exceed the requirements in clause 4.2.8 or the values for the applicable multicarrier BTS class in table 4.2.5-1, whichever is most stringent.

**Table 4.2.5-1: Spurious Emissions Measurements outside the transmit band**

Band	Frequency offset outside relevant transmit band	Maximum power limit		
		Wide Area	Medium Range	Local Area
9 kHz to 1 GHz	$\geq 2$ MHz	-25 dBm	-33 dBm	-46 dBm
	$\geq 5$ MHz	$-20-4,2 \times (\Delta f - 5)$ dBm	$-28-2,6 \times (\Delta f - 5)$ dBm	-41 dBm
	$\geq 10$ MHz	-36 dBm	-36 dBm	-36 dBm
1 GHz to 12,75 GHz	$\geq 2$ MHz	-25 dBm	-33 dBm	-45 dBm
	$\geq 5$ MHz	$-20-3 \times (\Delta f - 5)$ dBm	$-28-1,4 \times (\Delta f - 5)$ dBm	-40 dBm
	$\geq 10$ MHz	-30 dBm	-30 dBm	-30 dBm

- 3) The maximum power measured at step b) shall not exceed:
- -98 dBm, -91 dBm and -84 dBm in the operating receive band for the Wide Area, Medium Range and Local Area classes respectively.

#### 4.2.5.2.3 Conformance

Conformance tests described in clause 5.3.5.2 shall be carried out.

#### 4.2.5.3 Conducted spurious emissions from the transmitter antenna connector, in 3G bands outside the BTS transmit band

##### 4.2.5.3.0 General

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the requirement of the present clause or the Transmitter spurious emissions requirement in clause 4.2.4 of ETSI EN 301 908-18 [1] can be equally applied.

##### 4.2.5.3.1 Definition

This test measures spurious emissions from the BSS transmitter antenna connector in the UTRA UE and BS receive bands, while the transmitters are in operation.

##### 4.2.5.3.2 Limit

The maximum power measured in the frequency bands in table 5.3.5-3 shall not exceed -62 dBm.

##### 4.2.5.3.3 Conformance

Conformance tests described in clause 5.3.5.3 shall be carried out.

### 4.2.6 Intermodulation attenuation

#### 4.2.6.1 Definition

The purpose of the test to measure against requirements intermodulation attenuation is to verify that the RF transmit equipment is able to restrict the generation of signals in its non-linear elements caused by the presence of the RF output from the transmitter and an interfering signal reaching the transmitter via its antenna to below specified levels.

## 4.2.6.2 Limit

### 4.2.6.2.1 For BTS not belonging to a multicarrier BTS class

#### For measurements in the operating RX band

No requirement applies.

#### For measurements in the relevant TX band

At frequencies offset from the wanted signal carrier frequency by more than 6 MHz and up to the edge of the relevant transmit band, the intermodulation components measured shall not exceed -70 dBc or -36 dBm, whichever is the higher. 1 in 100 time slot periods may fail the requirement by up to 10 dB.

At frequencies offset from the wanted signal carrier frequency of less than 6 MHz, the requirements are those specified in clause 4.2.4.1 on Continuous Modulation Spectrum. The exceptions given in clause 4.2.4.1 also apply.

### 4.2.6.2.2 For BTS belonging to a multicarrier BTS class

#### For measurements in the operating RX band

In the operating receive band the measured intermodulation components shall never under normal test conditions exceed -98 dBm, -91 dBm and -84 dBm for Wide Area, Medium Range and Local Area multicarrier BTS respectively.

#### For measurements in the relevant TX band

In the relevant transmit band, at offsets from the wanted signal carrier frequency by more than 6 MHz and up to 10 MHz outside the edge of the relevant transmit band, the measured intermodulation products shall not exceed the limit in table 4.2.6-1, or, -70 dBc, or the requirements specified in clause 4.2.4.1.2.2 on Continuous Modulation Spectrum, whichever less stringent. In addition, for a BTS belonging to a multicarrier BTS class the measured third order intermodulation products may increase up to -60 dBc or -36 dBm, whichever is less stringent.

In the relevant transmit band, at offsets of less than or equal to 6 MHz, the requirements are those specified in clause 4.2.4.1, except at intermodulation frequencies where the measured intermodulation products shall not exceed the limit in table 4.2.6-1, or, -70 dBc, or the requirements specified in clause 4.2.4.1.2.2 on Continuous Modulation Spectrum, whichever less stringent. In addition, for a BTS belonging to a multicarrier BTS class the measured third order intermodulation products may increase up to -60 dBc or -36 dBm, whichever is less stringent.

For offsets of the measurement frequency point from the wanted signal carrier frequency higher or equal to 1,8 MHz the dBc value specified in table 4.2.4-1 shall be reduced by 5 dB to account for the bandwidth conversion from 100 kHz to 30 kHz.

In case of a BTS belonging to a multicarrier BTS class operating with one carrier, the level and number of allowable exceptions up to 10 MHz outside the relevant transmit band as defined in clause 4.2.8 using  $N = 1$  apply.

The intermodulation products shall never exceed -16 dBm, measured in 100 kHz bandwidth.

**Table 4.2.6-1: Intermodulation lower limit**

Maximum output power per carrier	Intermodulation power
> 33 dBm	-36 dBm
> 24 dBm and $\leq$ 33 dBm	-41 dBm
$\leq$ 24 dBm	-46 dBm

## 4.2.6.3 Conformance

Conformance tests described in clause 5.3.6 shall be carried out.

## 4.2.7 Intra Base Station System intermodulation attenuation

### 4.2.7.1 Definition

The purpose of the test to measure against requirements for intra Base Station System intermodulation attenuation is to verify that the level of intermodulation products produced inside the RX and TX bands (due to the leakage of RF power between transmitters that are operating in close vicinity of each other inside the BSS, or are combined to feed a single antenna) do not exceed the specified limit.

### 4.2.7.2 Limit

#### 4.2.7.2.1 For BTS not belonging to a multicarrier BTS class

##### **For measurements in the operating RX band**

No requirement applies.

##### **For measurements in the relevant TX band**

In the relevant transmit band, at offsets greater than 0,6 MHz and up to 6 MHz, the requirements are those specified in clause 4.2.4.1 on Continuous Modulation Spectrum. The exceptions given there shall also apply.

At frequencies offset from the wanted signal carrier frequency by more than 6 MHz and up to the edge of the relevant transmit band, the intermodulation components measured shall not exceed -70 dBc or -36 dBm, whichever is the higher. 1 in 100 time slot periods may fail the requirement by up to 10 dB.

#### 4.2.7.2.2 For BTS belonging to a multicarrier BTS class

##### **For measurements in the operating RX band**

In the operating receive band the measured intermodulation components shall never under normal test conditions exceed -98 dBm, -91 dBm and -84 dBm for the Wide Area, Medium Range and Local Area classes, respectively.

##### **For measurements in the relevant TX band**

In the relevant transmit band, the requirements in clause 4.2.8 apply.

### 4.2.7.3 Conformance

Conformance tests described in clause 5.3.7 shall be carried out.

## 4.2.8 Wideband noise and intra BSS intermodulation attenuation in multicarrier operation

### 4.2.8.1 Definition

The purpose of the test to measure against requirements for wideband noise and intra BSS intermodulation attenuation in multicarrier operation is to verify that the level of intermodulation products produced inside the relevant TX bands for a BTS belonging to a multicarrier BTS class does not exceed the specified limit when multiple carriers are active.

### 4.2.8.2 Limit

For a BTS belonging to a multicarrier BTS class, when more than one carrier is active, in the relevant transmit band, the unwanted emission power shall be measured at offsets between 0,4 MHz from the uppermost and lowermost wanted signal carrier frequency and 10 MHz outside the edge of the relevant transmit band.

At frequency offsets higher than or equal to 1,8 MHz from the centre frequency of the uppermost and lowermost active carrier and up to 10 MHz outside the edge of the relevant TX band, the unwanted emissions for a BTS belonging to a multicarrier BTS class shall not exceed the less stringent of the following requirements:



- In a frequency band of 600 kHz centred at the centre frequencies of the intermodulation components, the average power measured over a timeslot shall not exceed -70 dBc or the limit in table 4.2.8-1, whichever is less stringent.

**Table 4.2.8-1: Intermodulation lower limit**

Maximum output power per carrier	Intermodulation power
> 33 dBm	-36 dBm
> 24 dBm and ≤ 33 dBm	-41 dBm
≤ 24 dBm	-46 dBm

- In a frequency band of 600 kHz centered at the third order intermodulation centre frequencies, the average power of the measured intermodulation components over a timeslot may increase up to -60 dBc.
- The requirements specified in clause 4.2.4.1 on Continuous Modulation Spectrum, increased by  $10 \times \text{LOG}(N)$  dB where N is the number of active carriers. The dBc value specified in table 4.2.4-1 for the frequency offset of the centre frequency of the closest carrier to the measurement frequency point shall be reduced by 5 dB to account for the bandwidth conversion from 100 kHz to 30 kHz.

In order to prove the compliance with the intermodulation requirements, the power of all third and fifth order intermodulation products shall be measured.

In the test case with unequal power distribution, the reference for the relative requirements is the power of the carrier with the highest power applied.

At frequency offsets of less than 1,8 MHz from the outermost carriers, the unwanted emissions shall fulfil a mask that is defined in the following steps:

- 1) The dBc values of table 4.2.4-1 in clause 4.2.4.1 ( $A_j$  with  $j = 1$  to  $N$ ) are extracted for each carrier, taking into account the output power level of one carrier and the corresponding frequency offset between the measurement frequency point and the respective carrier. For carriers at offsets above 1,8 MHz from the measurement frequency point, the dBc value for the respective carrier shall be reduced by 5 dB to account for the bandwidth conversion from 100 kHz to 30 kHz.
- 2) The dBc value ( $A_j$  with  $j = N + 1$ ) of the IM attenuation as defined above in the present clause for a BTS belonging to a multicarrier BTS class has to be derived. In some configurations there might be no IM product falling onto the respective frequency. Then this contribution is ignored in the following.
- 3) The obtained  $N + 1$  dBc values are cumulated in the (following way) linear domain:

$$A_{\text{Cumulated, dBc}} = 10 \log_{10} \sum_{j=1}^{N+1} 10^{A_j/10}$$

- 4) This procedure has to be done for the following frequency offsets above the uppermost and below the lowermost carriers: 400 kHz, 600 kHz and 1 200 kHz.
- 5) For each of these measurement frequency points, the measured spectrum shall not exceed the respective unwanted emission mask defined by  $A_{\text{Cumulated, dBc}}$ .

For test case c) in clause 5.3.8.1 the requirements above the uppermost carrier and below the lowermost carrier are the same as specified above with N being the total number of active carriers. In addition the test includes the measurement of the frequency range between the innermost carriers of the two sub-blocks, where the following requirements apply:

- a) For frequency offsets of less than 1,8 MHz above the centre frequency of the uppermost carrier A of the lower sub-blocks or below the centre frequency of the lowermost carrier B of the upper sub-blocks, the unwanted emission shall not exceed a mask defined by the cumulation of the spectrum due to modulation and wideband noise from each of the N carriers and the Intermodulation products, as specified above in this clause for frequency offsets of less than 1,8 MHz for the test of contiguous carrier allocations.

- b) For frequency offsets of equal or larger than 1,8 MHz above the centre frequency of the uppermost carrier A of the lower sub-block and for frequency offsets of equal or larger than 1,8 MHz below the centre frequency of the lowermost carrier B of the upper sub-block: the value of the spectrum due to modulation and wideband noise given for the measurement of carrier A or carrier B, whichever is closest, may not increase by more than  $10 \times \text{LOG}(N)$  dB, or fulfil the Intermodulation requirement given above for a BTS belonging to a multicarrier BTS class for frequencies where IM products are expected, whichever is the less stringent.

NOTE: The cumulated IM products are represented by respective Intra BSS intermodulation attenuation requirement, regardless if IM products originate from either or both sub-blocks.

The absolute lower limit in item 2) in clause 4.2.4.1.2.2 shall apply for all numbers N of active carriers.

At offsets between 600 kHz above the uppermost and below the lowermost carrier, respectively, and 10 MHz outside the relevant transmit band, in bands of 200 kHz width centered on a frequency, which is an integer multiple of 200 kHz, in test case a) and b) in clause 5.3.8.1 exceptions are allowed for N active carriers at  $M = 18 + 3 \times (N-1)$  or up to 40 bands, whichever is the lowest. All exceptions are measured in 100 kHz bandwidth, averaged over the 200 kHz band and may be up to the limit in table 4.2.8-2. In addition, all exceptions within the relevant transmit band and up to four exceptions at offsets up to 2 MHz from the respective band edges, may be up to -70 dBc relative to the carrier measured in a bandwidth of 100 kHz, or -36 dBm, whichever is less stringent. For test case c) in clause 5.3.8.1 the same total number of exceptions M for N active carriers shall apply as given above for test case a) in clause 5.3.8.1, including the range of frequency offsets between 0,6 MHz above the uppermost carrier of the lower sub-block and 0,6 MHz below the lowermost carrier of the upper sub-block. The 200 kHz bands, which centre frequency coincides with the centre frequency of third order IM products of any combination of two or three active carriers and corresponding adjacent channels ( $\pm 200$  kHz), shall not be included in counting the exceptions.

**Table 4.2.8-2: Exception power level for wideband noise**

Multicarrier BTS class	Exception level
Wide Area	-36 dBm
Medium Range	-42 dBm
Local Area	-50 dBm

## 4.2.9 Static Reference Sensitivity Level

### 4.2.9.1 Definition

The static reference sensitivity level of the receiver is the level of signal at the receiver input with a standard test signal at which the receiver will produce after demodulation and channel decoding data with a Frame Erasure Ratio (FER), Residual Bit Error Ratio (RBER) Bit Error Ratio (BER) or Block Error Ratio (BLER) better than or equal to that specified for a specific logical channel type under static propagation conditions.

### 4.2.9.2 Limit

For tests with SFH disabled, the tests shall be performed at one ARFCN. For tests with SFH enabled, the tests shall be performed with the range of hopping frequencies centred around RF channel M.

The error performance given in table 4.2.9-1 shall be met for TCH/FS channel (FER and RBER for class Ib and class II bits) or TCH/EFS (FER and RBER for class Ib and class II bits) or TCH/AFS12.2 (RBER for class Ib).

If GPRS is supported by the BSS, the error performance given in table 4.2.9-1 shall be met for PDTCH/CS-1 channel (BLER).

The error performance given in table 4.2.9-1 shall be met for PDTCH/MCS-5 or, if not supported, for the PDTCH/MCS-x with the next higher supported number x.

The error performance given in table 4.2.9-1 shall be met for PDTCH/UAS-7 or, if not supported, for the PDTCH/UAS-x with the next higher supported number x.

The error performance given in table 4.2.9-1 shall be met for PDTCH/UBS-5, PDTCH/UBS-7 and PDTCH/UBS-10 or, if not supported, for the PDTCH/UBS-x with the next higher supported number x.

For all tests where a signal is present on adjacent timeslots, the receiver of the TRX under test shall be activated for the duration of the test on the adjacent time slots. As a minimum, this shall include the Automatic Gain Control (AGC) of the receiver being operational on the adjacent timeslots.

**Table 4.2.9-1: Static error performance limits at RX sensitivity level**

Channel type	Error Parameter	Limit Value
TCH/FS	FER	0,10 $\alpha$ %
- class Ib	RBER	0,40/ $\alpha$ %
- class II	RBER	2,0 %
TCH/EFS	FER	0,1 %
- class Ib	RBER	0,1 %
- class II	RBER	2,0 %
TCH/AFS12.2, class Ib	RBER	0,001 %
PDTCH/CS-1	BLER	10 %
PDTCH/MCS-1 to 9	BLER	10 % (see note 1)
PDTCH/UAS-7 to 11	BLER	10 % (see note 2)
PDTCH/UBS-5 to 12	BLER	10 % (see note 2)
NOTE 1: The performance requirements for MCS-1 to 4 and MCS-5 to 9 apply to BTTI and RTTI without PAN included.		
NOTE 2: The performance requirements for all respective PDTCH type apply to BTTI and RTTI without PAN included.		

NOTE: The value of  $\alpha$  in table 4.2.9-1 may be between 1 and 1,6, but should be the same for both occurrences.

#### 4.2.9.3 Conformance

Conformance tests described in clause 5.3.9 shall be carried out.

#### 4.2.10 Void

#### 4.2.11 Reference Interference Level

##### 4.2.11.1 Definition

The reference interference level is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal at any adjacent carrier frequencies (adjacent channel interference).

##### 4.2.11.2 Limit

#### Normal-BTS, Micro-BTS, Wide Area and Medium Range multicarrier BTS Conformance Requirement

- 1) 200 kHz offset:

With SFH disabled, the error performance for each of the following logical channel types supported by the BSS shall be measured, each on one ARFCN, for the specified propagation conditions:

TCH/FS: TU50

FACCH/F: TU50

E-TCH/43.2 NT  
or for the highest supported data speed  
or PDTCH/MCS-5 or, if not supported,  
PDTCH/MCS-x with the next higher  
supported number x: TU50

PDTCH/UAS-7 or, if not supported, PDTCH/UAS-x with the next higher supported number x:	TU50
PDTCH/UBS-5 or, if not supported PDTCH/UBS-x with the next higher supported number x:	TU50
PDTCH/UBS-7 or, if not supported PDTCH/UBS-x with the next higher supported number x:	TU50
PDTCH/UBS-10 or, if not supported PDTCH/UBS-x with the next higher supported number x:	TU50

For tests with UBS-x, the Interfering signal shall use higher symbol rate and be generated with the same modulation and pulse shaping filter as the wanted signal.

2) 400 kHz offset:

With SFH disabled, the error performance for each of the following logical channel types supported by the BSS shall be measured, each on RF channels B, M and T, for the specified propagation conditions:

TCH/FS:	TU50
E-TCH/43.2 NT or for the highest supported data speed or PDTCH/MCS-5 or, if not supported, PDTCH/MCS-x with the next higher supported number x:	TU50
PDTCH/UAS-7 or, if not supported, PDTCH/UAS-x with the next higher supported number x:	TU50
PDTCH/UBS-5 or, if not supported PDTCH/UBS-x with the next higher supported number x:	TU50
PDTCH/UBS-7 or, if not supported PDTCH/UBS-x with the next higher supported number x:	TU50
PDTCH/UBS-10 or, if not supported PDTCH/UBS-x with the next higher supported number x:	TU50

With SFH disabled, the error performance for each of the following logical channel types supported by the BSS shall be measured, each on one ARFCN, for the specified propagation profiles:

FACCH/F:	TU50
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3) Channels in VAMOS mode:

If VAMOS is supported by the BSS, the error performance shall be measured for test scenario VUTS-2.

In case 1) above, the error performance given in tables 4.2.11-1 and 4.2.11-2 shall be met for all combinations of logical channel type, frequency of wanted signal, 200 kHz frequency offset of interfering signal and multipath propagation condition tested.

In case 2) above, the error performance given in tables 4.2.11-1 and 4.2.11-2 for EGPRS, ECSD and tables 4.2.11-4 and 4.2.11-5 for other channels shall be met for all combinations of logical channel type, frequency of wanted signal, 400 kHz frequency offset of interfering signal and multipath propagation condition tested.

In case 3) above, the error performance given in table 4.2.11-6 and 4.2.11-7 shall be met for one supported traffic channel and its corresponding associated control channels (FACCH and SACCH) on one ARFCN for SCPIR\_UL values 0 dB and -10 dB. The supported traffic channel (TCH/HS, TCH/EFS, TCH/AFS<sub>x</sub>, TCH/AHS<sub>x</sub> or TCH/WFS<sub>x</sub>) and codec mode (if applicable) with the highest bitrate for which requirements exist at both SCPIR\_UL values shall be tested.

The value of  $\alpha$  in tables 4.2.11-1 to 4.2.11-5 shall be in the range 1 to 1,6 and shall be the same for both occurrences in each propagation condition; it may be different for different propagation conditions.

### Pico-BTS and Local Area multicarrier BTS Conformance Requirement

#### 1) 200 kHz offset:

With SFH disabled, the error performance for each of the following logical channel types supported by the BSS shall be measured, each on one ARFCN, for the TI5 multipath propagation profile:

TCH/FS:	TI5
FACCH/F:	TI5
E-TCH/43.2 NT or for the highest supported data speed or PDTCH/MCS-5 or, if not supported, PDTCH/MCS-x with the next higher supported number x:	TI5
PDTCH/UAS-7 or, if not supported, PDTCH/UAS-x with the next higher supported number x:	TI5
PDTCH/UBS-5 or, if not supported PDTCH/UBS-x with the next higher supported number x:	TI5
PDTCH/UBS-7 or, if not supported PDTCH/UBS-x with the next higher supported number x:	TI5
PDTCH/UBS-10 or, if not supported PDTCH/UBS-x with the next higher supported number x:	TI5

#### 2) 400 kHz offset:

With SFH disabled, the error performance for each of the following logical channel types supported by the BSS shall be measured, each on one ARFCN, for the TI5 multipath propagation profile:

TCH/FS:	TI5
FACCH/F:	TI5
E-TCH/43.2 NT or for the highest supported data speed or PDTCH/MCS-5 or, if not supported, PDTCH/MCS-x with the next higher supported number x:	TI5
PDTCH/UAS-7 or, if not supported, PDTCH/UAS-x with the next higher supported number x:	TI5

PDTCH/UBS-5 or, if not supported  
PDTCH/UBS-x with the next higher  
supported number x: TI5

PDTCH/UBS-7 or, if not supported  
PDTCH/UBS-x with the next higher  
supported number x: TI5

PDTCH/UBS-10 or, if not supported  
PDTCH/UBS-x with the next higher  
supported number x: TI5

3) channels in VAMOS mode:

If VAMOS is supported by the BSS, the error performance shall be measured for test scenario VUTS-2.

In case 1) above, the error performance given in tables 4.2.11-1 and 4.2.11-4 shall be met for all combinations of logical channel type, frequency of wanted signal, 200 kHz frequency offset of interfering signal and TI5 multipath propagation condition tested.

In case 2) above, the error performance given in tables 4.2.11-1 and 4.2.11-2 for EGPRS and ECSD and tables 4.2.11-4 and 4.2.11-5 for other channels shall be met for all combinations of logical channel type, frequency of wanted signal, 400 kHz frequency offset of interfering signal and multipath propagation condition tested.

The value of  $\alpha$  in tables 4.2.11-1 to 4.2.11-5 shall be in the range 1 to 1,6 and shall be the same for both occurrences in the TI5 propagation condition.

In case 3) above, the error performance given in tables 4.2.11-6 and 4.2.11-7 shall be met for one supported traffic channel and its corresponding associated control channels (FACCH and SACCH) on one ARFCN for SCPIR\_UL values 0 dB and -10 dB and TI5 multipath conditions tested. The supported traffic channel (TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx or TCH/WFSx) and codec mode (if applicable) with the highest bitrate for which requirements exist at both SCPIR\_UL values shall be tested.

**Table 4.2.11-1: GSM 400, GSM 900 and ER-GSM 900 Multipath error performance limits at RX interference level**

Channel Type	Error Measure	Error Ratios for the specified propagation conditions	
		TU50 (no SFH)	TI5 (no SFH)
FACCH/F	(FER)	9,5 %	9,5 %
E-TCH/F43.2 NT	(BLER)	10 %	10 %
E-TCH/F32.0 T	(BER)	0,1 %	0,1 %
E-TCH/F28.8 T	(BER)	0,1 %	0,1 %
E-TCH/F28.8 NT	(BLER)	10 %	10 %
TCH/FS	(FER)	6,0 $\alpha$ %	6,0 $\alpha$ %
- class Ib	(RBER)	0,40/ $\alpha$ %	0,40/ $\alpha$ %
- class II	(RBER)	8,0 %	8,0 %
PDTCH/MCS-5 to 6	(BLER)	10 %	10 %
PDTCH/MCS-7	(BLER)	10 %	10 %
PDTCH/MCS-8	(BLER)	30 %	30 %
PDTCH/MCS-9	(BLER)	30 %	30 %
PDTCH/UAS-7 to 9	(BLER)	10 %	10 %
PDTCH/UAS-10	(BLER)	10 %	10 %
PDTCH/UAS-11	(BLER)	10 %	10 %
PDTCH/UBS-5 to 10	(BLER)	10 %	10 %
PDTCH/UBS-11	(BLER)	10 %	10 %
PDTCH/UBS-12	(BLER)	10 %	10 %

NOTE: For GSM 400 the speeds shall be doubled (e.g. TU50 shall be TU100).

Table 4.2.11-2: DCS 1 800 Multipath error performance limits at RX interference level

Channel Type	Error Measure	Error Ratios for the specified propagation conditions	
		TU50 (no SFH)	TI5 (no SFH)
FACCH/F	(FER)	3,4 %	9,5 %
E-TCH/F43.2 NT	(BLER)	10 %	10 %
E-TCH/F32.0 T	(BER)	0,1 %	0,1 %
E-TCH/F28.8 T	(BER)	0,1 %	0,1 %
E-TCH/F28.8 NT	(BLER)	10 %	10 %
TCH/FS	(FER)	3,0 $\alpha$ %	6,0 $\alpha$ %
- class Ib	(RBER)	0,25/ $\alpha$ %	0,40/ $\alpha$ %
- class II	(RBER)	8,1 %	8,0 %
PDTCH/MCS-5 to 6	(BLER)	10 %	10 %
PDTCH/MCS-7	(BLER)	10 %	10 %
PDTCH/MCS-8	(BLER)	30 %	30 %
PDTCH/MCS-9	(BLER)	30 %	30 %
PDTCH/UAS-7 to 9	(BLER)	10 %	10 %
PDTCH/UAS-10	(BLER)	10 %	10 %
PDTCH/UAS-11	(BLER)	30 %	10 %
PDTCH/UBS-5 to 10	(BLER)	10 %	10 %
PDTCH/UBS-11	(BLER)	10 % (see note)	10 % (see note)
PDTCH/UBS-12	(BLER)	10 % (see note)	10 % (see note)

NOTE: 30 % BLER requirement apply for wanted signal narrow.

Table 4.2.11-3: Void

Table 4.2.11-4: GSM 400, GSM 900 and ER-GSM 900 Multipath error performance limits at RX interference level offset 400 kHz

Channel Type	Error Measure	Error Ratios for the specified propagation conditions	
		TU50 (no SFH)	TI5 (no SFH)
FACCH/F	(FER)	17,1 %	17,1 %
TCH/FS	(FER)	10,2 $\alpha$ %	10,2 $\alpha$ %
- class Ib	(RBER)	0,72/ $\alpha$ %	0,72/ $\alpha$ %
- class II	(RBER)	8,8 %	8,8 %

NOTE: For GSM 400 the speeds shall be doubled (e.g. TU50 shall be TU100).

Table 4.2.11-5: DCS 1 800 Multipath error performance limits at RX interference level offset 400 kHz

Channel Type	Error Measure	Error Ratios for the specified propagation conditions	
		TU50 (no SFH)	TI5 (no SFH)
FACCH/F	(FER)	6,1 %	17,1 %
TCH/FS	(FER)	5,1 $\alpha$ %	10,2 $\alpha$ %
- class Ib	(RBER)	0,45/ $\alpha$ %	0,72/ $\alpha$ %
- class II	(RBER)	8,9 %	8,8 %

**Table 4.2.11-6: GSM 400 and GSM 900 Multipath error performance limits at RX interference level for channels in VAMOS mode**

Channel Type	Error Measure	SCPIR_UL (dB)	Error Ratios for the specified test scenario
			VUTS-2
TCH/HS	(FER)	0	1 %
- class Ib	(RBER)	0	0,16 %
- class II	(RBER)	0	3,54 %
TCH/EFS	(FER)	0	1 %
- class Ib	(RBER)	0	0,04 %
- class II	(RBER)	0	3,10 %
TCH/AFS 12.2	(FER)	0	1 %
- class Ib	(RBER)	0	0,45 %
TCH/AFS 4.75	(FER)	0	1 %
- class Ib	(RBER)	0	0,1 %
TCH/AHS 7.4	(FER)	0	1 %
- class Ib	(RBER)	0	0,14 %
- class II	(RBER)	0	1,20 %
TCH/AHS 4.75	(FER)	0	1 %
- class Ib	(RBER)	0	0,18 %
- class II	(RBER)	0	4,50 %
TCH/WFS 12.65	(FER)	0	1 %
- class Ib	(RBER)	0	0,30 %
TCH/WFS 6.60	(FER)	0	1 %
- class Ib	(RBER)	0	0,15 %
FACCH/F	(FER)	0	5 %
FACCH/H	(FER)	0	5 %
SACCH	(FER)	0	5 %
Repeated SACCH	(FER)	0	5 %
TCH/HS	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,13 %
- class II	(RBER)	-10	3,90 %
TCH/EFS	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,04 %
- class II	(RBER)	-10	3,40 %
TCH/AFS 12.2	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,63 %
TCH/AHS 7.4	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,22 %
- class II	(RBER)	-10	1,60 %
TCH/WFS 12.65	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,35 %



**Table 4.2.11-7: DCS 1 800 Multipath error performance limits at RX interference level for channels in VAMOS mode**

Channel Type	Error Measure	SCPIR_UL (dB)	Error Ratios for the specified test scenario
			VUTS-2
TCH/HS	(FER)	0	1 %
- class Ib	(RBER)	0	0,18 %
- class II	(RBER)	0	3,50 %
TCH/EFS	(FER)	0	1 %
- class Ib	(RBER)	0	0,04 %
- class II	(RBER)	0	3,85 %
TCH/AFS 12.2	(FER)	0	1 %
- class Ib	(RBER)	0	0,52 %
TCH/AFS 4.75	(FER)	0	1 %
- class Ib	(RBER)	0	0,13 %
TCH/AHS 7.4	(FER)	0	1 %
- class Ib	(RBER)	0	0,18 %
- class II	(RBER)	0	1,54 %
TCH/AHS 4.75	(FER)	0	1 %
- class Ib	(RBER)	0	0,21 %
- class II	(RBER)	0	4,40 %
TCH/WFS 12.65	(FER)	0	1 %
- class Ib	(RBER)	0	0,32 %
TCH/WFS 6.60	(FER)	0	1 %
- class Ib	(RBER)	0	0,15 %
FACCH/F	(FER)	0	5 %
FACCH/H	(FER)	0	5 %
SACCH	(FER)	0	5 %
Repeated SACCH	(FER)	0	5 %
TCH/HS	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,15 %
- class II	(RBER)	-10	4,01 %
TCH/EFS	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,04 %
- class II	(RBER)	-10	3,41 %
TCH/AFS 12.2	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,67 %
TCH/AHS 7.4	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,23 %
- class II	(RBER)	-10	1,75 %
TCH/WFS 12.65	(FER)	-10	1 %
- class Ib	(RBER)	-10	0,50 %

### 4.2.11.3 Conformance

Conformance tests described in clause 5.3.11 shall be carried out.

## 4.2.12 Blocking Characteristics

### 4.2.12.0 General

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the test suite of the present clause or the Out-of-band blocking requirement in clause 4.2.9 of ETSI EN 301 908-18 [1] can be equally applied for frequency offsets outside the relevant inband frequencies as defined in table 5.3.12-2 of present document.

### 4.2.12.1 Definition

Blocking and spurious response rejection is a measure of the ability of a BSS receiver to receive a wanted GSM modulated signal in the presence of an interfering signal; the level of the interfering signal is higher for the test of blocking than for spurious response.

### 4.2.12.2 Limit

#### 4.2.12.2.1 Blocking

For the channels below, if supported, the measured values shall not exceed the following requirements:

**Table 4.2.12-1: Performance limits for testing blocking, spurious response and intermodulation characteristics**

Logical channel	Performance limit
Channel: TCH/FS	Limit: class II (RBER) = 2,0 %
Channel: E-TCH/F43.2 NT or for the highest supported data speed	10 % BLER for E-TCH/F43.2 NT 0,1 % BER for E-TCH/F32.0 T 0,1 % BER for E-TCH/F28.8 T 10 % BLER for E-TCH/F28.8 NT
Channel: PDTCH/MCS-5 or, if not supported, PDTCH/MCS-x with the next higher supported number x	10 % BLER (see note)
Channel: PDTCH/MCS-1 to MCS-4 if TCH/FS is not supported	10 % BLER (see note)
NOTE: For packet-switched channels, the requirements apply for BTTI without PAN.	

Requirements on out-of-band blocking frequencies, only apply to logical channels modulated using GMSK modulation.

The number of recorded frequencies for the channel type tested, at which the limits above are exceeded, shall meet all of the following requirements per wanted signal frequency under test:

- a) For measurement frequencies which are:

GSM 900, ER-GSM 900: 45 MHz or less from the wanted signal, the total number does not exceed six.

DCS 1 800: 95 MHz or less from the wanted signal, the total number does not exceed twelve.

GSM 400: in band frequencies, the total number does not exceed three.

- b) For measurement frequencies which are:

GSM 900, ER-GSM 900: 45 MHz or less from the wanted signal, no more than three are consecutive.

DCS 1 800: 95 MHz or less from the wanted signal, no more than three are consecutive.

- c) For measurement frequencies which are:

GSM 900, ER-GSM 900: more than 45 MHz from the wanted signal, the total number does not exceed twenty four.

DCS 1 800: more than 95 MHz from the wanted signal, the total number does not exceed twenty four.

GSM 400: out band frequencies, the total number does not exceed twenty four.

- d) For measurement frequencies which are:

GSM 900, ER-GSM 900: more than 45 MHz below the wanted signal, no more than three are consecutive.

DCS 1 800: more than 95 MHz below the wanted signal, no more than three are consecutive.

GSM 400: out band frequencies below the wanted signal, no more than three are consecutive.

- e) For a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, the requirements in a) and b) above apply for inband frequencies on all frequency bands. Similarly the requirements in c) and d) apply for out band frequencies on all frequency bands.

#### 4.2.12.2 Spurious response

The limits in table 4.2.12-1 shall never be exceeded.

#### 4.2.12.3 Conformance

Conformance tests described in clause 5.3.12 shall be carried out.

### 4.2.13 Intermodulation characteristics

#### 4.2.13.1 Definition

This test measures the linearity of the receiver RF parts. It expresses the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

#### 4.2.13.2 Limit

The limits in table 4.2.12-1 shall never be exceeded.

#### 4.2.13.3 Conformance

Conformance tests described in clause 5.3.13 shall be carried out.

### 4.2.14 AM suppression

#### 4.2.14.1 Definition

AM suppression is a measure of the ability of a BSS receiver to receive a wanted GSM modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal.

#### 4.2.14.2 Limit

For the channels below, if supported, the measured values shall not exceed the following requirements:

**Table 4.2.14-1: Performance limits for AM suppression tests**

Logical channel	Performance limit
Channel: TCH/FS	Limit: FER = 0,10 $\alpha$ % class Ib (RBER) = 0,40/ $\alpha$ % class II (RBER) = 2,0 %
Channel: E-TCH/F43.2 NT or for the highest supported data speed	10 % BLER for E-TCH/F43.2 NT 0,1 % BER for E-TCH/F32.0 T 0,1 % BER for E-TCH/F28.8 T 10 % BLER for E-TCH/F28.8 NT
Channel: PDTCH/MCS-5 or, if not supported, PDTCH/MCS-x with the next higher supported number x	10 % BLER (see note)
Channel: PDTCH/MCS-1 to MCS-4 if TCH/FS is not supported	10 % BLER (see note)
NOTE: For packet-switched channels, the requirements apply for BTTI without PAN.	

### 4.2.14.3 Conformance

Conformance tests described in clause 5.3.14 shall be carried out.

## 4.2.15 Spurious emissions from the receiver antenna connector

### 4.2.15.0 General

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the requirement of the present clause or the Receiver spurious emissions requirement in clause 4.2.7 of ETSI EN 301 908-18 [1] can be equally applied.

### 4.2.15.1 Definition

Spurious emissions are emissions at frequencies other than those of the BTS transmitter ARFCNs and adjacent frequencies. This test measures spurious emissions from the BTS receiver antenna connector.

### 4.2.15.2 Limit

The measured power shall not exceed:

- -57 dBm for all frequencies from 9 kHz up to 1 GHz.
- -47 dBm for all frequencies from 1 GHz to 12,75 GHz.

### 4.2.15.3 Conformance

Conformance tests described in clause 5.3.15 shall be carried out.

## 4.2.16 Radiated spurious emissions

### 4.2.16.0 General

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the requirement of the present clause or the Radiated emissions requirement in clause 4.2.3 of ETSI EN 301 908-1 [20] can be equally applied.

### 4.2.16.1 Definition

This test measures radiated spurious emissions from the BSS cabinet, including emissions due to the transmitters. For a BTS with multiple enclosures according to clause 5.3.16.1, the BTS part with Radio digital unit and the Radio unit may be tested separately.

### 4.2.16.2 Limit

- a) The power measured within the BTS relevant transmitter band shall not exceed -36 dBm.
- b) The power measured over the frequency range 30 MHz to 12,75 GHz, excluding the BTS relevant transmitter band shall not exceed:
  - -36 dBm for frequencies up to 1 GHz.
  - -30 dBm for frequencies above 1 GHz.

### 4.2.16.3 Conformance

Conformance tests described in clause 5.3.16 shall be carried out.

## 5 Testing for compliance with technical requirements

### 5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile.

Where technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions (within the boundary limits of the declared operational environmental profile) to give confidence of compliance for the affected technical requirements.

Normally it should be sufficient for all tests to be conducted using normal test conditions except where otherwise stated.

For guidance on the use of other test conditions to be used in order to show compliance reference can be made to ETSI TS 151 021 [2], clause 4.6.

Many tests in the present document are performed with appropriate frequencies in the bottom, middle and top of the operating frequency band of the BS. These are denoted as RF channels B (bottom), M (middle) and T (top) as defined in clause 3.1.

The measurement system that shall apply for each test is described in ETSI TS 151 021 [2], annex B. The measurement procedure and other information on testing of statistical parameters is provided in annexes A and C in ETSI TS 151 021 [2].

### 5.2 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 5.2-1.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor)  $k = 1,96$  (which provide confidence levels of 95 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028 [i.6], in particular in annex D of the ETSI TR 100 028-2 [i.11].

Table 5.2-1 is based on such expansion factors.

**Table 5.2-1: Maximum measurement uncertainty**

Parameter			Uncertainty
Transmitted RF carrier power	Absolute RF power level	power step 0	$\pm 1,0$ dB
Spectrum due to modulation and wideband noise	RF power	absolute limit values	$\pm 1,0$ dB
	Relative RF power	$\delta f \leq 0,1$ MHz	$\pm 0,5$ dB
		$0,1$ MHz < $\delta f \leq 1,8$ MHz	Power diff > 50 dB: $\pm 0,7$ dB Power diff $\geq 50$ dB: $\pm 1,5$ dB
Switching transients spectrum	RF power	Absolute power level	$\pm 1,5$ dB
		Relative power	Power diff > 50 dB: $\pm 0,7$ dB Power diff $\geq 50$ dB: $\pm 1,5$ dB

Parameter			Uncertainty
Conducted spurious emissions from the antenna connector	inside the BTS transmit band		±1,5 dB
	in the receive band of the BTS		±3 dB
	elsewhere	$f \leq 2$ GHz	±1,5 dB
		$2$ GHz < $f \leq 4$ GHz	±2,0 dB
	$f > 4$ GHz	±4,0 dB	
Intermodulation attenuation and Intra base station system intermodulation attenuation	outside RX band	RF power; absolute limit values	±1,5 dB
		RF power, relative measurements	±2,0 dB
	inside RX band	RF power; absolute limit values	+4 dB/-3 dB
Reference interference level	RF power		+5 dB/-0 dB
	Relative RF power		±1,0 dB
Blocking characteristics	RF power, wanted signal		±1,0 dB
	RF power, interfering signal	$f \leq 2$ GHz	±0,7 dB
		$2$ GHz < $f \leq 4$ GHz	±1,5 dB
		$f > 4$ GHz	±3,0 dB
RX Intermodulation characteristics and AM suppression	RF power, wanted signal		±1,0 dB
	RF power, interfering signals		±0,7 dB
Radiated spurious emissions	RF power		±6,0 dB

## 5.3 Essential radio test suites

### 5.3.0 General

The tests listed in this clause are based on GSM base station standard configuration. For other configurations some tests may need to be repeated, see annex B.

#### 5.3.1 Void

### 5.3.2 Mean transmitted RF carrier power

#### 5.3.2.1 Test case

For a normal BTS, the power shall be measured at the input of the TX combiner or at the BSS antenna connector. For a micro-BTS, the power shall be measured at the BSS antenna connector. For a BTS belonging to a multicarrier BTS class the power shall be measured at each transmitting BSS antenna connector. The Manufacturer shall declare the maximum output power of the BSS for each supported modulation at the same reference point as the measurement is made. The TX combiner shall have the maximum number of TRXs connected to it.

NOTE: The value of the output power measured at the antenna connector is generally more useful for cell planning, and may be required for regulatory purposes.

All TRXs in the configuration shall be switched on transmitting full power in all time slots for at least 1 hour before starting the test.

The Manufacturer shall declare how many TRXs the BSS supports:

- 1) 1 TRX: The TRX shall be tested at B, M and T;
- 2) 2 TRX: The TRXs shall each be tested at B, M and T;
- 3) 3 TRX or more: Three TRXs shall each be tested at B, M and T.

In case of a BTS belonging to a multicarrier BTS class, the tests shall be performed for the declared number(s) of carriers, operating at equally distributed power at minimum carrier frequency spacing and grouped at B, M and T, for each antenna connector.

If the Manufacturer declares that Synthesizer Slow Frequency Hopping is supported by the BSS, the BSS shall be configured with the number of TRXs and frequency allocation defined above and SFH enabled.

The BSS under test shall be set to transmit at least 3 adjacent time slots in a TDMA-frame at the same power level. The RMS power level shall be measured on a time slot basis over the useful part of one of the active time slots and then the average of the logarithmic value taken over at least 200 time slots. Only active bursts shall be included in the averaging process. Whether SFH is supported or not, the measurement shall be carried out on all of the 3 frequencies in turn. The measurement bandwidth shall be at least 300 kHz.

The definition of the useful part of the time slot shall be as in ETSI TS 145 004 [4] and ETSI TS 145 010 [6].

For timing on a per time slot basis one of the following configurations shall be used according to ETSI TS 145 010 [6]:

In case of normal symbol rate:

- each time slot shall contain 156,25 modulating symbols; or
- 2 time slots shall contain 157 and 6 time slots shall contain 156 modulating symbols.

In case of higher symbol rate:

- each time slot shall contain 187,5 modulating symbols; or
- time slot 0 and 4 shall each contain 188,4 symbols and the remaining time slots shall contain 187,2 symbols.

The power shall be measured at the highest static power level as specified in clause 4.2.2. As a minimum, one time slot shall be tested on each TRX.

For BTS supporting operation in the ER-GSM 900 band, RF channels B, M, and T refer to the operating frequency band excluding the frequency range 918 MHz to 921 MHz. In addition the test is required to be carried out in the frequency range 918 MHz to 921 MHz for following RF channels: B' = 918,2 MHz, M' = 919,6 MHz and T' = 921,0 MHz to ensure that the maximum carrier power of the ER-GSM 900 BTS fulfils the requirements defined in ETSI TS 145 005 [5], clause 4.1.2.4.

### 5.3.2.2 Test Environment

Normal: Each TRX specified in the test case shall be tested.

Extreme power supply: One TRX shall be tested, on one ARFCN.

NOTE: Tests under extreme power supply are carried out at extreme temperature limits.

### 5.3.3 Void

### 5.3.4 Adjacent channel power

#### 5.3.4.1 Spectrum due to modulation and wideband noise

##### 5.3.4.1.1 Test case

The system under test shall be tested with one TRX active or with the BTS equipped with only one TRX, at three frequencies, first at RF channel B, second at RF channel M and third at RF channel T. Slow frequency hopping shall be disabled:

- a) All time slots shall be set up to transmit full power GMSK modulated with a pseudo-random bit sequence of encrypted bits apart from time slot 0 which shall be set up to transmit at full power but may be modulated with normal BCCH data. The pseudo-random bit sequence may be generated by another pseudo-random bit sequence inserted before channel encoding in the BSS.
- b) The power level (as used in table 4.2.4-1 in clause 4.2.4.1) shall be measured using the method of clause 5.3.2 for the highest power step.
- c) Using a filter and video bandwidth of 30 kHz the power shall be measured at the antenna connector on the carrier frequency. The measurement shall be gated over 50 % to 90 % of the useful part of the time slot excluding midamble, and the measured value over this part of the burst shall be averaged. The averaging shall be over at least 200 time slots and only the active burst shall be included in the averaging process. The test is performed on one timeslot and not on timeslot 0.
- d) Step c) shall be repeated with the following offsets above and below the carrier frequency:
  - in case of a BTS not belonging to a multicarrier BTS class:
    - 100 kHz, 200 kHz, 250 kHz, 400 kHz; and
    - 600 kHz to 1 800 kHz in steps of 200 kHz.
  - in case of a BTS belonging to a multicarrier BTS class:
    - 100 kHz, 200 kHz, 250 kHz, 400 kHz; and
    - 600 kHz up to and including 1 600 kHz in steps of 200 kHz.
- e) With a filter and video bandwidth of 100 kHz and all time slots active, the power shall be measured at the antenna connector for frequency offsets beyond 1 800 kHz up to 2 MHz outside either side of the relevant TX band in case of a BTS not belonging to a multicarrier BTS class. In case of a BTS belonging to a multicarrier BTS class the power shall also be measured at the frequency offset of 1,8 MHz. This test shall be made in a frequency scan mode, with a minimum sweep time of 75 ms and averaged over 200 sweeps.
- f) If the TRX supports QPSK, AQPSK, 8-PSK, 16-QAM or 32-QAM modulation, steps a) to e) shall be repeated with all time slots set up to transmit with the respective modulation apart from timeslot 0 which may be modulated with normal BCCH data.

For a BTS belonging to a multicarrier BTS class, the test methods and conditions in this clause apply for configurations with one carrier active. For multicarrier BTS configurations with more than one carrier active, the test in clause 5.3.8 shall be performed.

#### 5.3.4.1.2 Test Environment

Normal.

#### 5.3.4.2 Switching transients spectrum

##### 5.3.4.2.1 Test case

The Manufacturer shall declare how many TRXs the BSS supports:

- 1 TRX: The TRX shall be tested at B, M and T.
- 2 TRX: One shall be configured to support the BCCH and the second TRX shall be activated and tested at B, M and T.
- 3 TRX: One shall be configured to support the BCCH and the other two shall be activated and tested. Tests shall be performed on B, M and T and both TRXs shall be tested on at least one frequency.
- 4 TRX or more: One shall be configured to support the BCCH and three TRXs shall be tested, one on B, one on M and one on T.



For a BTS belonging to a multicarrier BTS class, the test is performed for a single active carrier at B, M and T for each antenna port, transmitting at declared maximum power.

If the TRX supporting the BCCH is physically different from the remaining TRX(s), it shall also be tested on B, M and T.

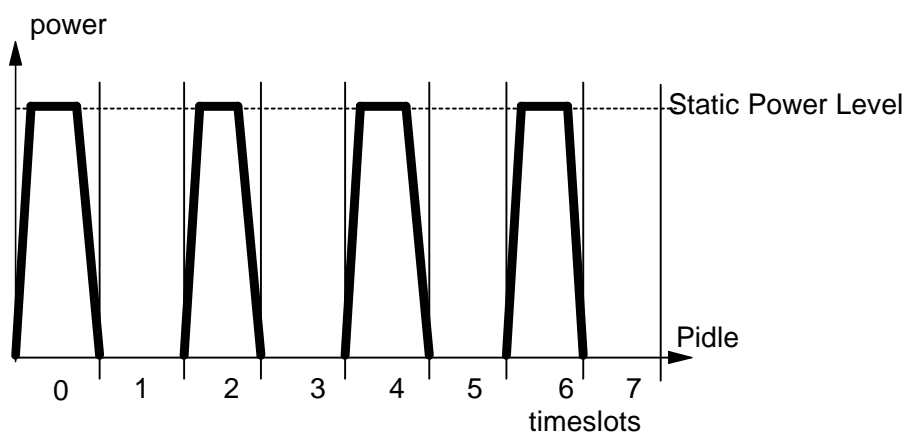
- a) All active time slots shall be GMSK, 8-PSK, QPSK, AQPSK, 16-QAM or 32-QAM modulated with a pseudo-random bit sequence apart from time slot 0 of the TRX supporting the BCCH which may be modulated with normal data. The power shall be measured at the offsets listed below from one of the carrier frequencies in the configuration with the test equipment parameters below. The reference power for relative measurements is the power measured in a bandwidth of at least 300 kHz for the TRX under test for the time slot in this test with the highest power.

- Resolution bandwidth: 30 kHz.
- Video bandwidth: 100 kHz.
- Zero frequency scan.
- Peak hold enabled.

The following offsets from the carrier frequency shall be used:

- 400 kHz, 600 kHz, 1 200 kHz and 1 800 kHz.
- b) All timeslots of the TRX or TRXs under test shall be activated at the highest static power level and the power measured as described in step a). If synthesizer SFH is supported, the test shall be repeated for the TRX or TRXs which are activated and which do not support the BCCH, with them hopping between B, M and T.
- c) Any active TRX which does not support the BCCH shall be configured with alternate timeslots active at the highest level of static power control and the remaining timeslots idle as illustrated in figure 5.3.4-2 and the power measured as described in step a).

**Figure 5.3.4-1: Void**



**Figure 5.3.4-2: Power/time slot configuration**

#### 5.3.4.2.2 Test Environment

Normal.

## 5.3.5 Spurious emissions from the transmitter antenna connector

### 5.3.5.1 Conducted spurious emissions from the transmitter antenna connector, inside the BTS transmit band

#### 5.3.5.1.1 Test case

##### i) For a BTS not belonging to a multicarrier BTS class

The BTS shall be configured with one TRX active at its maximum output power on all time slots. The test shall be performed at RF channels B, M and T. Slow frequency hopping shall be disabled.

The transmitter antenna connector shall be connected to a spectrum analyser or selective voltmeter with the same characteristic impedance. Peak hold shall be enabled. The power shall be measured.

For frequencies with an offset of  $1,8 \text{ MHz} \leq f < 6 \text{ MHz}$  from the carrier frequency, and which fall within the relevant TX band:

- The detecting device shall be configured with a resolution bandwidth of 30 kHz and a video bandwidth of approximately three times this value.

For frequencies with an offset of  $\geq 6 \text{ MHz}$  from the carrier frequency, and which fall within the relevant TX band:

- The detecting device shall be configured with a resolution bandwidth of 100 kHz and a video bandwidth of approximately three times this value.

##### ii) For a BTS belonging to a multicarrier BTS class

The test methods and conditions specified in clause 5.3.4.1.1 apply for configurations with one carrier active and declared maximum output power on all time slots. For BTS configurations with more than one carrier active, the test in clause 5.3.8 shall be performed in addition.

#### 5.3.5.1.2 Test Environment

Normal.

### 5.3.5.2 Conducted spurious emissions from the transmitter antenna connector, outside the BTS transmit band

#### 5.3.5.2.0 General

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the test suite of the present clause or the Transmitter spurious emissions test suite in clause 5.3.3 of ETSI EN 301 908-18 [1] can be equally applied for frequency offsets larger than 10 MHz outside the relevant transmit band.

#### 5.3.5.2.1 For BTS not belonging to a multicarrier BTS class

##### 5.3.5.2.1.1 Test case

- a) The BSS shall be configured with all transmitters active at their maximum output power on all time slots. If a TRX is designated as being a dedicated BCCH, it shall be allocated to RF channel M. All remaining TRXs shall be allocated in the following order; first to RF channel B, then to T, then distributed as evenly as possible throughout the BSS operating transmit band. Slow frequency hopping shall be disabled.
- b) The transmitter antenna connector shall be connected to a spectrum analyser or selective voltmeter with the same characteristic impedance.

The detecting device shall be configured with a resolution and video bandwidth of 100 kHz. The minimum sweep time shall be at least 75 ms and the response shall be averaged over 200 sweeps.

The power shall be measured over the frequency band defined in step c).

- c) Step b) shall be performed for the following frequency band:
- For a GSM 900, ER-GSM 900 or GSM 400 BSS, the band 1 805 MHz to 1 880 MHz. For a DCS 1 800 or GSM 400 BSS, the band 918 MHz to 960 MHz when co-existing with an ER-GSM 900 BTS.
  - For a DCS 1 800 or GSM 400 BSS, the band 921 MHz to 960 MHz.
- d) The BSS shall be configured as in step a) except that each TRX which is not a dedicated BCCH shall transmit on full power on alternate time slots. The active timeslots should be the same for all TRXs. Either odd or even timeslots may be tested. If slow frequency hopping is supported, each TRX which is not a dedicated BCCH shall hop over the full range of frequencies defined in step a).

The detecting device shall be configured as defined in table 5.3.5-1. Peak hold shall be enabled, and the video bandwidth shall be approximately three times the resolution bandwidth. If this video bandwidth is not available on the detecting device, it shall be the maximum available, and at least 1 MHz.

The power shall be measured over those parts of the frequency range 100 kHz to 12,75 GHz which are outside the BTS relevant transmit band.

- e) If the manufacturer declares that the BSS protects co-coverage GSM 400 systems the following test shall be performed:

Step b) shall be repeated for the following frequency band:

- for a GSM 900, ER-GSM 900 or DCS 1 800 BSS, the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496,0 MHz.

**Table 5.3.5-1: Spurious Emissions Measurements outside the transmit band**

Frequency Band	Frequency offset	Resolution Bandwidth
100 kHz to 50 MHz		10 kHz
50 MHz to 500 MHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	≥ 2 MHz	30 kHz
	≥ 5 MHz	100 kHz
500 MHz to 12,75 GHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	≥ 2 MHz	30 kHz
	≥ 5 MHz	100 kHz
	≥ 10 MHz	300 kHz
	≥ 20 MHz	1 MHz
	≥ 30 MHz	3 MHz

#### 5.3.5.2.1.2 Test Environment

Normal.

#### 5.3.5.2.2 For BTS belonging to a multicarrier BTS class

##### 5.3.5.2.2.1 Test case

- a) The BSS shall be configured with the maximum number of carriers per antenna connector active at their corresponding maximum output power on all time slots. All carriers shall be distributed according to test case b) in clause 5.3.8 throughout the maximum Base Station RF bandwidth, including the lowest and highest possible RF channels. If a carrier is designated as being a dedicated BCCH, it shall be allocated to RF channel in the middle of the maximum Base Station RF bandwidth. The maximum Base Station RF bandwidth shall include RF channel B and in a repeated test RF channel T. Slow frequency hopping shall be disabled.
- b) Each transmitter antenna connector shall be connected to a spectrum analyser or selective voltmeter with the same characteristic impedance.

The detecting device shall be configured with a resolution and video bandwidth of 100 kHz. The minimum sweep time shall be at least 75 ms and the response shall be averaged over 200 sweeps.

The power shall be measured over the BSS operating receive band.

- c) Step b) shall be repeated for the following frequency band:
- For a GSM 900 or GSM 400 BSS, the band 1 805 MHz to 1 880 MHz;
  - For a DCS 1 800 or GSM 400 BSS, the band 921 MHz to 960 MHz;
  - For a DCS 1 800 or GSM 400 BSS, the band 918 MHz to 960 MHz when co-existing with an ER-GSM 900 BTS.
- d) The BSS shall be configured as in step a) except that each carrier which is not a dedicated BCCH shall transmit on full power on alternate time slots. The active timeslots should be the same for all carriers. Either odd or even timeslots may be tested. If slow frequency hopping is supported, each carrier which is not a dedicated BCCH shall hop over the full range of frequencies defined in step a).

The detecting device shall be configured as defined in table 5.3.5-2. Average detection shall be enabled, and the video bandwidth shall be approximately three times the resolution bandwidth. If this video bandwidth is not available on the detecting device, it shall be the maximum available, and at least 1 MHz.

The power shall be measured over those parts of the frequency range 100 kHz to 12,75 GHz which are outside the BTS relevant transmit band.

- e) If the manufacturer declares that the BSS protects co-coverage GSM 400 systems the following test shall be performed:

Step b) shall be repeated for the following frequency band:

- For a GSM 900 or DCS 1 800 BSS, the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496,0 MHz.

- f) Test d) is repeated for two cases: when the carriers not supporting BCCH are located at minimum carrier frequency spacing at RF channel B and upwards and when allocated at RF channel T and downwards.

**Table 5.3.5-2: Spurious Emissions Measurements outside the transmit band**

Frequency Band	Frequency offset	Resolution Bandwidth
100 kHz to 50 MHz		10 kHz
50 MHz to 500 MHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	≥ 2 MHz	30 kHz
	≥ 5 MHz	100 kHz
500 MHz to 1 000 MHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	≥ 2 MHz	30 kHz
	≥ 5 MHz	100 kHz
	≥ 10 MHz	300 kHz
	≥ 20 MHz	1 MHz
	≥ 30 MHz	3 MHz
1 000 MHz to 12,75 GHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	≥ 2 MHz	30 kHz
	≥ 5 MHz	100 kHz
	≥ 10 MHz	1 MHz
	≥ 30 MHz	3 MHz

For a BTS belonging to a multicarrier BTS class the definition of the requirements are aligned with the definitions in Recommendation ITU-R SM.329-12 [13] and ERC/REC 74-01 [i.5] in that:

- Unwanted emissions in multicarrier operation are specified in clause 4.2.8 of the present document (requirements for wideband noise and intra BSS intermodulation attenuation in multicarrier operation), both for inband and out-of band emissions up to  $2 \times BW$  frequency offset from edge of relevant transmit band,

where BW is the transmitter bandwidth used as the necessary bandwidth for determining the boundary between the out-of-band and spurious domains. The transmitter bandwidth is defined as the width of the frequency band covering the envelope of the transmitted carriers.

- Minimum required transmitter bandwidth for each operator is assumed to be 5 MHz, i.e. BW is 5 MHz.
- Spurious emissions according to ERC/REC 74-01 [i.5] definition are specified in clause 4.2.5.2 of the present document from  $2 \times BW = 10$  MHz and higher frequency offsets. The 10 MHz spurious domain boundary applies also for larger transmitter bandwidths.
- In addition there is an upper limit for the unwanted emissions from 0 MHz to 10 MHz frequency offset outside the relevant transmit band edge according to the limits in clause 4.2.5.2.2.2 of the present document.
- The relevant transmit bands are defined in table 1-1 of the present document.

#### 5.3.5.2.2.2 Test Environment

Normal.

### 5.3.5.3 Conducted spurious emissions from the transmitter antenna connector, in 3G bands outside the BTS transmit band

#### 5.3.5.3.0 General

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the test suite of the present clause or the Transmitter spurious emissions test suite in clause 5.3.3 of ETSI EN 301 908-18 [1] can be equally applied, as stated in clause 4.2.0 in the present document.

#### 5.3.5.3.1 Test case

- a) A BTS not belonging to a multicarrier BTS class shall be configured with all transmitters active at their maximum output power on all time slots. If a TRX is designated as being a dedicated BCCH, it shall be allocated to RF channel M. All remaining TRXs shall be allocated in the following order; first to RF channel B, then to T, then distributed as evenly as possible throughout the maximum Base Station RF bandwidth. Slow frequency hopping shall be disabled.

In case of a BTS belonging to a multicarrier BTS class the BTS shall be configured with the maximum number of carriers per antenna connector active at their corresponding maximum output power on all time slots. All carriers shall be distributed according to test case b) in clause 5.3.8 throughout the maximum Base Station RF bandwidth, including the lowest and highest possible RF channels. If a carrier is designated as being a dedicated BCCH, it shall be allocated to RF channel in the middle of the maximum Base Station RF bandwidth. The maximum Base Station RF bandwidth shall include RF channel B and in a repeated test RF channel T. Slow frequency hopping shall be disabled.

- b) Each transmitter antenna connector shall be connected to a spectrum analyser or selective voltmeter with the same characteristic impedance.

The detecting device shall be configured with a resolution and video bandwidth of 100 kHz. The minimum sweep time shall be at least 75 ms and the response shall be averaged over 200 sweeps.

The power shall be measured for the frequency bands listed in table 5.3.5-3.

**Table 5.3.5-3: Test of spurious emissions - co-existence with 3 G systems on other frequency bands**

Band (MHz)	Comment
832 to 862, 791 to 821	E-UTRA/FDD BS Rx band, E-UTRA/FDD UE Rx band
1 900 to 1 920	UTRA/TDD band
1 920 to 1 980, 2 110 to 2 170	UTRA/FDD BS Rx band, UTRA/FDD UE Rx band
2 010 to 2 025	UTRA/TDD band
2 300 to 2 400	E-UTRA/TDD band
2 500 to 2 570, 2 620 to 2 690	E-UTRA/FDD BS Rx band, E-UTRA/FDD UE Rx band
2 570 to 2 620	E-UTRA/TDD band

### 5.3.5.3.2 Test Environment

Normal.

## 5.3.6 Intermodulation attenuation

### 5.3.6.1 Test case

If SFH is supported by the BSS, it shall be disabled during this measurement.

The Manufacturer shall declare how many TRXs the BSS supports. The BSS shall be configured with the maximum number of TRXs supported. The test shall be performed for the number of TRXs and the frequencies defined in the conformance requirement.

Only the TRX under test shall be active. All remaining TRXs shall be idle on an ARFCN within the transmit *operating* band for the BSS.

**NOTE:** It is particularly important, for a BSS which uses a tuned transmitter combiner, that all sections of the combiner are set to frequencies within the transmit *operating* band of the BSS during this test.

The antenna output of the RF transmit equipment under test, including the combiner, shall be connected to a coupling device, presenting to the RF equipment a load with an impedance of 50  $\Omega$ . The frequency of the test signal shall be within the transmit operating band (see clause B.1.2). The test signal shall be unmodulated and the frequency shall be X MHz offset from the frequency of the RF transmit equipment under test. The TRX under test shall be set to highest static power control level and the test signal power level shall be adjusted 30 dB below this value. The test signals are illustrated in figure 5.3.6-1. The power level of the test signal shall be measured at the antenna output end of the coaxial cable, when disconnected from the RF transmit equipment and then correctly matched into 50  $\Omega$ . The antenna output power of the RF transmit equipment shall be measured directly at the antenna output terminal connected to an artificial antenna. Intermodulation product frequencies in the relevant TX band and relevant RX band shall be identified and measured according to the following process.

#### **For the measurements in the operating RX band:**

Use a measurement and filter bandwidth of 100 kHz, frequency scan mode, averaged over 200 sweeps, with a sweep time of at least 75 ms. The frequency offset X shall be chosen to cause the lowest order intermodulation product to fall in the operating RX band.

#### **For measurements in the relevant TX band:**

##### **i) For BTS not belonging to a multicarrier BTS class**

The measurement shall be made for frequency offsets X of: 0,8 MHz, 2,0 MHz, 3,2 MHz and 6,2 MHz. The power of all third and fifth order intermodulation products shall be measured. The method of measurement specified below depends on the frequency offset of the intermodulation product from the carrier frequency:

- For measurements at frequency offsets from the active TRX of more than 6 MHz the peak power of any intermodulation components shall be measured with a bandwidth of 300 kHz, zero frequency span, over a time slot period. This shall be measured over sufficient time slots to ensure conformance according to methodology of annex A in ETSI TS 151 021 [2]. The reference power for relative measurements is the power measured in a bandwidth of at least 300 kHz for the TRX under test.
- For measurements at frequency offsets from the active TRX 1,8 MHz or less the intermodulation product power shall be measured selectively using video averaging over 50 % to 90 % of the useful part of the time slot excluding the midamble. The averaging shall be over at least 200 time slots and only active bursts shall be included in the averaging process. The RF and video filter bandwidth of the measuring instrument shall be 30 kHz.
- For measurements at frequency offsets in the range 1,8 MHz to 6 MHz the intermodulation product power shall be measured in a frequency scan mode, with a minimum sweep time of 75 ms and averaged over 200 sweeps. The RF and video filter bandwidth of the measuring instrument shall be 100 kHz.

## ii) For BTS belonging to a multicarrier BTS class

The measurements shall be made for frequency offsets  $X$  of: 0,8 MHz, 2,0 MHz, 3,2 MHz and 6,2 MHz. The power of all third and fifth order intermodulation products shall be measured in a 600 kHz band centered at their centre frequencies. The method of measurement specified below depends on the frequency offset of the intermodulation product from the carrier frequency:

- For measurements at frequency offsets from the active TRX more than 6 MHz the average power of any intermodulation components shall be measured with a bandwidth of 300 kHz, zero frequency span, over a time slot period. This shall be measured over sufficient time slots to ensure conformance according to methodology of annex A in ETSI TS 151 021 [2]. The reference power for relative measurements is the power measured in a bandwidth of at least 300 kHz for the TRX under test. The measurement shall be performed with center frequencies of the measurement bandwidth in the frequency band  $\pm 150$  kHz around the center frequencies of the intermodulation components.
- For measurements at frequency offsets in the range from 1,8 MHz up to and including 6 MHz the average power of any intermodulation components shall be measured with a bandwidth of 100 kHz, zero frequency span, over a time slot period. This shall be measured over sufficient time slots to ensure conformance according to methodology of annex A in ETSI TS 151 021 [2]. The reference power for relative measurements is the power measured in a bandwidth of at least 100 kHz for the TRX under test. The measurement shall be performed with center frequencies of the measurement bandwidth in the frequency band  $\pm 250$  kHz around the center frequencies of the intermodulation components.
- For measurements at frequency offsets in the range from 1,2 MHz up to 1,8 MHz the average power of any intermodulation components shall be measured with a bandwidth of 30 kHz, zero frequency span, over a time slot period. This shall be measured over sufficient time slots to ensure conformance according to methodology of annex A in ETSI TS 151 021 [2]. The reference power for relative measurements is the power measured in a bandwidth of at least 30 kHz for the TRX under test.

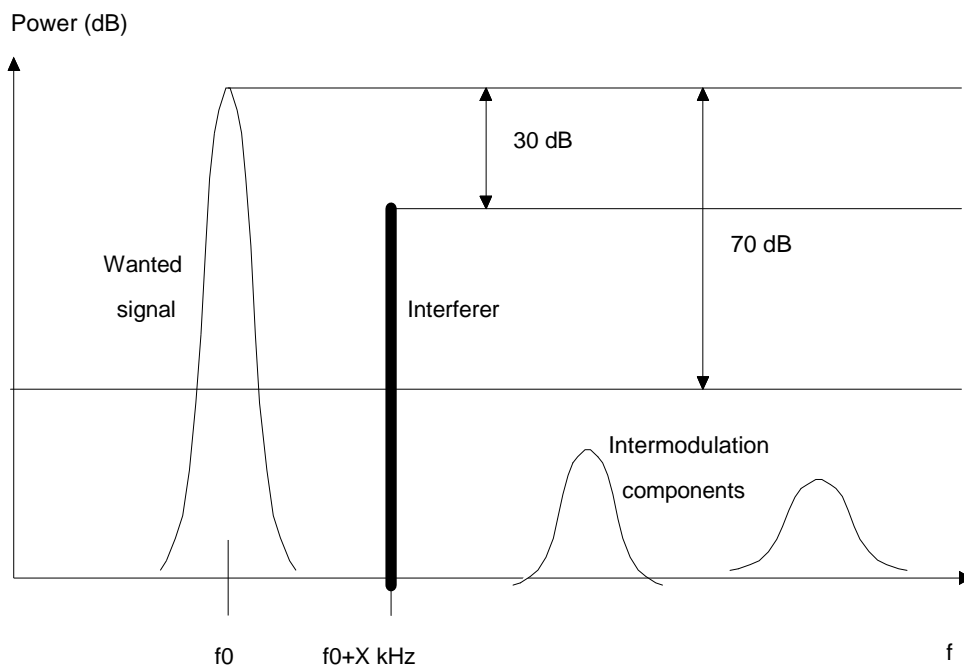


Figure 5.3.6-1: Example of TX intermodulation attenuation

### 5.3.6.2 Test Environment

Normal.

The following tests shall be performed, depending on the number of TRXs supported by the BSS:

- 1) TRX: The TRX shall be tested at B, M, and T.
- 2) TRX: One test shall be performed on B, M, and T. Each TRX shall be tested at least once.

- 3) or more TRX: One TRX shall be tested at B, one at M and one at T.

A BTS belonging to a multicarrier BTS class shall be tested on B, M and T for each transmitting antenna connector.

## 5.3.7 Intra Base Station System intermodulation attenuation

### 5.3.7.1 Test case

If SFH is supported by the BSS, it shall be disabled during this measurement.

The BSS shall be configured with a full complement of transceivers. Each RF transmit equipment shall be operated at the maximum power specified (Highest Static Power Level in clause 4.2.2) and with modulation of a pseudo random sequence applied.

For a BTS belonging to a multicarrier BTS class the tests shall be performed per antenna connector for the lowest supported number of carriers ( $\geq 2$ ) and the declared maximum number of carriers transmitting on equal maximum power according to the power declaration for each configuration.

In the relevant transmit band, the intermodulation components shall be measured at frequency offsets above the uppermost and below the lowermost carrier frequencies.

All intermodulation product frequencies in the relevant TX band and operating RX band shall be identified and measured according to the process below.

#### **For the measurement in the operating RX band**

The equipment shall be operated with ARFCNs such that the lowest order intermodulation product falls into the operating receive band. The measurement shall be carried out at the antenna connector of the BSS, using a frequency selective instrument.

A possible measurement set-up for this test is shown in clause B.2 in ETSI TS 151 021 [2].

For measurements in the RX band the following is the test set up:

- A filter and video bandwidth of 100 kHz.
- Frequency scan mode.
- Minimum sweep time of 75 ms and averaged over 200 sweeps.

#### **For measurements in the relevant TX band**

##### **i) For BTS not belonging to a multicarrier BTS class**

The equipment shall be operated at equal and minimum carrier frequency spacing specified for the BSS configuration under test.

For frequency offsets of more than 6 MHz the peak power of any intermodulation components shall be measured with a bandwidth of 300 kHz, zero frequency span, over a time slot period. This shall be measured over sufficient time slots to ensure conformance according to methodology of clause A.1 in ETSI TS 151 021 [2]. The reference power for relative measurements is the power measured in a bandwidth of at least 300 kHz for the TRX under test.

For frequency offsets 1,8 MHz or less the intermodulation product power shall be measured selectively using video averaging over 50 % to 90 % of the useful part of the time slot excluding the midamble. The averaging shall be over at least 200 time slots and only active bursts shall be included in the averaging process. The RF and video filter bandwidth of the measuring instrument shall be 30 kHz.

For frequency offsets in the range 1,8 MHz to 6 MHz the intermodulation product power shall be measured in a frequency scan mode, with a minimum sweep time of 75 ms and averaged over 200 sweeps. The RF and video filter bandwidth of the measuring instrument shall be 100 kHz.

##### **ii) For BTS belonging to a multicarrier BTS class**

The tests are performed according to clause 5.3.8.



### 5.3.7.2 Test Environment

Normal.

## 5.3.8 Wideband noise and intra BSS intermodulation attenuation in multicarrier operation

### 5.3.8.1 Test case

If SFH is supported by the BSS, it shall be disabled during this measurement.

- a) The tests shall be performed per antenna connector for the declared maximum number of carriers transmitting on equal maximum power according to the power declaration. The equipment shall be operated at minimum carrier frequency spacing specified for the BSS configuration under test. The test is performed for carriers located around M.
- b) The BTS belonging to a multicarrier BTS class shall be configured to operate with the lowest supported numbers of carriers ( $\geq 2$ ) and the declared maximum number of carriers transmitting on equal maximum power according to the power declaration for each configuration and distributed as described below over the corresponding declared maximum Base Station RF bandwidth, configured to include B. The test is repeated in a configuration where maximum Base Station RF bandwidth includes T.

In addition, if no third order intermodulation product at any of these configurations occurs outside the group of carriers and within the relevant TX band or the maximum Transmit Filter bandwidth, whichever is smallest, the carrier frequency spacings shall be equally reduced until one of the third order intermodulation product closest to the group of carriers occurs on one of the band edges of the applicable bandwidth, and the test is repeated. When reducing the spacings, both carrier frequency configurations shall be tested for the two cases: one where the lowest frequency is kept at B and as close as possible to the lower band edge and one where the highest frequency is kept at T and as close as possible to the upper band edge of the relevant transmit band.

- c) If the BTS belonging to a multicarrier BTS class equipment according to the vendor declaration supports non-contiguous frequency allocation as defined in clause B.2.10 and four or more carriers, tests shall be performed per antenna connector with maximum number of carriers as equally as possible distributed between two sub-blocks, each with a sub-block edge at the edge of the maximum Base Station RF bandwidth. The sub-blocks are located around M with a sub-block gap of at least 5 MHz and sub-block bandwidth according to table 5.3.8-1. The carriers shall be operating at equal declared maximum power for this configuration.

**Table 5.3.8-1: Sub-block bandwidth for non-contiguous frequency allocation**

Maximum number of carriers	Sub-block bandwidth [MHz]	Maximum possible equal frequency spacing (Deq) [MHz]
4	4	3,6
5 to 6	4	1,8
7 to 8	4	1,2
9 to 10	4,4	1
11 to 12	4,4	0,8
13 to 14	5,2	0,8
15 to 16	6	0,8
NOTE: For every further increase of 2 more maximum number of carriers, the sub-block bandwidth is increased by 0,8 MHz while Deq remains 0,8 MHz.		

To distribute the carriers in test case b) and within a sub-block in test case c), the difference between adjacent carrier spacing's, between the carrier center frequencies, shall be maximum  $\pm 200$  kHz and the third order IM products, generated by any combination of two or three frequencies, shall coincide within 400 kHz, measured at the center frequencies of the IM products. Any combination fulfilling these criteria can be used, but the same carrier frequency configuration shall be used when B or T respectively is included in the measurement.

The following procedure applies in test case b):

- 1) Calculate the maximum possible equal frequency spacing ( $Deq$ ) within the declared maximum Base Station RF bandwidth ( $RF_{BW\ Max}$ ). Note that the center frequencies of the outermost carriers shall be 200 kHz inside the band edges of  $RF_{BW\ Max}$  and that  $Deq$  is a multiple of 200 kHz.
- 2) Allocate one carrier at lowest and one at highest frequency possible within the  $RF_{BW\ Max}$ .
- 3) Allocate the remaining carriers at frequencies shifted from one of the outermost carriers by a multiple of  $Deq$  with altering offsets. These offsets may be chosen freely to be either 0, +200 kHz or -200 kHz but the difference between two adjacent spacings shall be no more than 200 kHz. It is not allowed to set all offsets to 0. In addition the IM spread limits (IM3 to coincide within 400 kHz) shall be fulfilled.

As an exception, if above conditions cannot be fulfilled, the frequency spacing between the outermost carriers defined in step 2) is reduced by 200 kHz through either reallocation of the uppermost carrier if B is included in the measurement or reallocation of the lowermost carrier if T is included in the measurement.

The following procedure applies in test case c):

- 1) Note the maximum possible equal frequency spacing ( $Deq$ ) from table 5.3.8-1.
- 2) In each sub-block, allocate one carrier at lowest and one at highest frequency possible within the sub-block bandwidth.
- 3) Allocate the remaining carriers of each sub-block at frequencies shifted from the outermost carriers of each sub-block by a multiple of  $Deq$  with altering offsets. If the number of carriers in the two sub-blocks is unequal, one multiple of  $Deq$  will need to be unoccupied in the sub-block with fewer carriers. The offsets may be chosen freely to be either 0, +200 kHz or -200 kHz but the difference between two adjacent spacings shall be no more than 200 kHz.

As an exception if above conditions cannot be fulfilled, the procedure may be modified:

- i) Above procedure may be used with a smaller sub-block bandwidth if the maximum Base Station RF bandwidth is not sufficient, with the maximum possible equal frequency spacing ( $Deq$ ) being the next lower multiple of 200 kHz.
- ii) If i) is not sufficient, above procedure may be used with minimum carrier spacing if the maximum Base Station RF bandwidth is not sufficient. In that case altering offsets shall not be used, as described in step 3).
- iii) If i) or ii) is not sufficient, above procedure may be used when declaring a lower maximum number of carriers for non-contiguous frequency allocation.

For frequency offsets from the centre frequency of the uppermost and lowermost active carrier of more than 6 MHz the average power shall be measured over sufficient time slots to ensure conformance according to methodology of clause A.1:

- Within a 600 kHz band centered at the centre frequencies of the intermodulation components the measurements shall be performed with the center frequencies of the measurement bandwidth in the frequency band  $\pm 150$  kHz around the centre frequencies of the intermodulation components, using a measurement bandwidth of 300 kHz. The reference power for relative measurements shall be the power measured in a bandwidth of 300 kHz for one of the carriers under test.
- For offsets outside the 600 kHz bands around the centre frequencies of the intermodulation components, the measurements shall be performed with the center frequencies of the measurement bandwidth starting at  $\pm 350$  kHz around the centre frequencies of the intermodulation components, using a measurement bandwidth of 100 kHz. The reference power for relative measurements in a bandwidth of 30 kHz for one of the carriers under test.

For frequency offsets from the centre frequency of the uppermost and lowermost active carrier of 1,8 MHz up to and including 6 MHz the average power shall be measured in a frequency scan mode, with a minimum sweep time of 75 ms and averaged over 200 sweeps:

- Within a 600 kHz band centered at the centre frequencies of the intermodulation components, the measurements shall be performed with the center frequencies of the measurement bandwidth in the frequency band  $\pm 250$  kHz around the centre frequencies of the intermodulation components, using a RF and video filter bandwidth of the measuring instrument of 100 kHz. The reference power for relative measurements shall be the power measured in a bandwidth of 100 kHz for one of the carriers under test.
- For offsets outside the 600 kHz bands around the centre frequencies of the intermodulation components, the measurements shall be performed with the center frequencies of the measurement bandwidth starting at  $\pm 350$  kHz around the centre frequencies of the intermodulation components, using a measurement bandwidth of 100 kHz. The reference power for relative measurements shall be the power measured in a bandwidth of 30 kHz for one of the carriers under test.

For frequency offsets from the centre frequency of the uppermost and lowermost active carrier of less than 1,8 MHz the average power shall be measured selectively using video averaging over 50 % to 90 % of the useful part of the time slot excluding the midamble. The averaging shall be over at least 200 time slots and only active bursts shall be included in the averaging process. The RF and video filter bandwidth of the measuring instrument shall be 30 kHz. The reference power for relative measurements shall be the power measured in a bandwidth of 30 kHz for one of the carriers under test.

The measurement conditions for the continuous modulation spectrum regarding frequency offsets and detector settings shall be the same as defined in clause 5.3.4.1 for a BTS belonging to a multicarrier BTS class.

### 5.3.8.2 Test Environment

Normal.

## 5.3.9 Static reference sensitivity level

### 5.3.9.1 Test case

The test shall be performed for the specified ARFCNs. As a minimum, one time slot shall be tested on one TRX.

All TRXs in the BSS configuration shall be on and transmitting full power in all time slots.

For circuit switched channels, a test signal with normal GSM modulation shall be applied to the BSS RX antenna connector, with a power specified in table 5.3.9-1, on a chosen time slot.

For packet switched channels, a test signal with normal GSM modulation or 8-PSK modulation, if supported, shall be applied to the BSS RX antenna connector, with a power specified in table 5.3.9-2, on a chosen time slot. For packet switched channels only BTTI without PAN need to be tested.

For BTS types other than normal, the test signal input level shall be increased by the values in table 5.3.9-3.

The two adjacent time slots shall have a level 50 dB above reference sensitivity requirement specified in table 5.3.9-1. The content of this signal shall allow the receiver of the TRX under test to either be activated or to detect valid GMSK modulated GSM signals (as specified in the conformance requirement) on the adjacent timeslots for the duration of the test. No signal should be applied during the remaining timeslots.

If Synthesizer Slow Frequency Hopping is supported by the BSS, the test shall be repeated with the following changes:

- a) The BSS shall be hopping over the maximum range and number of ARFCNs possible for the test environment and which are available in the BSS configuration.
- b) The test signal should only be applied for the timeslot under test; no signal should be applied during the remaining timeslots.

**Table 5.3.9-1: Test Signal input level for Static reference sensitivity measurement for circuit switched channels**

BTS Type	Test signal Input Level GMSK
GSM 400/GSM 900/DCS 1 800 BTS	-104 dBm
GSM 900 micro-BTS M1	-97 dBm
GSM 900 micro-BTS M2	-92 dBm
GSM 900 micro-BTS M3	-87 dBm
GSM 900 pico-BTS P1	-88 dBm
DCS 1 800 micro-BTS M1	-102 dBm
DCS 1 800 micro-BTS M2	-97 dBm
DCS 1 800 micro-BTS M3	-92 dBm
DCS 1 800 pico-BTS P1	-95 dBm

**Table 5.3.9-2: Test Signal input level for Static reference sensitivity measurement for packet switched channels without PAN**

Normal BTS (GSM 400, GSM 900 and DCS 1 800)					
Type of Channel		Static	TTI (see note 1)	Comment	
PDTCH/CS-1	dBm	-104	BTTI		
PDTCH/MCS-1	dBm	-104	BTTI and RTTI		
PDTCH/MCS-2	dBm	-104	BTTI and RTTI		
PDTCH/MCS-3	dBm	-104	BTTI and RTTI		
PDTCH/MCS-4	dBm	-101,5	BTTI and RTTI		
PDTCH/MCS-5	dBm	-101	BTTI and RTTI		
PDTCH/MCS-6	dBm	-99,5	BTTI and RTTI		
PDTCH/MCS-7	dBm	-96	BTTI and RTTI		
PDTCH/MCS-8	dBm	-93	BTTI and RTTI		
PDTCH/MCS-9	dBm	-91,5	BTTI and RTTI		
PDTCH/UAS-7	dBm	-97,5	BTTI and RTTI		
PDTCH/UAS-8	dBm	-96,5	BTTI and RTTI		
PDTCH/UAS-9	dBm	-96	BTTI and RTTI		
PDTCH/UAS-10	dBm	-95	BTTI and RTTI		
PDTCH/UAS-11	dBm	-93	BTTI and RTTI		
PDTCH/UBS-5	dBm	-103,5	BTTI and RTTI	Input signal generated with narrow pulse-shaping filter	
PDTCH/UBS-6	dBm	-101,5	BTTI and RTTI		
PDTCH/UBS-7	dBm	-95	BTTI and RTTI		
PDTCH/UBS-8	dBm	-93	BTTI and RTTI		
PDTCH/UBS-9	dBm	-91,5	BTTI and RTTI		
PDTCH/UBS-10	dBm	-88	BTTI and RTTI		
PDTCH/UBS-11	dBm	-85,5	BTTI and RTTI		
PDTCH/UBS-12	dBm	-84,5	BTTI and RTTI		
PDTCH/UBS-5	dBm	-104	BTTI and RTTI		Input signal generated with wide pulse-shaping filter
PDTCH/UBS-6	dBm	-104	BTTI and RTTI		
PDTCH/UBS-7	dBm	-101	BTTI and RTTI		
PDTCH/UBS-8	dBm	-99,5	BTTI and RTTI		
PDTCH/UBS-9	dBm	-98,5	BTTI and RTTI		
PDTCH/UBS-10	dBm	-95	BTTI and RTTI		
PDTCH/UBS-11	dBm	-93	BTTI and RTTI		
PDTCH/UBS-12	dBm	-91,5	BTTI and RTTI		

NOTE 1: Test Signal input levels for Static reference sensitivity apply to BTTI without PAN as well as RTTI without PAN for PDTCH indicated in the table.

NOTE 2: The requirements for all channel types assume single antenna configuration.

**Table 5.3.9-3: Test signal input level corrections for different BTS Types (for table 5.3.9-2)**

BTS Type	Test signal Average Input Level corrections
GSM 400/GSM 900 micro-BTS M1	+7 dB
GSM 900 micro-BTS M2	+12 dB
GSM 900 micro-BTS M3	+17 dB
GSM 900 pico-BTS P1	+16 dB
DCS 1 800 micro-BTS M1	+2 dB
DCS 1 800 micro-BTS M2	+7 dB
DCS 1 800 micro-BTS M3	+12 dB
DCS 1 800 pico-BTS P1	+9 dB

The input signal before channel encoding in the BSSTE shall be compared with the signal which is obtained from the BSS receiver after channel decoding.

### 5.3.9.2 Test Environment

Normal.

### 5.3.10 Void

### 5.3.11 Reference Interference Level

#### 5.3.11.1 Test case

If Slow Frequency Hopping (SFH) is supported by the BSS, it shall be disabled during this measurement, except when performing tests using propagation conditions with ideal SFH.

When SFH is used in the test, the BSS shall hop over the maximum range and number of ARFCNs possible for the test environment and which are available in the BSS configuration. If SFH is not supported, the test shall be performed on the specified number of ARFCNs. As a minimum, one time slot shall be tested on one TRX.

The tests shall be performed in a single-antenna configuration except in case of packet-switched channels with higher symbol rate and channels in VAMOS mode where two-antenna configuration with no correlation or gain difference between the branches is used.

Two input signals shall be connected to the respective receiver connector via a combining network. When testing each signal shall be connected through a Multipath Fading Simulator (MFS) as described in clause B.1 in ETSI TS 151 021 [2], except in the cases of frequency offsets of the interfering signal from the wanted signal of 400 kHz, where the interferer shall be static, unless otherwise stated in tables 5.3.11-2 and 5.3.11-3. The multipath fading propagation conditions shall be uncorrelated. In the case of channels in VAMOS mode, two input wanted signals and two input interfering signals shall be connected to each receiver antenna connector via a multipath fading simulator such that the multipath fading propagation conditions between all the input signals and all the receiver antennas are uncorrelated. The frequency offsets and the relative levels of the interfering signals are defined in table 5.3.11-0 for test scenario VUTS-2. The wanted signals VAMOS sub-channel 1 and VAMOS sub-channel 2 shall be GMSK modulated and encoded according to the channel type in table 5.3.11-6. The interfering signals shall be GMSK modulated with a pseudo random bitstream without midamble. Independent pseudo random bit streams shall be assumed between all input signals.

**Table 5.3.11-0: Test scenarios for reference interference level for channels in VAMOS mode**

Test Scenario	Interfering Signal	Interferer power level (see note 1)	TSC	Interferer Delay range
VUTS-2	Adjacent channel 1 (see note 2) Adjacent channel 2 (see note 2)	- 0 dB	none none	no delay no delay
NOTE 1: Power level relative to Adjacent channel 1.				
NOTE 2: Both interferers are on the same adjacent channel frequency.				

The referred power level for both signals shall be the average power into the BSS RX antenna connector. This shall be measured by taking the mean powers of the sum of the individual paths.

For GMSK modulated circuit switched channels except channels in VAMOS mode, the wanted signal shall have the power level as defined in table 5.3.11-1. It shall have normal GSM modulation. In the case of a pico-BTS or Local Area multicarrier BTS, the power level defined in table 5.3.11-1 shall be 4 dB greater for measurements performed with interferer offsets of 400 kHz.

For packet switched channels and ECSD channels with 8PSK modulation, the wanted signal level shall be  $(X-9\text{dB}+I_r)$ , where "X" is the power level defined in table 5.3.11-1 and " $I_r$ " is the co-channel interference ratio defined in table 5.3.11-4. For packet-switched channels with QPSK, 16-QAM and 32-QAM modulation in the case of 200 kHz adjacent channel interference, the wanted signal level shall be  $(X+9\text{dB}+I_{ar})$ , where "X" is the power level defined in table 5.3.11-1 and " $I_{ar}$ " the interference ratio in table 5.3.11-5.

For channels in VAMOS mode, VAMOS sub-channel 2 shall be at input level  $(X+9\text{dB}+I_r)$  for test scenario VUTS-2, where "X" is the power level defined in table 5.3.11-1 and " $I_r$ " is the carrier-to-interference ratio in table 5.3.11-6. In the case of Local Area multicarrier BTS, table 5.3.11-7 applies. VAMOS sub-channel 1 shall be at an input level relative to VAMOS sub-channel 2 according to the value of SCPIR\_UL in table 5.3.11-6.

**Table 5.3.11-1: Test signal average input level for Reference Interference Level measurements**

BTS Type	Test signal average input level to receiver
GSM 400/GSM 900/ER-GSM 900/DCS 1 800 BTS	-84 dBm
GSM 900/ER-GSM 900 micro-BTS M1	-77 dBm
GSM 900/ER-GSM 900 micro-BTS M2	-72 dBm
GSM 900/ER-GSM 900 micro-BTS M3	-67 dBm
GSM 900/ER-GSM 900 pico-BTS P1	-68 dBm (see note)
DCS 1 800 micro-BTS M1	-82 dBm
DCS 1 800 micro-BTS M2	-77 dBm
DCS 1 800 micro-BTS M3	-72 dBm
DCS 1 800 pico-BTS P1	-75 dBm (see note)
GSM 400/GSM 900/DCS 1 800 Wide Area multicarrier BTS	-84 dBm
GSM 400/GSM 900/DCS 1 800 Medium Range multicarrier BTS	-78 dBm
GSM 400/GSM 900/DCS 1 800 Local Area multicarrier BTS	-70 dBm (see note)
NOTE:	The power level shall be increased by 4 dB for measurements performed with interferer offsets of 400 kHz.

The interfering signal shall be continuous and have GSM modulation of a pseudo-random bitstream without midamble. If the TRX supports 8-PSK, 16-QAM or 32-QAM at normal symbol rate it shall be tested with the interfering signal having GMSK modulation and with the interfering signal having 8-PSK modulation, unless it can be demonstrated that it is sufficient to test either with GMSK or 8-PSK modulated interfering signal.

If the wanted signal has higher symbol rate, the TRX shall be tested for adjacent (200 kHz) channel interference performance with an interfering signal at higher symbol rate, using the same modulation and pulse shaping filter as the wanted signal, while adjacent (400 kHz) channel interference performance shall be tested with the interfering signal having GMSK modulation and with the interfering signal having 8-PSK modulation. If the TRX does not support 8-PSK it shall be tested with the interfering signal having GMSK modulation. For SFH this interferer shall consist of either one signal which hops in synchronization with the time slot under test or a number of fixed frequency signal sources. In the latter case the number of interfering sources determines the number of frequencies over which the time slot under test can hop in the test environment irrespective of the upper limit of the BTS.

For packet-switched channels only BTTI without PAN need to be tested.

When testing 16-QAM, 32-QAM (both normal and higher symbol rate) and QPSK modulated channels TSC-6 shall be used for the wanted signal.

For GMSK modulated circuit switched channels except channels in VAMOS mode, the test shall be performed with frequency offsets of the interfering signal from the wanted signal, for a relative level of interfering signal above the wanted signal as specified in table 5.3.11-2.

For packet switched channels and ECSD, the test shall be performed with frequency offsets of the interfering signal from the wanted signal, for a carrier to interferer ratio, relative to the co-channel interference ratio (C/Ic), as specified in table 5.3.11-3. The minimum co-channel interference ratio (C/Ic) for all the combinations of logical channel type and propagation condition are as specified in table 5.3.11-4.

For channels in VAMOS mode, the test shall be performed for the test scenario in table 5.3.11-0 with the minimum carrier to interferer ratio specified in table 5.3.11-6. In the case of Local Area multicarrier BTS table 5.3.11-7 applies instead.

In the case of Slow Frequency Hopping (SFH) the interfering signal shall be on the same ARFCN as the wanted signal over the useful part of the time slot burst. Only the multipath propagation condition TU50 (no SFH) need be tested for normal and micro-BTS systems, and only the multipath propagation condition TI5 (no SFH) need be tested for pico-BTS systems.

**Table 5.3.11-2: Adjacent channel interference rejections for circuit switched channels except ECSD**

Interferers offset	Carrier to Interferer Ratio:		Fading of interferer
	Normal, Micro-BTS, WA and MR multicarrier BTS	Pico-BTS and LA multicarrier BTS	
200 kHz	-9 dB	-5 dB	yes
400 kHz	-41 dB	-37 dB	no

**Table 5.3.11-3: Adjacent channel interference ratios for packet switched channels and for ECSD channels**

Modulation of wanted signal	8-PSK	16-QAM and 32-QAM with normal symbol rate	QPSK, 16-QAM and 32-QAM with higher symbol rate	Fading of interferer
Interferers offset	Carrier to Interferer Ratio	Carrier to Interferer Ratio	Carrier to Interferer Ratio	
200 kHz	table 5.3.11-5	table 5.3.11-5	table 5.3.11-5	yes
400 kHz	C/Ic - 50 dB	C/Ic - 48 dB	C/Ic - 44,5 dB (QPSK) C/Ic - 43 dB (16-QAM) C/Ic - 42,5 dB (32-QAM)	yes

For QPSK, 16-QAM and 32-QAM modulated channels with higher symbol rate, the wanted signal shall be generated with wide pulse shaping filter when testing for adjacent (400 kHz) channel performance. For tests of adjacent (200 kHz) channel performance the input signals shall be generated with pulse shaping filters according to table 5.3.11-5.

For channels in VAMOS mode, a time and frequency offset shall be applied to VAMOS sub-channel 1 relative to VAMOS sub-channel 2. The offsets shall be applied burst-wise and taken from a sample sequence that conforms with the probability distribution in Equation 5.3.11a for the time offset and Equation 5.3.11b for the frequency offset.

**Table 5.3.11-3a: Probability distribution parameters**

Frequency Band	900	1 800
$\mu$	45 Hz	90 Hz
$\sigma$	10 Hz	17 Hz

$$p(\text{Time offset}) = \begin{cases} 0,25 & \text{for Time offset} = -1 \text{ Normal Symbol Periods} \\ 0,5 & \text{for Time offset} = 0 \text{ Normal Symbol Periods} \\ 0,25 & \text{for Time offset} = 1 \text{ Normal Symbol Periods} \\ 0, & \text{else} \end{cases} \quad (5.3.11a)$$

$$p(\text{Frequency offset}) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(\text{Frequency offset} - \mu)^2}{2\sigma^2}} \quad (5.3.11b)$$

NOTE: Any sample sequence which fulfils this criteria may be used.

**Table 5.3.11-4: Co-channel interference ratios (C/Ic) for packet switched channels and ECSD channels**

<b>GSM 400, GSM 900 and ER-GSM 900</b>			
<b>Channel type</b>	<b>Unit</b>	<b>Carrier to Interferer Ratios for specified propagation conditions</b>	
		<b>TU50 (no SFH)</b>	<b>TI5 (no SFH)</b>
PDTCH/MCS-5	dB	15,5	19,5
PDTCH/MCS-6	dB	18	22
PDTCH/MCS-7	dB	24	28
PDTCH/MCS-8	dB	30	34
PDTCH/MCS-9	dB	33	37
E-TCH/F43.2 NT	dB	19,5	23,5
E-TCH/F32.0 T	dB	17	21
E-TCH/F28.8 T	dB	17,5	21,5
E-TCH/F28.8 NT	dB	14,5	18,5

NOTE 1: For GSM 400 the speeds shall be doubled (e.g. TU50 shall be TU100).  
NOTE 2: The carrier to interferer ratios in this table are only used to derive the wanted signal level to be used for the adjacent-channel interference requirement.

<b>DCS 1 800</b>			
<b>Channel type</b>	<b>Unit</b>	<b>Carrier to Interferer Ratios for specified propagation conditions</b>	
		<b>TU50 (no SFH)</b>	<b>TI5 (no SFH)</b>
PDTCH/MCS-5	dB	15	19,5
PDTCH/MCS-6	dB	17,5	22
PDTCH/MCS-7	dB	26	28
PDTCH/MCS-8	dB	25**	34
PDTCH/MCS-9	dB	29**	37
E-TCH/F43.2 NT	dB	19,5	23,5
E-TCH/F32.0 T	dB	16	21
E-TCH/F28.8 T	dB	16	21,5
E-TCH/F28.8 NT	dB	14	18,5

NOTE 1: Performance is specified at 30 % BLER for those cases marked as (\*\*).  
NOTE 2: The carrier to interferer ratios in this table are only used to derive the wanted signal level to be used for the adjacent-channel interference requirement.



**Table 5.3.11-5: Adjacent channel interference ratios (C/Ia) for EGPRS, EGPRS2 and ECSD channels**

<b>GSM 400, GSM 900 and ER-GSM 900</b>				
<b>Channel Type</b>	<b>Unit</b>	<b>Carrier to Interferer Ratios for specified propagation conditions</b>		
		<b>TU50 (no SFH)</b>	<b>TI5 (no SFH)</b>	<b>Comment</b>
PDTCH/MCS-5	dB	-2	2	
PDTCH/MCS-6	dB	1	5	
PDTCH/MCS-7	dB	8,5	12,5	
PDTCH/MCS-8	dB	9**	13**	
PDTCH/MCS-9	dB	13,5**	17,5**	
PDTCH/UAS-7	dB	9,5	13,5	
PDTCH/UAS-8	dB	11	15	
PDTCH/UAS-9	dB	13,5	17,5	
PDTCH/UAS-10	dB	17	21	
PDTCH/UAS-11	dB	23,5	27,5	
PDTCH/UBS-5	dB	-16,5	-12,5	Input signals generated with wide pulse-shaping filter (see note 3)
PDTCH/UBS-6	dB	-14,0	-10,0	
PDTCH/UBS-7	dB	-9,5	-5,5	
PDTCH/UBS-8	dB	-6,0	-2,0	
PDTCH/UBS-9	dB	-3,5	0,5	
PDTCH/UBS-10	dB	1,0	5,0	
PDTCH/UBS-11	dB	9,0	13,0	
PDTCH/UBS-12	dB	13,5	17,5	
PDTCH/UBS-5	dB	-14,0	-10,0	Input signals generated with narrow pulse-shaping filter (see note 3)
PDTCH/UBS-6	dB	-11,0	-7,0	
PDTCH/UBS-7	dB	-2,5	1,5	
PDTCH/UBS-8	dB	0,5	4,5	
PDTCH/UBS-9	dB	2,0	6,0	
PDTCH/UBS-10	dB	9,0	13,0	
PDTCH/UBS-11	dB	13,0	17,0	
PDTCH/UBS-12	dB	14,5	18,5	
E-TCH/F43.2 NT	dB	3,5	7,5	
E-TCH/F32.0 T	dB	-2,5	1,5	
E-TCH/F28.8 T	dB	0,5	4,5	
E-TCH/F28.8NT	dB	- 1,5	2,5	

NOTE 1: For GSM 400 the speeds shall be doubled (e.g. TU50 shall be TU100).  
NOTE 2: Performance is specified at 30 % BLER for those cases marked as (\*\*).  
NOTE 3: PDTCH/UBS-5 to 12 requirements assume two-antenna configuration. The Interfering signal shall use higher symbol rate and be generated with the same modulation and pulse shaping filter as the wanted signal.

DCS 1 800				
Channel Type	Unit	Carrier to Interferer Ratios for specified propagation conditions		
		TU50 (no SFH)	TI5 (no SFH)	Comment
PDTCH/MCS-5	dB	-2	2	
PDTCH/MCS-6	dB	1,5	5	
PDTCH/MCS-7	dB	10,5	12,5	
PDTCH/MCS-8	dB	10**	13**	
PDTCH/MCS-9	dB	16**	17,5**	
PDTCH/UAS-7	dB	9,5	13,5	
PDTCH/UAS-8	dB	12	15	
PDTCH/UAS-9	dB	15,5	17,5	
PDTCH/UAS-10	dB	24,5	21	
PDTCH/UAS-11	dB	20,5**	27,5	
PDTCH/UBS-5	dB	-13,0	-12,5	Input signals generated with wide pulse-shaping filter (see note 2)
PDTCH/UBS-6	dB	-10,0	-10,0	
PDTCH/UBS-7	dB	-5,5	-5,5	
PDTCH/UBS-8	dB	-2,0	-2,0	
PDTCH/UBS-9	dB	1,5	0,5	
PDTCH/UBS-10	dB	5,0	5,0	
PDTCH/UBS-11	dB	14,5	13,5	
PDTCH/UBS-12	dB	20,0	17,5	
PDTCH/UBS-5	dB	-10,0	-10,0	Input signals generated with narrow pulse-shaping filter (see note 2)
PDTCH/UBS-6	dB	-6,5	-7,5	
PDTCH/UBS-7	dB	2,0	1,5	
PDTCH/UBS-8	dB	5,0	4,5	
PDTCH/UBS-9	dB	7,0	6,0	
PDTCH/UBS-10	dB	14,0	13,0	
PDTCH/UBS-11	dB	12,5**	17,0	
PDTCH/UBS-12	dB	14,0**	18,5	
E-TCH/F43.2 NT	dB	4	7,5	
E-TCH/F32.0 T	dB	-3,5	1,5	
E-TCH/F28.8 T	dB	-0,5	4,5	
E-TCH/F28.8NT	dB	-2	2,5	

NOTE 1: Performance is specified at 30 % BLER for those cases marked as (\*\*).

NOTE 2: PDTCH/UBS-5 to 12 requirements assume two-antenna configuration. The Interfering signal shall use higher symbol rate and be generated with the same modulation and pulse shaping filter as the wanted signal.

Table 5.3.11-6: Carrier to interference ratios for channels in VAMOS mode

GSM 400, GSM 900			
Channel Type	Unit	SCPIR_UL (dB)	Carrier to Interferer Ratios (C/I1) for test scenarios for propagation condition TU50 (no SFH)
			VUTS-2
TCH/HS	dB	0	-6,5
TCH/EFS	dB	0	-3,5
TCH/AFS 12.2	dB	0	-4,5
TCH/AFS 4.75	dB	0	-12,5
TCH/AHS 7.4	dB	0	-1
TCH/AHS 4.75	dB	0	-7,5
TCH/WFS 12.65	dB	0	-4
TCH/WFS 6.60	dB	0	-11
FACCH/F	dB	0	-8,5
FACCH/H	dB	0	-8,5
SACCH	dB	0	-7,5
Repeated SACCH	dB	0	-14,5
TCH/HS	dB	-10	-8
TCH/EFS	dB	-10	-7
TCH/AFS 12.2	dB	-10	-7,5
TCH/AHS 7.4	dB	-10	-3
TCH/WFS 12.65	dB	-10	-6,5

NOTE 1: I1 corresponds to the power of Adjacent channel 1.  
NOTE 2: For GSM 400 the speeds shall be doubled (e.g. TU50 shall be TU100).

DCS 1 800			
Channel Type	Unit	SCPIR_UL (dB)	Carrier to Interferer Ratios (C/I1) for test scenarios for propagation condition TU50 (no SFH)
			VUTS-2
TCH/HS	dB	0	-5,5
TCH/EFS	dB	0	-3,5
TCH/AFS 12.2	dB	0	-4,5
TCH/AFS 4.75	dB	0	-14
TCH/AHS 7.4	dB	0	-1
TCH/AHS 4.75	dB	0	-7,5
TCH/WFS 12.65	dB	0	-4
TCH/WFS 6.60	dB	0	-11
FACCH/F	dB	0	-8,5
FACCH/H	dB	0	-8
SACCH	dB	0	-7
Repeated SACCH	dB	0	-15
TCH/HS	dB	-10	-6,5
TCH/EFS	dB	-10	-5
TCH/AFS 12.2	dB	-10	-6
TCH/AHS 7.4	dB	-10	0,5
TCH/WFS 12.65	dB	-10	-5

NOTE: I1 corresponds to the power of Adjacent channel 1.

**Table 5.3.11-7: Carrier to interference ratios for channels in VAMOS mode for propagation condition TI5 (no SFH)**

<b>GSM 400, GSM 900</b>			
<b>Channel Type</b>	<b>Unit</b>	<b>SCPIR_UL (dB)</b>	<b>Carrier to Interferer Ratios (C/I1) for test scenarios for propagation condition TI5 (no SFH)</b>
			<b>VUTS-2</b>
TCH/HS	dB	0	-0,5
TCH/EFS	dB	0	2,5
TCH/AFS 12.2	dB	0	1,5
TCH/AFS 4.75	dB	0	-6,5
TCH/AHS 7.4	dB	0	5
TCH/AHS 4.75	dB	0	-1,5
TCH/WFS 12.65	dB	0	2
TCH/WFS 6.60	dB	0	-5
FACCH/F	dB	0	-2,5
FACCH/H	dB	0	-2,5
SACCH	dB	0	-1,5
Repeated SACCH	dB	0	-8,5
TCH/HS	dB	-10	-2
TCH/EFS	dB	-10	-1
TCH/AFS 12.2	dB	-10	-1,5
TCH/AHS 7.4	dB	-10	3
TCH/WFS 12.65	dB	-10	-0,5
NOTE 1: I1 corresponds to the power of Adjacent channel 1.			
NOTE 2: For GSM 400 the speeds shall be doubled (e.g. TI5 shall be TI10).			

<b>DCS 1 800</b>			
<b>Channel Type</b>	<b>Unit</b>	<b>SCPIR_UL (dB)</b>	<b>Carrier to Interferer Ratios (C/I1) for test scenarios for propagation condition TI5 (no SFH)</b>
			<b>VUTS-2</b>
TCH/HS	dB	0	0,5
TCH/EFS	dB	0	2,5
TCH/AFS 12.2	dB	0	1,5
TCH/AFS 4.75	dB	0	-8
TCH/AHS 7.4	dB	0	5
TCH/AHS 4.75	dB	0	-1,5
TCH/WFS 12.65	dB	0	2
TCH/WFS 6.60	dB	0	-5
FACCH/F	dB	0	-2,5
FACCH/H	dB	0	-2
SACCH	dB	0	-1
Repeated SACCH	dB	0	-9
TCH/HS	dB	-10	-0,5
TCH/EFS	dB	-10	1
TCH/AFS 12.2	dB	-10	0
TCH/AHS 7.4	dB	-10	6,5
TCH/WFS 12.65	dB	-10	1
NOTE: I1 corresponds to the power of Adjacent channel 1.			

All TRXs in the BSS configuration shall be on and transmitting full power in all time slots.

The input signal before channel encoding in the BSSTE shall be compared with the signal which is obtained from the BSS receiver after channel decoding.

### 5.3.11.2 Test Environment

Normal.

## 5.3.12 Blocking Characteristics

### 5.3.12.0 General

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the test suite of the present clause or the out-of-band blocking test suite in clause 5.3.8 of ETSI EN 301 908-18 [1] can be equally applied for frequency offsets outside the relevant inband frequencies as defined in table 5.3.12-2 of the present document.

### 5.3.12.1 Test case

The manufacturer shall declare any intermediate frequencies (IF1 to IFn) used within the receiver, and the frequency of the local oscillator applied to the first receiver mixer.

- 1) This measurement is carried out in three stages:
  - a) An optional preliminary test to identify frequencies of interfering signal which require more detailed investigation.
  - b) Measurement of blocking performance:  
All out-of-band frequencies (general requirements for co-existence).
  - c) Measurement of spurious response performance; this test need only be performed at those frequencies of interfering signal at which the specification for blocking is not met.
- 2) The BSS shall be configured to operate as close to the centre of the operating receive band as is possible. In case of BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, the BTS configuration in clause B.2.10 applies. If Slow frequency hopping is supported by the BSS, it shall be disabled during these measurements.
- 3) The measurement shall be performed in a test configuration, depending on the declared type of receiver:
  - a) For all types of receivers except for BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, the two RF signals shall be fed into the receiver antenna connector of the BSS using a combining network. The wanted signal shall be at the operating frequency of the receiver, shall be modulated with normal GSM modulation, and shall be at a level as specified in table 5.3.12-1, table 5.3.12-1a and table 5.3.12-1b. The measurement is only performed under static propagation conditions.
  - b) In case of testing a BTS belonging to a Wide Area or Medium Range multicarrier BTS class equipped with multicarrier receiver, the maximum supported number of wanted signals or **four**, whichever is less, and the blocking signal shall be fed into the receiver antenna connector of the BSS using a combining network. In case of testing a BTS belonging to a Local Area multicarrier BTS class equipped with multicarrier receiver, the maximum supported number of wanted signals or **two**, whichever is less, and the blocking signal shall be fed into the receiver antenna connector of the BSS using a combining network. The wanted signals shall be equally spread over the maximum Base Station RF bandwidth with two of them allocated at the edge frequencies of the maximum Base Station RF bandwidth of the receiver. Each wanted signal shall use a normal GSM modulation, with signal levels as specified in table 5.3.12-1, table 5.3.12-1a and table 5.3.12-1b at the receiver input. If no requirement is defined in table 5.3.12-3 for a combination of interfering signal power and frequency offset between interferer and wanted signal, the measured data for the corresponding wanted signal(s) may be discarded from the evaluation. The allocation of the center frequency of the RF Base Station bandwidth is set according to clause B.2.10 except for out-of-band blocking tests where it is sufficient to allocate the center of the supported Base Station RF bandwidth as close as possible to the center frequency of the operating band.

The performances of the wanted signals are recorded simultaneously.

The tests are repeated until all applicable interferer levels in table 5.3.12-3 have been tested.

The measurement is only performed under static propagation conditions without reconfiguring any receiver resources during the test.

If BSS supports both EGPRS and ECSD, it is not necessary to perform testing in both modes. If TCH/FS is not supported, the highest supported of PDTCH/MCS-1 to MCS-4 shall be measured.

Irrespective of the supported logical channels, when testing for out-of-band blocking frequencies, tests are performed for GMSK modulated channels only.

**Table 5.3.12-1: Power level of wanted signal for test of Blocking Characteristics of TCH/FS and PDTCH/MCS-5-9**

BTS Type	Power level of Wanted Signal					
	TCH/FS	PDTCH/MCS-5	PDTCH/MCS-6	PDTCH/MCS-7	PDTCH/MCS-8	PDTCH/MCS-9
GSM 400/GSM 900/ER-GSM 900/DCS 1 800 BTS	-101 dBm	-98 dBm	-96,5 dBm	-93 dBm	-90 dBm	-88,5 dBm
GSM 900/ER-GSM 900 micro-BTS M1	-94 dBm	-91 dBm	-89,5 dBm	-86 dBm	-83 dBm	-81,5 dBm
GSM 900/ER-GSM 900 micro-BTS M2	-89 dBm	-86 dBm	-84,5 dBm	-81 dBm	-78 dBm	-76,5 dBm
GSM 900/ER-GSM 900 micro-BTS M3	-84 dBm	-81 dBm	-79,5 dBm	-76 dBm	-73 dBm	-71,5 dBm
GSM 900/ER-GSM 900 pico-BTS P1	-85 dBm	-82 dBm	-80,5 dBm	-93 dBm	-74 dBm	-72,5 dBm
DCS 1 800 micro-BTS M1	-99 dBm	-96 dBm	-94,5 dBm	-91 dBm	-88 dBm	-86,5 dBm
DCS 1 800 micro-BTS M2	-94 dBm	-91 dBm	-89,5 dBm	-86 dBm	-83 dBm	-81,5 dBm
DCS 1 800 micro-BTS M3	-89 dBm	-86 dBm	-84,5 dBm	-81 dBm	-78 dBm	-76,5 dBm
DCS 1 800 pico-BTS P1	-92 dBm	-89 dBm	-87,5 dBm	-84 dBm	-81 dBm	-79,5 dBm
GSM 400/GSM 900/DCS 1 800 Wide Area multicarrier BTS	-101 dBm	-98 dBm	-96,5 dBm	-93 dBm	-90 dBm	-88,5 dBm
GSM 400/GSM 900/DCS 1 800 Medium Range multicarrier BTS	-95 dBm	-92 dBm	-90,5 dBm	-87 dBm	-84 dBm	-82,5 dBm
GSM 400/GSM 900/DCS 1 800 Local Area multicarrier BTS	-87 dBm	-84 dBm	-82,5 dBm	-79 dBm	-76 dBm	-74,5 dBm

**Table 5.3.12-1a: Power level of wanted signal for test of Blocking Characteristics of ECSD channels**

BTS Type	Power level of Wanted Signal			
	E-TCH/F43.2 NT	E-TCH/F32.0 T	E-TCH/F28.8 T	E-TCH/F28,8NT
GSM 400/GSM 900/DCS 1 800 BTS	-94 dBm	-101 dBm	-96,5 dBm	-97 dBm
GSM 900 micro-BTS M1	- 87 dBm	-94 dBm	-89,5 dBm	-90 dBm
GSM 900 micro-BTS M2	- 82 dBm	-89 dBm	-84,5 dBm	-85 dBm
GSM 900 micro-BTS M3	- 77 dBm	-84 dBm	-79,5 dBm	-80 dBm
GSM 900 pico-BTS P1	- 78 dBm	-85 dBm	-80,5 dBm	-81 dBm
DCS 1 800 micro-BTS M1	- 92 dBm	-99 dBm	-94,5 dBm	-95 dBm
DCS 1 800 micro-BTS M2	- 87 dBm	-94 dBm	-89,5 dBm	-90 dBm
DCS 1 800 micro-BTS M3	- 82 dBm	-89 dBm	-84,5 dBm	-85 dBm
DCS 1 800 pico-BTS P1	- 85 dBm	-92 dBm	-87,5 dBm	-88 dBm
GSM 400/GSM 900/DCS 1 800 Wide Area multicarrier BTS	-94 dBm	-101 dBm	-96,5 dBm	-97 dBm
GSM 400/GSM 900/DCS 1 800 Medium Range multicarrier BTS	- 88 dBm	-95 dBm	-90,5 dBm	-91 dBm
GSM 400/GSM 900/DCS 1 800 Local Area multicarrier BTS	- 80 dBm	-87 dBm	-82,5 dBm	-83 dBm

**Table 5.3.12-1b: Power level of wanted signal for test of Blocking Characteristics of PDTCH/MCS-1-4**

BTS Type	Power level of Wanted Signal			
	PDTCH/ MCS-1	PDTCH/ MCS-2	PDTCH/ MCS-3	PDTCH/ MCS-4
GSM 400/GSM 900/ER-GSM 900/DCS 1 800 BTS	-101 dBm	-101 dBm	-101 dBm	-98,5 dBm
GSM 900/ER-GSM 900 micro-BTS M1	-94 dBm	-94 dBm	-94 dBm	-91,5 dBm
GSM 900/ER-GSM 900 micro-BTS M2	-89 dBm	-89 dBm	-89 dBm	-86,5 dBm
GSM 900/ER-GSM 900 micro-BTS M3	-84 dBm	-84 dBm	-84 dBm	-81,5 dBm
GSM 900/ER-GSM 900 pico-BTS P1	-85 dBm	-85 dBm	-85 dBm	-82,5 dBm
DCS 1 800 micro-BTS M1	-99 dBm	-99 dBm	-99 dBm	-96,5 dBm
DCS 1 800 micro-BTS M2	-94 dBm	-94 dBm	-94 dBm	-91,5 dBm
DCS 1 800 micro-BTS M3	-89 dBm	-89 dBm	-89 dBm	-86,5 dBm
DCS 1 800 pico-BTS P1	-92 dBm	-92 dBm	-92 dBm	-89,5 dBm
GSM 400/GSM 900/DCS 1 800 Wide Area multicarrier BTS	-101 dBm	-101 dBm	-101 dBm	-98,5 dBm
GSM 400/GSM 900/DCS 1 800 Medium Range multicarrier BTS	-95 dBm	-95 dBm	-95 dBm	-92,5 dBm
GSM 400/GSM 900/DCS 1 800 Local Area multicarrier BTS	-87 dBm	-87 dBm	-87 dBm	-84,5 dBm

### Preliminary Test

- 4) This optional test may be performed to reduce the number of measurements required in step 8). If it is performed, this shall be at the frequencies specified below. This test is not applicable for a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver when testing inband blocking frequencies. In case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver the test, if applied, shall be performed with simultaneous reception and evaluation of the number of wanted signals, as specified in step 3b), when testing out-of-band blocking frequencies.
- 5) The test shall be performed for an interfering signal at all frequencies which are integer multiples of 200 kHz, and which fall within one or more of the frequency ranges listed below, but excluding frequencies which exceed 12,75 GHz or are less than 600 kHz from the wanted signal:
  - a) From:
    - P-GSM 900: 790 MHz to 1 015 MHz inclusive.
    - E-GSM 900: 780 MHz to 1 015 MHz inclusive.
    - R-GSM 900: 776 MHz to 1 015 MHz inclusive.
    - ER-GSM 900: 773 MHz to 1 015 MHz inclusive.
    - DCS 1 800: 1 610 MHz to 1 885 MHz inclusive.
    - GSM 450: 350 MHz to 558 MHz inclusive.
    - GSM 480: 378 MHz to 586 MHz inclusive.
  - b) P-GSM 900, E-GSM 900, R-GSM 900 and ER-GSM 900:
    - from  $F_{lo} - (IF_1 + IF_2 + \dots + IF_n + 12,5 \text{ MHz})$  to
    - $F_{lo} + (IF_1 + IF_2 + \dots + IF_n + 12,5 \text{ MHz})$ .
- DCS 1 800:
  - from  $F_{lo} - (IF_1 + IF_2 + \dots + IF_n + 37,5 \text{ MHz})$  to
  - $F_{lo} + (IF_1 + IF_2 + \dots + IF_n + 37,5 \text{ MHz})$ .

GSM 400:

from  $F_{lo} - (IF_1 + IF_2 + \dots + IF_n + 3,6 \text{ MHz})$  to  
 $F_{lo} + (IF_1 + IF_2 + \dots + IF_n + 3,6 \text{ MHz})$ .

- c) From  $IF_1 - 400 \text{ kHz}$  to  $IF_1 + 400 \text{ kHz}$ :

In the case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver:

From  $IF_1 - RF_{BW \text{ Max}}/2 - 200 \text{ kHz}$  to  $IF_1 + RF_{BW \text{ Max}}/2 + 200 \text{ kHz}$ .

- d) All of the ranges:

$mF_{lo} - IF_1 - 200 \text{ kHz}$  to  $mF_{lo} - IF_1 + 200 \text{ kHz}$ ; and  
 $mF_{lo} + IF_1 - 200 \text{ kHz}$  to  $mF_{lo} + IF_1 + 200 \text{ kHz}$ .

In the case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver:

$mF_{lo} - IF_1 - RF_{BW \text{ Max}}/2$  to  $mF_{lo} - IF_1 + RF_{BW \text{ Max}}/2$ ;

and

$mF_{lo} + IF_1 - RF_{BW \text{ Max}}/2$  to  $mF_{lo} + IF_1 + RF_{BW \text{ Max}}/2$ .

- e) All integer multiples of 10 MHz:

Where:  $F_{lo}$  is the frequency of the local oscillator applied to the first receiver mixer.

$IF_1 \dots IF_n$  are the  $n$  intermediate frequencies in the digital as well as the analog part of the receiver.

$m$  is all positive integers.

$RF_{BW \text{ Max}}$  equals the maximum Base Station RF bandwidth.

To reduce test time, a shortened test procedure may be used. In this case the test procedure according to annex A in ETSI TS 151 021 [2] shall be followed, with an upper limit of measurement of 4 GHz.

- 6) The interfering signal shall be frequency modulated with a modulation frequency of 2 kHz and a peak deviation of  $\pm 100 \text{ kHz}$ .
- 7) For interfering signal frequency within the range:
- |             |                         |
|-------------|-------------------------|
| P-GSM 900:  | 870 MHz to 925 MHz;     |
| E-GSM 900:  | 860 MHz to 925 MHz;     |
| R-GSM 900:  | 856 MHz to 921 MHz;     |
| ER-GSM 900: | 853 MHz to 918 MHz;     |
| DCS 1 800:  | 1 690 MHz to 1 805 MHz; |
| GSM 450:    | 444,4 MHz to 460,4 MHz; |
| GSM 480:    | 472,8 MHz to 488,8 MHz. |

The level of the interfering signal at the receiver input, except for BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, shall be:

GSM 400, GSM 900 and ER-GSM 900: -3 dBm.

DCS 1 800: -15 dBm.



For interfering signal frequencies on other frequencies, the level of the interfering signal shall be:

For BTS except BTS belonging to a multicarrier BTS class equipped with multicarrier receiver:  
+10 dBm.

In the case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, the level of the interfering signal shall be: -9 dBm.

The Residual Bit Error Ratio (RBER) for the TCH/FS channel using class II bits and the Block Error Ratio (BLER) for one supported PDTCH/MCS-x with lowest number x and 8-PSK modulation (x = 5, if the BSS supports all coding schemes) and/or E-TCH/F43.2 NT channel or BLER (or BER) for the highest supported data speed shall be measured and if TCH/FS is not supported the BLER for the tested PDTCH/MCS-1 to MCS-4. All frequencies at which the RBER exceeds 10 % and/or at which the BLER exceeds 25 % or the BER exceeds 0,25 % respectively shall be recorded for further study. A relaxed statistical significance may be used for this measurement, compared to that of step 9).

### Blocking Test

- 8) If the preliminary test has been performed, this test shall be performed at all frequencies which have been recorded at step 7). If the preliminary test has not been performed, this test shall be performed at all frequencies specified in step 5). The test is always applicable, irrespective of if the preliminary test has been performed or not, for a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver when testing inband blocking frequencies.

The interfering signal shall be unmodulated, and shall have a level at the receiver input as specified in tables 5.3.12-3 and 5.3.12-4.

- 9) The channels in table 4.2.14-1 shall, if supported, be measured except for out-of-band blocking frequencies, where only channels modulated using GMSK modulation shall be measured. All frequencies at which the limit in table 4.2.14-1 is exceeded shall be recorded. In case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver these frequencies shall be recorded separately for each wanted signal frequency.

For packet-switched channels, the tests and requirements apply for BTTI without PAN

For this test, in band frequencies are defined in table 5.3.12-2.

**Table 5.3.12-2: Definition of relevant inband frequencies**

GSM band	Relevant inband frequency band
P-GSM 900	870 MHz to 925 MHz
E-GSM 900	860 MHz to 925 MHz
R-GSM 900	856 MHz to 921 MHz
ER-GSM 900	853 MHz to 918 MHz
DCS 1 800	1 690 MHz to 1 805 MHz
GSM 450	444,4 MHz to 460,4 MHz
GSM 480	472,8 MHz to 488,8 MHz

The methodology for the measurement of BER shall be followed as described in annex A in ETSI TS 151 021 [2].

In case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, the testing duration may be reduced by simultaneously testing different logical channels on different carriers. The error rate shall be evaluated separately for each wanted signal and over the identical time interval for all wanted signals, determined by the logical channel under test requiring the longest test duration.

$f_0$  is the frequency of the wanted signal.

**Table 5.3.12-3: Level of interfering signal for blocking for BTS except multicarrier BTS with multicarrier receiver**

Frequency band	GSM 400, GSM 900 and ER-GSM 900 (dBm)					DCS 1 800 (dBm)				
	micro and pico-BTS					micro and pico-BTS				
	BTS	M1	M2	M3	P1	BTS	M1	M2	M3	P1
in - band: $f_o \pm 600$ kHz	-26	-31	-26	-21	-34	-35	-40	-35	-30	-41
$800$ kHz $\leq  f - f_o  < 1,6$ MHz	-16	-21	-16	-11	-34	-25	-30	-25	-20	-41
$1,6$ MHz $\leq  f - f_o  < 3$ MHz	-16	-21	-16	-11	-26	-25	-30	-25	-20	-31
$3$ MHz $\leq  f - f_o $	-13	-21	-16	-11	-18	-25	-30	-25	-20	-23
Out-of-band	8	8	8	8	8	0	0	0	0	0

NOTE 1:  $f$  refers to the interfering blocker signal and  $f_o$  refers to the wanted signal under test.  
NOTE 2: Micro and pico-BTS is not defined for GSM 400.  
NOTE 3: For a BTS belonging to the WA multicarrier BTS class without multicarrier receiver the requirements for BTS apply.

**Table 5.3.12-4: Level of interfering signal for blocking for multicarrier BTS with multicarrier receiver**

Frequency band	GSM 400 and GSM 900 (dBm)			DCS 1 800 (dBm)		
	WA	MR	LA	WA	MR	LA
in - band: $f_o \pm 600$ kHz	-35	-30	-22	-35	-30	-22
$800$ kHz $\leq  f - f_o  < 1,6$ MHz	-25 and -16	-20 and -15	-12 and -7	-25	-20	-12
$1,6$ MHz $\leq  f - f_o  < 3$ MHz	-25 and -16	-20 and -15	-12 and -7	-25	-20	-12
$3$ MHz $\leq  f - f_o $	-25 or -16	-20 or -15	-12 or -7	-25	-20	-12
Out-of-band	General	-15	-15	-15	-15	-15
	Co-siting	16	8	-6	16	8

NOTE 1:  $f$  refers to the interfering blocker signal and  $f_o$  refers to the wanted signal under test. In case of more than one wanted signal under test  $f_o$  refers to each wanted signal under test as described in step 3b).  
NOTE 2: For GSM 400 and GSM 900, for inband requirements for frequency offsets  $800$  kHz  $\leq |f - f_o|$ , the power level of wanted signal in tables 5.3.12-1, 5.3.12-1a and 5.3.12-1b may be increased according to table 5.3.12-5. The relaxed values in this table are not applicable for GSM-R usage.  
For GSM 400 and GSM 900, for inband requirements and for frequency offsets  $|f - f_o| \geq 3$  MHz, the interfering signal level depends on the interferer frequency according to following rule: The higher interfering signal level from the table is used if the interferer frequency is a multiple of 400 kHz and otherwise the lower level.

**Table 5.3.12-5: Wanted signal level increase in GSM 400 and GSM 900 for multicarrier BTS with multicarrier receiver**

Wide Area		Medium Range		Local Area	
Level of interfering signal	Wanted signal level increase	Level of interfering signal	Wanted signal level increase	Level of interfering signal	Wanted signal level increase
$\leq -25$ dBm	+0 dB	$\leq -20$ dBm	+0 dB	$\leq -12$ dBm	+0 dB
$> -25$ dBm and $\leq -20$ dBm	+5 dB	$> -20$ dBm and $\leq -15$ dBm	+5 dB	$> -12$ dBm and $\leq -7$ dBm	+9 dB
$> -20$ dBm and $\leq -16$ dBm	+9 dB	-	-	-	-

For P-GSM 900 and E-GSM 900, the blocking level in the band 925 MHz to 935 MHz is relaxed to 0 dBm.

For R-GSM 900 at offsets  $600$  kHz  $\leq |f - f_o| < 3$  MHz, the blocking level in the band 876 MHz to 880 MHz shall be reduced by 5 dB.

For ER-GSM 900 at offsets  $600$  kHz  $\leq |f - f_o| < 3$  MHz, the blocking level in the band 873 MHz to 880 MHz shall be reduced by 5 dB.

### Spurious response

- 10) This test shall be performed at all frequencies and channels which have been recorded at step 9). The interfering signal shall be unmodulated, and shall have a level of -43 dBm. In case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver the test shall be performed with simultaneous reception and evaluation of the number of wanted signals, as specified in step 3b).
- 11) The RBER for TCH/FS channel using class II bits and BLER for one supported PDTCH/MCS-x with lowest number x and 8-PSK modulation (x=5, if the BSS supports all coding schemes) and/or BLER for E-TCH/F43.2 NT or BLER (or BER) for the highest supported data speed and, if TCH/FS is not supported, the BLER for the tested PDTCH/MCS-1 to MCS-4 shall be measured.

### 5.3.12.2 Test Environment

Normal: One TRX shall be tested.

## 5.3.13 Intermodulation characteristics

### 5.3.13.1 Test case

If SFH is supported by the BSS, it shall be disabled during this measurement. The measurement is performed only under static conditions. The measurement shall be performed for the radio frequency channels B, M and T and for the supported channels in table 5.3.12-1, table 5.3.12-1a and table 5.3.12-1b. As a minimum, one time slot shall be tested on one TRX to be tested.

Three signals shall be applied to the receiver via a combining network. The powers of the signals are measured at the receiver antenna connector.

The wanted signal shall have a power level as defined in table 5.3.12-1, table 5.3.12-1a and table 5.3.12-1b. Only wanted signals with BTTI and no PAN need to be tested.

The second signal is an interfering signal, GMSK modulated by a pseudo-random bit sequence, and shall be 1,6 MHz above the wanted signal frequency. During the useful part of the burst of the wanted signal, the modulation of this interfering signal shall be any 148-bits subsequent of the 511-bits sequence, defined in Recommendation ITU-T O.153 [12] fascicle IV.4., and the power shall be -43 dBm for GSM 400, GSM 900 and ER-GSM 900 and -49 dBm for DCS 1 800.

NOTE: This signal can be a continuous signal modulated by the 511-bits sequence.

The third signal is an interfering signal and shall be unmodulated. It shall be 800 kHz above the wanted signal frequency, and the power shall be -43 dBm for GSM 400, GSM 900 and ER-GSM 900 and -49 dBm for DCS 1 800.

The various signals are illustrated in figure 5.3.13-1.

In case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, the two interfering signal levels shall be adjusted by 0 dB, +2 dB and +5 dB, for the Wide Area, Medium Range and Local Area classes, respectively.

If BSS supports both EGPRS and ECSD, it is not necessary to perform testing in both modes. If TCH/FS is not supported, the highest supported of PDTCH/MCS-1 to MCS-4 shall be measured.

The unprotected class II bits obtained from the BSS receiver after channel decoding and before any extrapolation shall be compared with the unprotected class II bits originating from the BSSTE.

The RBER of the TCH/FS class II bits and BLER of one supported PDTCH/MCS-x with lowest number x and 8-PSK modulation (x=5, if the BSS supports all coding schemes) and E-TCH/F43.2 NT or BLER (or BER) of the highest supported data speed and, if TCH/FS is not supported, the BLER for the tested PDTCH/MCS-1 to MCS-4 shall be measured.

The measurement shall be repeated with the unwanted signal frequencies below the carrier frequency of the wanted signal.

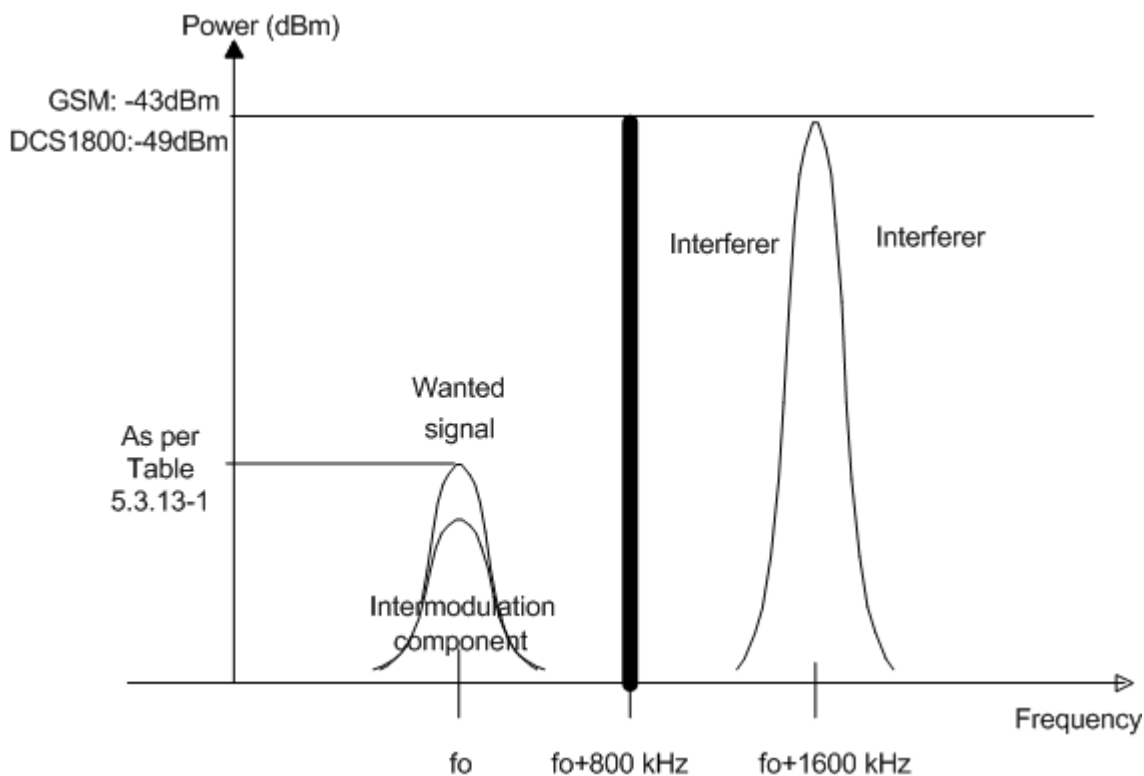


Figure 5.3.13-1: Example of RX intermodulation rejection

### 5.3.13.2 Test Environment

Normal: One TRX shall be tested.

## 5.3.14 AM suppression

### 5.3.14.1 Test case

If Slow Frequency Hopping (SFH) is supported by the BSS, it shall be disabled during this measurement. The measurement is performed only under static conditions:

- a) In case of BTS not belonging to a multicarrier BTS class or in case of BTS belonging to a multicarrier BTS class without multicarrier receiver.

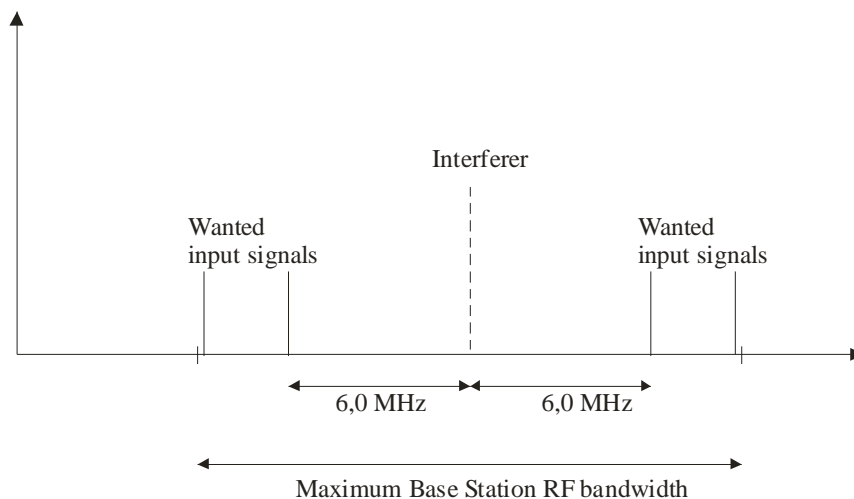
This test shall be performed at any one ARFCN on one TRX and on supported channels at a signal level as specified in table 5.3.12-1, table 5.3.12-1a and table 5.3.12-1b.

- b) In case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver.

In case of the Wide Area and Medium Range classes, the BTS shall be configured according to clause B.2.10 with the maximum supported number of wanted input signals or **four**, whichever less, applied for supported channels at a signal level as specified in table 5.3.12-1, table 5.3.12-1a and table 5.3.12-1b at the receiver input.

In case of the Local Area class, the BTS shall be configured according to clause B.2.10 with the maximum supported number of wanted input signals or **two**, whichever less, applied for supported channels at a signal level as specified in table 5.3.12-1, table 5.3.12-1a and table 5.3.12-1b at the receiver input.

The frequencies of the wanted signals are allocated within the maximum Base Station RF bandwidth as symmetrically located as possible around the center frequency of the maximum Base Station RF bandwidth with two wanted signals at frequencies 6,0 MHz from the interfering signal, and the remaining wanted signals located at the edges of the maximum supported RF bandwidth, as long as the frequency separation in the respective frequency pairs is at least 600 kHz, as indicated in figure 5.3.14-1.



**Figure 5.3.14-1: Allocation of wanted signals and interferer**

If the maximum Base Station RF bandwidth does not allow allocating the signals at 6 MHz and more on each side of the interferer according to the description above, the frequency of the interferer is allocated to keep frequency separation to the wanted signals on one side of the interferer fixed at  $\geq 6$  MHz as described above and the wanted signal(s) are still allocated at the edge of the maximum Base Station RF bandwidth with 600 kHz frequency separation within the respective frequency pairs, if applicable.

NOTE 1: If the maximum number of supported wanted signals is three, above description implies that the outer signal with the smallest frequency separation to the interferer is left out compared to the four-signal setup. If the maximum number of supported wanted signals is two, both outer signals are left out.

The wanted signal(s) shall have the same normal GSM modulation.

If BSS supports both EGPRS and ECSD, it is not necessary to perform testing in both modes. If TCH/FS is not supported, the highest supported of PDTCH/MCS-1 to MCS-4 shall be measured.

The interfering signal is GMSK modulated according to GSM characteristics (with or without a midamble) with a pseudo random bit sequence of at least 511 bits length.

NOTE 2: A 148-bit sequence of the 511-bit of a pseudo-random bit sequence as defined in Recommendation ITU-T O.153 [12] fascicle IV.4 is recommended.

- i) In case of BTS not belonging to a multicarrier BTS class or in case of BTS belonging to a multicarrier BTS class without multicarrier receiver.

The frequency ( $f$ ) of the interfering signal shall be in the relevant receive band, at least 6 MHz separated from the ARFCN under test. Frequency  $f$  is an integer multiple of 200 kHz and at least 2 ARFCNs separated from any identified spurious response in step 9) of the test case in clause 5.3.12.

- ii) In case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver.

The frequency ( $f$ ) of the interfering signal shall be within the maximum Base Station RF bandwidth, at least 6 MHz separated from the ARFCN(s) under test. Frequency  $f$  is an integer multiple of 200 kHz and at least 2 ARFCNs separated from any identified spurious response in 9 in the test case in clause 5.3.12.2.

The performances of the wanted signals at 6 MHz or more from the interferer are recorded simultaneously without reallocation of receiver resources during the test.

In case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, the testing duration may be reduced by simultaneously testing different logical channels on different carriers. The error rate shall be evaluated separately for each wanted signal and over the identical time interval for all wanted signals, determined by the logical channel under test requiring the longest test duration.

The interferer shall have one timeslot active, meeting the power/time mask in ETSI TS 145 005 [5], annex A. The transmitted bursts shall be synchronized to but delayed in time between 61 and 86 symbol periods relative to the bursts of the wanted signal. The mean level of the interferer over the useful part of the burst is defined in table 5.3.14-1.

Table 5.3.14-1: Interfering signal level

	BTS (dBm)	Multicarrier BTS			Micro-BTS			Pico-BTS
		WA (dBm)	MR (dBm)	LA (dBm)	M1 (dBm)	M2 (dBm)	M3 (dBm)	P1 (dBm)
GSM 400	-31	-31	-26	-18	-	-	-	-
GSM 900	-31	-31	-26	-18	-34	-29	-24	-21
ER-GSM 900	-31	-	-	-	-34	-29	-24	-21
DCS 1 800	-35	-35	-30	-22	-33	-28	-23	-26

The two input signals shall be connected to the receiver via a combining network. The referred power level for both signals shall be the power into the BSS RX antenna connector.

NOTE 3: When testing this requirement, a notch filter may be necessary to ensure that the co channel performance of the receiver is not compromised.

### 5.3.14.2 Test Environment

Normal.

## 5.3.15 Spurious emissions from the receiver antenna connector

### 5.3.15.0 General

For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the test suite of the present clause or the Receiver spurious emissions test suite in clause 5.3.6 of ETSI EN 301 908-18 [1] can be equally applied.

### 5.3.15.1 Test case

The transmitter shall be configured with one TRX active. It shall be allocated to RF Channel M and shall transmit at full power on all time slots.

For a BTS equipped with diversity, the requirements of this clause apply to each receiver dedicated antenna connector.

For a BTS equipped with a duplexer or duplexers, the requirements of clause 4.2.5 apply to any antenna connector which is a port for both transmitter(s) and receiver(s). Therefore, this test need not be performed on these ports.

The receiver antenna connector shall be connected to a spectrum analyser or selective voltmeter with the same characteristic impedance.

The detecting device shall be configured as defined in table 5.3.15-1. Peak hold shall be enabled, and the video bandwidth shall be approximately three times the resolution bandwidth. If this bandwidth is not available on the detecting device, it shall be the maximum available, and at least 1 MHz. In case of a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, RMS detector mode shall be enabled instead.

The power shall be measured over the frequency ranges specified in table 5.3.15-1.

### 5.3.15.2 Test Environment

Normal.

**Table 5.3.15-1: Measurement conditions for Conducted Emissions from the Receiver Antenna Connector**

Frequency Band	Frequency offset	Resolution Bandwidth
100 kHz to 50 MHz		10 kHz
50 MHz to 500 MHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	≥ 2 MHz	30 kHz
	≥ 5 MHz	100 kHz
500 MHz to 1 GHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	≥ 2 MHz	30 kHz
	≥ 5 MHz	100 kHz
	≥ 10 MHz	300 kHz
	≥ 20 MHz	1 MHz
	≥ 30 MHz	3 MHz
1 GHz to 12,75 GHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	≥ 2 MHz	30 kHz
	≥ 5 MHz	100 kHz
	≥ 10 MHz	300 kHz/1 MHz (see note)
	≥ 20 MHz	1 MHz
	≥ 30 MHz	3 MHz
Inside the relevant transmit band	(offset from the transmit carrier frequency)	
	≥ 1,8 MHz	30 kHz
	≥ 6 MHz	100 kHz

NOTE: 1 MHz measurement bandwidth applies only to a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver.

## 5.3.16 Radiated spurious emissions

### 5.3.16.0 General

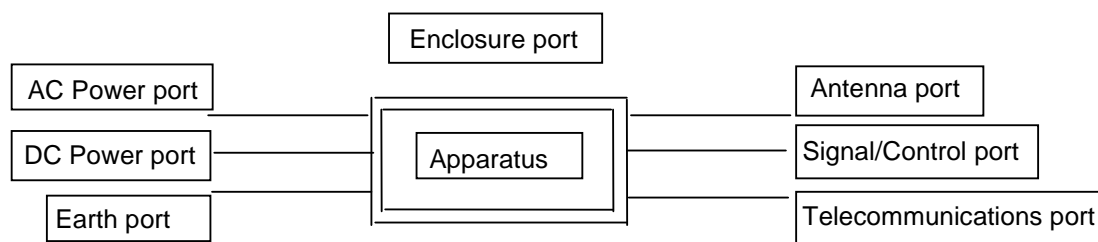
For a BTS belonging to a multicarrier BTS class additionally conforming to ETSI EN 301 908-1 [20] and ETSI EN 301 908-18 [1], either the test suite of the present clause or the Radiated emissions test suite in clause 5.3.2 of ETSI EN 301 908-1 [20] can be equally applied.

For BTS with single enclosure solution according to figures 5.3.16-1 and 5.3.16-2, radiated spurious emissions are measured from the BSS cabinet including emissions due to the transmitters from the radio equipment.

For BTS with multiple enclosure solution according to figures 5.3.16-1 and 5.3.16-3, radiated spurious emissions from the BTS part with radio digital unit and the radio unit may be tested separately.

The definition of enclosure port is aligned to ETSI EN 301 908-1 [20] and is depicted in figure 5.3.16-1. Further definitions are included in clause 3.1.

NOTE: For example, any connection point on an equipment intended for connection of cables to or from that equipment is considered as a port (see figure 5.3.16-1).



**Figure 5.3.16-1: Examples of ports**

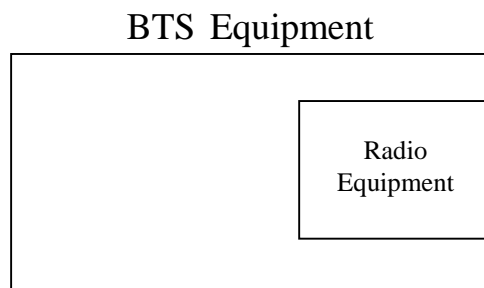


Figure 5.3.16-2: BTS with single enclosure solution

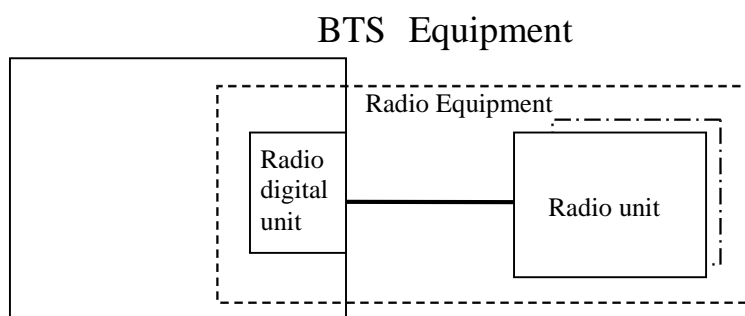


Figure 5.3.16-3: BTS with multiple enclosure solution

### 5.3.16.1 Test case

- a) A test site fulfilling the requirements of Recommendation ITU-R SM.329-12 [13] shall be used. The BTS shall be placed on a non-conducting support and shall be operated from a power source via an RF filter to avoid radiation from the power leads. The method of Recommendation ITU-R SM.329-12 [13] shall be used, except in any case where it conflicts with the present document.

Radiation of any spurious components shall be detected by the test antenna and measuring receiver (e.g. a spectrum analyser). At each frequency at which a component is detected, the BSS shall be rotated and the height of the test antenna adjusted to obtain maximum response, and the effective radiated power of that component determined by a substitution measurement. The measurement shall be repeated with the test antenna in the orthogonal polarization plane.

- b) The BTS shall be configured with one transmitter active, at its maximum output power on all time slots, on the specified ARFCNs. Slow frequency hopping shall be disabled.

NOTE: It may be necessary to take steps to ensure that emissions from other transmitters which are not active do not influence the results. This may be achieved by, for example, equipping the BTS with only one TRX or by muting the outputs of the transmitters to a greater degree than otherwise required in ETSI TS 145 005 [5].

- c) The measuring receiver shall be configured with a resolution bandwidth of 30 kHz and a video bandwidth of approximately three times this value. Peak hold shall be enabled, except in case of a BTS belonging to a multicarrier BTS class where RMS mode of detector applies. The received power shall be measured for frequencies with an offset of  $1,8 \text{ MHz} \leq f < 6 \text{ MHz}$  from the carrier frequency, and which fall within the BTS relevant transmitter band.

At each frequency at which a component is detected, the maximum effective radiated power of that component shall be determined, as described in step a).



- d) The measuring receiver shall be configured with a resolution bandwidth of 100 kHz and a video bandwidth of approximately three times this value. Peak hold shall be enabled, except in case of a BTS belonging to a multicarrier BTS class where average mode of detector applies. The received power shall be measured for frequencies with an offset of  $\geq 6$  MHz from the carrier frequency, and which fall within the BTS relevant transmitter band.

At each frequency at which a component is detected, the maximum effective radiated power of that component shall be determined, as described in step a).

- e) The BSS shall be configured with all transmitters active at their maximum output power on all time slots. If a TRX is designated as being a dedicated BCCH, it shall be allocated to RF channel M. All remaining TRXs shall be allocated in the following order; first to RF channel B, then to T, then distributed as evenly as possible throughout the BSS operating transmit band. Slow frequency hopping shall be disabled. In case of a BTS belonging to a multicarrier BTS class the maximum number of supported carriers are active and operating at maximum declared power. The carriers are distributed over the maximum supported RF BW as defined in clause 5.3.8.

The measuring receiver shall be configured as defined in table 5.3.16-1. Peak hold shall be enabled, and the video bandwidth shall be approximately three times the resolution bandwidth. If this video bandwidth is not available on the measuring receiver, it shall be the maximum available, and at least 1 MHz. In case of a BTS belonging to a multicarrier BTS class, RMS detector mode shall be enabled instead. The received power shall be measured over the frequency range 30 MHz to 12,75 GHz, excluding the BTS relevant transmitter band.

**Table 5.3.16-1: Radiated spurious Emissions Measurements outside the transmit band**

Frequency Band	Frequency offset	Resolution Bandwidth
30 MHz to 50 MHz		10 kHz
50 MHz to 500 MHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	$\geq 2$ MHz	30 kHz
	$\geq 5$ MHz	100 kHz
500 MHz to 1 GHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	$\geq 2$ MHz	30 kHz
	$\geq 5$ MHz	100 kHz
	$\geq 10$ MHz	300 kHz
	$\geq 20$ MHz	1 MHz
	$\geq 30$ MHz	3 MHz
1 GHz to 12,75 GHz and outside the relevant transmit band	(offset from the edge of the relevant transmit band)	
	$\geq 2$ MHz	30 kHz
	$\geq 5$ MHz	100 kHz
	$\geq 10$ MHz	300 kHz/1 MHz (see note)
	$\geq 20$ MHz	1 MHz
	$\geq 30$ MHz	3 MHz

NOTE: 1 MHz measurement bandwidth applies only to a BTS belonging to a multicarrier BTS class.

At each frequency at which a component is detected, the maximum effective radiated power of that component shall be determined, as described in step a).

### 5.3.16.2 Test Environment

- Normal: Inside the relevant TX band: The test shall be performed with the TRX active on one ARFCN.  
 Outside the relevant TX band: The test shall be performed once.

## Annex A (normative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.10] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

**Table A.1: Relationship between the present document and the essential requirements of Directive 2014/53/EU**

Harmonised Standard ETSI EN 301 502				
The following requirements are relevant to the presumption of conformity under the article 3.2 of Directive 2014/53/EU [i.1]				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Mean transmitted RF carrier power	4.2.2	U	
2	Adjacent channel power	4.2.4	U	
3	Spurious emissions from the transmitter antenna connector	4.2.5	U	
4	Intermodulation attenuation	4.2.6	U	
5	Intra Base Station System intermodulation attenuation	4.2.7	C	For all base station equipment except BTS belonging to a multicarrier BTS class.
6	Wideband noise and intra BSS intermodulation attenuation in multicarrier operation	4.2.8	C	For BTS belonging to a multicarrier BTS class only.
7	Reference sensitivity level	4.2.9	U	
8	Reference Interference Level	4.2.11	U	
9	Blocking Characteristics	4.2.12	U	
10	Intermodulation characteristics	4.2.13	U	
11	AM suppression	4.2.14	U	
12	Spurious emissions from the receiver antenna connector	4.2.15	U	
13	Radiated spurious emissions	4.2.16	U	

### Key to columns:

#### Requirement:

**No** A unique identifier for one row of the table which may be used to identify a requirement.

**Description** A textual reference to the requirement.

**Clause Number** Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

#### Requirement Conditionality:

**U/C** Indicates whether the requirement shall be unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

**Condition** Explains the conditions when the requirement shall or shall not be applicable for a requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

## Annex B (normative): General test conditions and declarations

### B.1 Declaration by manufacturer

#### B.1.0 General

Certain functions of a BTS are optional in the GSM specifications.

When specified in a test, the manufacturer shall declare the nominal value of a parameter, or whether an option is supported.

#### B.1.1 Output power and determination of power class

The manufacturer shall declare the rated maximum power per TRX for each supported modulation. For a micro or pico-BTS, this shall be specified at the antenna connector. For a normal BTS, it shall be stated whether this is specified at the input to the combiner or at the antenna connector of the BSS.

For a BTS belonging to a multicarrier BTS class, the manufacturer shall declare the maximum output power per carrier in case that all carriers are operated at the same nominal output power. The declaration shall be given for each modulation and for each supported number of carriers up to the maximum number on each antenna port. Additionally, the maximum total power supported shall be declared. The manufacturer shall also declare whether the BTS meets the requirements of a Wide Area, Medium Range and/or Local Area multicarrier BTS. The BTS may only be declared to meet the requirements of a Medium Range and/or Local Area multicarrier BTS class if the declared total power fulfils the power limit defined in table B.1-2.

For a micro-BTS, the class of the micro-BTS shall be determined from the declared maximum power, according to table B.1-1. Where applicable, the manufacturer shall declare whether the BTS meets the requirements of a micro or pico-BTS.

For a BTS supporting other modulations as well (8-PSK, 16-QAM, 32-QAM, QPSK, AQPSK) or higher symbol rate the manufacturer shall declare the maximum output power capability for GMSK and each other supported combination of modulation and symbol rate. The TRX power class, the class of a micro-BTS or a pico-BTS is defined by the highest output power capability for any modulation.

**Table B.1-1: Micro and pico-BTS Power Classes**

TRX power class	GSM 900 and ER-GSM 900 micro and pico-BTS Maximum output power	DCS 1 800 micro and pico-BTS Maximum output power
M1	(> 19)-24 dBm	(> 27)-32 dBm
M2	(> 14)-19 dBm	(> 22)-27 dBm
M3	(> 9)-14 dBm	(> 17)-22 dBm
P1	(> 13)-20 dBm	(> 16)-23 dBm

**Table B.1-2: Multicarrier BTS classes**

Multicarrier BTS class	Total power limit per antenna port
Wide Area	No limit
Medium Range	$\leq 38$ dBm
Local Area	$\leq 24$ dBm

NOTE: For a normal BTS, the TRX power class can be determined from the manufacturers declared output power per TRX measured at the input to the combiner, according to the tables of TRX power classes in ETSI TS 145 005 [5]. The test requirements for a normal BTS do not vary with TRX power classes. The definition of TRX power class only relates to the declared power per TRX and does not impose any requirement on the measured output power of the BTS.

## B.1.2 Specified frequency range

The manufacturer shall declare:

- which of the frequency bands defined in clause 1 are supported by the BSS; a BSS may support DCS 1 800, GSM 450, GSM 480 and one out of the GSM 900 bands or the ER-GSM 900 band;
- the frequency range within the above frequency band(s) supported by the BSS; this frequency range comprises the transmit and receive operating bands;
- in case of a BTS belonging to a multicarrier BTS class, the maximum Base Station RF bandwidth per transmit and receive antenna connector supported by the BSS;
- in case of a BTS belonging to a multicarrier BTS class, the maximum Transmit Filter bandwidth supported by the BSS.

Many tests in the present document are performed with appropriate frequencies in the bottom, middle and top of the operating frequency band of the BTS. These are denoted as RF channels B (bottom), M (middle) and T (top).

When a test is performed by a test laboratory, the ARFCNs to be used for RF channels B, M and T shall be specified by the laboratory. The laboratory may consult with operators, the manufacturer or other bodies.

When a test is performed by a manufacturer, the ARFCNs to be used for RF channels B, M and T may be specified by an operator.

## B.1.3 Frequency hopping

The Manufacturer shall declare whether the BSS supports Slow Frequency Hopping (SFH) and if yes, which basic implementation or implementations is supported. If SFH is supported the BSS shall be able to switch to any frequency in its operating band on a time slot per time slot basis. For BTSs belonging to a multicarrier BTS class in the BSS, it is sufficient to be able to switch to any frequency within the maximum Base Station RF bandwidth on a time slot per time slot basis.

Two basic implementations of SFH are possible:

- a) baseband frequency hopping: frequency hopping is done by multiplexing the data of the logical channels to different TRXs according to the hopping scheme. The TRXs are fixed tuned to a dedicated ARFCN;
- b) synthesizer frequency hopping: frequency hopping is done by tuning the TRX on a timeslot per timeslot basis. The logical channels are dedicated to a hopping TRX.

The detailed description of the frequency hopping scheme shall apply as described in ETSI TS 145 002 [3].

## B.1.4 Void

## B.1.5 Downlink discontinuous transmission (DTX)

Downlink discontinuous transmission (DTX), shall be implemented as defined in the GSM specifications for full rate speech channels, see ETSI TS 145 008 [21], and in ETSI TS 124 022 [10] and ETSI TS 148 020 [11] for non-transparent data. DTX may optionally be implemented in the downlink BSS (transmitter) as an operator choice. All requirements in the present document, unless otherwise stated, apply whether downlink DTX is used or not.

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## B.2 BTS Configurations

### B.2.0 General

The present document specifies tests for the standard configurations of BTS which have been assumed in GSM requirements specifications, in particular ETSI TS 145 001 [i.7], ETSI TS 145 002 [3] and ETSI TS 145 005 [5]. However, there are other configurations of BTS which comply with these specifications, but for which the application of these specifications is not fully defined. For some such configurations there may be alternate ways to apply the requirements of the present document to testing of the configuration, or some variation in the test method may be necessary. It may therefore be necessary for the parties to the testing to reach agreement over the method of testing in advance.

If the BSS is supplied in a number of different environmental enclosures or configurations, it may not be necessary to test RF parameters for each environmental configuration, provided that it can be demonstrated that the equipment has been tested at the worst internal environmental conditions.

If a BTS is supplied with a number of different configurations of passive TX antenna combiners, there may be alternate ways to demonstrate the compliance rather than performing the measurements for each configuration. As an example, the worst case configuration of the antenna combiners for a given test shall as a minimum be used for this purpose.

Where alternative interpretations of the present document are possible for a BSS configuration under test, the interpretation which has been adopted in performing the test shall be recorded with the test results.

Where variation in the test method within the present document has been necessary to enable a BSS configuration to be tested, the variation in the test method which has been made in performing the test shall be recorded with the test results. Where possible, agreement should be reached in advance about the nature of such a variation with any party who will later receive the test results.

Possible interpretations of the present document for some common configurations are given in the following clauses.

### B.2.1 Receiver diversity

The tests in clauses 5.3.11 through 5.3.15 of the present document assume that the receiver is not equipped with diversity. For receivers with diversity, the tests shall be performed by applying the specified test signals to one of the receiver antenna connectors, with the remaining receiver antenna connectors being terminated with 50  $\Omega$ ; or disabled.

This does not apply to cases which are specified for two antenna configuration only, i.e. EGPRS2-B with higher symbol rate and channels in VAMOS mode. In this case all receiver tests are performed in two antenna configuration except in Static propagation conditions. At two-antenna configuration the requirements are specified for no correlation or gain imbalance between the two receive branches.

### B.2.2 Duplexers

The requirements of the present document shall be met with a duplexer fitted, if a duplexer is supplied as part of the BSS. If the duplexer is supplied as an option by the manufacturer, sufficient tests should be repeated with and without the duplexer fitted to verify that the BSS meets the requirements of the present document in both cases.

The following tests should be performed with the duplexer fitted, and without it fitted if this is an option:

- 1) Clause 5.3.2, Mean transmitted RF power, for the highest static power step only, if this is measured at the antenna connector.
- 2) Clause 5.3.5.2, Conducted spurious emissions from the transmitter antenna connector; outside the BTS transmit band.
- 3) Clause 5.3.7, Intra base station system intermodulation attenuation or clause 5.3.8, Wideband noise and intra BSS intermodulation attenuation in multicarrier operation.

The remaining tests may be performed with or without the duplexer fitted.

NOTE 1: When performing receiver tests with a duplexer fitted, it is important to ensure that the output from the transmitters does not affect the test apparatus. This can be achieved using a combination of attenuators, isolators and filters.

NOTE 2: When duplexers are used, intermodulation products will be generated, not only in the duplexer but also in the antenna system. The intermodulation products generated in the antenna system are not controlled by ETSI specifications, and may degrade during operation (e.g. due to moisture ingress). Therefore, to ensure continued satisfactory operation of a BSS, an operator will normally select ARFCNs to minimize intermodulation products falling on receive channels. For testing of complete conformance, an operator may specify the ARFCNs to be used.

## B.2.3 Power supply options

If the BSS is supplied with a number of different power supply configurations, it may not be necessary to test RF parameters for each of the power supply options, provided that it can be demonstrated that the range of conditions over which the equipment is tested is at least as great as the range of conditions due to any of the power supply configurations.

This applies particularly if a BSS contains a DC rail which can be supplied either externally or from an internal mains power supply. In this case, the conditions of extreme power supply for the mains power supply options can be tested by testing only the external DC supply option. The range of DC input voltages for the test should be sufficient to verify the performance with any of the power supplies, over its range of operating conditions within the BTS, including variation of mains input voltage, temperature and output current.

## B.2.4 Ancillary RF amplifiers

The requirements of the present document shall be met with the ancillary RF amplifier fitted. At tests according to clauses 5.3.2 to 5.3.8 and 5.3.11 to 5.3.15 for TX and RX respectively, the ancillary amplifier is connected to the BTS by a connecting network (including any cable(s), attenuator(s), etc.) with applicable loss to make sure the appropriate operating conditions of the ancillary amplifier and the BTS. The applicable connecting network loss range is declared by the manufacturer. Other characteristics and the temperature dependence of the attenuation of the connecting network are neglected. The actual attenuation value of the connecting network is chosen for each test as one of the applicable extreme values. The lowest value is used except for clause 5.3.2 where the highest applicable attenuation value is applied.

Sufficient tests should be repeated with the ancillary amplifier fitted and, if it is optional, without the ancillary RF amplifier to verify that the BSS meets the requirements of the present document in both cases.

When testing for essential conformance, the following tests should be repeated with the optional ancillary amplifier fitted according to table B.2-1, where x denotes that the test is applicable.

**Table B.2-1**

	Clause	TX amplifier only	RX amplifier only	TX/RX amplifiers combined (see note)
<b>Receiver tests</b>	5.3.12		x	x
	5.3.13		x	x
	5.3.15		x	
<b>Transmitter tests</b>	5.3.2	x		x
	5.3.4 (5.3.4.1 only)	x		x
	5.3.5	x		x
	5.3.6	x		x
	5.3.7 or 5.3.8	x		x

NOTE: Combining can be by duplex filters or any other network. The amplifiers can either be in RX or TX branch or in both. Either one of these amplifiers could be a passive network.

For receiver tests only testing on TCH/FS is required.

In test according to clause 5.3.2 highest applicable attenuation value is applied.

## B.2.5 BSS using antenna arrays

A BSS may be configured with a multiple antenna port connection for some or all of its TRXs or with an antenna array related to one cell (not one array per TRX). This clause applies to a BSS which meets at least one of the following conditions:

- the transmitter output signals from one or more TRX appear at more than one antenna port; or
- there is more than one receiver antenna port for a TRX or per cell and an input signal is required at more than one port for the correct operation of the receiver; or

NOTE: Diversity reception does not meet this requirement) thus the outputs from the transmitters as well as the inputs to the receivers are directly connected to several antennas (known as "air combining").

- transmitters and receivers are connected via duplexers to more than one antenna.

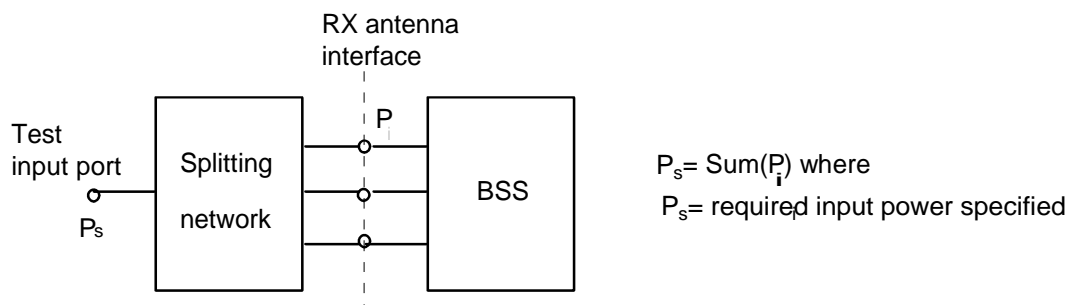
If a BSS is used, in normal operation, in conjunction with an antenna system which contains filters or active elements which are necessary to meet the GSM requirements, the tests of essential conformance may be performed on a system comprising the BSS together with these elements, supplied separately for the purposes of testing. In this case, it shall be demonstrated that the performance of the configuration under test is representative of the system in normal operation, and the conformance assessment is only applicable when the BSS is used with the antenna system.

For testing of essential conformance of such a BSS, the following procedure may be used.

### Receiver tests

For each test, the test signals applied to the receiver antenna connectors shall be such that the sum of the powers of the signals applied equals the power of the test signal(s) specified in the test.

An example of a suitable test configuration is shown in figure B.2-1.



**Figure B.2-1: Receiver test setup**

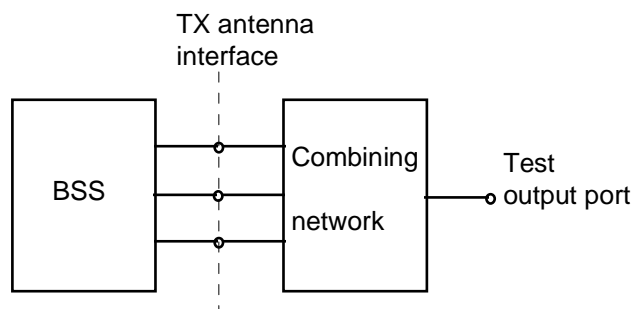
For spurious emissions from the receiver antenna connector, the test may be performed separately for each receiver antenna connector.

### Transmitter tests

For each test, the conformance requirement shall be met by the sum of the signals emitted by each transmitter antenna connector. This may be assessed by separately measuring the signals emitted by each antenna connector and summing the results, or by combining the signals and performing a single measurement. The characteristics (e.g. amplitude and phase) of the combining network should be such that the power of the combined signal is maximized.

An example of a suitable test configuration is shown in figure B.2-2.





**Figure B.2-2: Transmitter test setup**

For Intermodulation attenuation, the test may be performed separately for each transmitter antenna connector.

## B.2.6 BTS supporting 8-PSK modulation

If a TRX supports 8-PSK it shall, unless otherwise stated in the tests in clause 5.3, be tested at both GMSK and 8-PSK modulation unless it can be demonstrated that it is sufficient to test only at GMSK or 8-PSK modulation.

If a BTS is configured with both TRXs supporting 8-PSK and TRXs not supporting 8-PSK, the stated number of TRXs to be tested shall apply to each type of TRX.

## B.2.7 BTS supporting additional modulations in EGPRS2

If a TRX supports additional modulations (QPSK, 16-QAM or 32-QAM) it shall, unless otherwise stated in the tests in clause 5.3, be tested at GMSK as well as at the additional supported modulation unless it can be demonstrated that it is sufficient to test only at GMSK or the specific additional modulation.

If a BTS is configured with TRXs supporting additional modulations as well as TRXs not supporting additional modulations, the different types of TRX shall be counted separately, and the stated number of TRXs to be tested shall refer to each type of TRX separately.

## B.2.8 Supported Symbol Rate

The tests in the present document are applicable to both normal symbol rate and higher symbol rate configurations, unless otherwise stated. In case of higher symbol rate the requirements in clause 4.2.11 of the present document assume input signals using the wide pulse shaping filter unless otherwise stated. The definition of the narrow and wide pulse-shaping filters shall be as specified in ETSI TS 145 004 [4]. The input signals used are defined by:

Narrow pulse-shaping filter: Higher symbol rate using spectrally narrow pulse shaping filter.

Wide pulse-shaping filter: Higher symbol rate using spectrally wide pulse shaping filter.

## B.2.9 Support of RTTI and/or FANR

All tests are performed for BTTI configuration and without PAN, unless otherwise stated. Additional tests marked as specifically RTTI requirements without and with PAN, as well as BTTI with PAN shall be performed if BTS is declared to support these features.

## B.2.10 Multicarrier BTS

If the BTS is declared to be a BTS belonging to a multicarrier BTS class the configuration and number of TRXs to be used in the test corresponds to the configuration and number of active carriers at each transmitting antenna connector (i.e. at each transmitter output of a multicarrier transmitter or transceiver). The tests shall be repeated for each transmitting antenna connector, if connected to a multicarrier transmitter. If the maximum Base Station RF bandwidth is less than the relevant transmit band, and the transmitter is capable of operating on all parts of the relevant transmit band or a declared part of it (operating TX band according to clause B.1.2) by tuning, the transmitter tests are repeated until the whole relevant transmit band or the declared operating band is tested.

For testing a BTS belonging to a multicarrier BTS class, when the definition *minimum carrier frequency spacing* is used, the carrier spacing of 600 kHz shall apply for that case.

The tests in the present document are based on the testing of multicarrier configurations for the supported numbers of carriers, operating at declared maximum power for each number of carriers equally distributed among the carriers. All supported numbers of carriers shall be included in the tests unless otherwise stated in the test case.

For a BTS belonging to a multicarrier BTS class the manufacturer shall declare whether the BTS meets the requirements of the Wide Area class, the Medium Range class and/or the Local Area class. In addition, the manufacturer shall declare the supported combinations of number of carriers, output powers and the maximum Base Station RF bandwidth applicable for each connector. When the carriers in a transmitter test are required to be distributed over the maximum Base Station RF bandwidth, the supported maximum bandwidth at respective transmit antenna connector shall be applied.

The manufacturer shall also declare if the BTS belonging to a multicarrier BTS class is equipped with multicarrier receiver and if any multicarrier receiver paths are equivalent in terms of radio performance. The Medium Range and Local Area classes may not be declared without multicarrier receiver. The tests shall be repeated for each antenna connector, if connected to a multicarrier receiver. If the manufacturer has declared multicarrier receiver paths to be equivalent, it is sufficient to apply the specified test signal(s) at any one of the equivalent receiver paths' antenna connectors. If the maximum Base Station RF bandwidth is less than the relevant receive band, and the receiver is capable of operating on all parts of the relevant receive band or a declared part of it (operating RX band according to clause B.1.2) by tuning, the receiver tests are repeated until the whole relevant receive band or the declared operating band is tested.

In some tests there are separate requirements for BTS belonging to a multicarrier BTS class. In this case the requirements apply for all classes of multicarrier BTS (Wide Area, Medium Range and Local Area), unless otherwise stated. If there is no separate requirement for a multicarrier BTS class, the requirements for normal BTS apply.

For any test that applies to a BTS belonging to a multicarrier BTS class equipped with multicarrier receiver, the required receiver resources for the declared maximum supported number of wanted signals shall be allocated and activated simultaneously at frequencies as evenly distributed as possible over the declared maximum Base Station RF bandwidth including the band edges of the Base Station RF bandwidth during the complete test, unless otherwise stated. The actual number and allocation of the applied input signals shall be as defined in each respective test. In case the supported maximum number of signals is higher than the number of applied wanted signals the remaining resources are allocated and activated for frequencies, not under test.

The declared configuration and stated performance shall be tested and fulfilled for any channel using the resource allocation and input signal configuration stated above. When the receiver resources in a test are required to be distributed over the maximum Base Station RF bandwidth, the maximum number of supported wanted signals shall be distributed over the supported maximum bandwidth at respective receive antenna connector.

The test cases for multicarrier receiver apply also for a BTS belonging to a multicarrier BTS class with multicarrier receiver supporting non-contiguous frequency allocation as specified below in this clause. The BTS configuration conditions in this clause apply.

For any test that applies to a multicarrier configuration in case of a BTS belonging to a multicarrier BTS class all carriers shall apply the GMSK modulation, unless otherwise stated.

In test cases regarding unwanted emissions inband, i.e. including spectrum due to modulation and wideband noise, spurious emissions and intermodulation attenuation, detector mode RMS shall be used for conformance testing. The detector mode used, shall be stated in the conformance test report.

The vendor shall declare if the BTS belonging to a multicarrier BTS class supports non-contiguous frequency allocation, defined as an allocation where two sub-blocks are separated by at least 5 MHz.

## B.2.11 BTS supporting VAMOS

Requirements do not apply to channels in VAMOS mode unless explicitly stated. When they apply, they shall apply to both VAMOS sub-channels.

All receiver measurements shall be performed with two antenna receive diversity without correlation or gain imbalance between receive branches. Measurements for transmitter and receiver shall be performed using TSC-5 from TSC Set 1 on VAMOS sub-channel 1 and TSC-5 from TSC Set 2 on VAMOS sub-channel 2. Both sub-channels shall use independent pseudo random bit streams for the encrypted bits.

If a TRX supports AQPSK it shall, unless otherwise stated in the tests in clause 5.3, be tested at GMSK as well as at AQPSK.

If a BTS is configured with TRXs supporting AQPSK as well as TRXs not supporting AQPSK, the different types of TRX shall be counted separately, and the stated number of TRXs to be tested shall refer to each type of TRX separately.

VAMOS mode is not applicable to pico BTS.

## B.2.12 BTS supporting ER-GSM

For BTS supporting operation in the ER-GSM 900 band, for the test in the frequency range 918 MHz to 921 MHz, maximum allowed RF power actually transmitted by the BTS depends on the coexistence scenarios and coordination between operators or defined by regulatory authority.

The BTS transmitter maximum rated output power per carrier shall be subject to regulatory coordination to avoid uncoordinated system impacts (RF scenarios for ER-GSM introduction and the MCL to be used are given in ETSI TR 145 050 [i.8] based on the case of uncoordinated or coordinated deployment in the same geographical area with other systems in the E-GSM band.

In some tests there are separate requirements for BTS operating in the ER-GSM 900 band. If there is no separate requirement, the requirements for normal BTS shall apply.

## Annex C (normative): Test environments

### C.0 General

For each test in the present document, the environmental conditions under which the BSS shall be tested are defined. The classification of environment shall be as defined in IEC EN 60721 [16], [17], [18] and [19].

### C.1 Normal test environment

When a normal test environment is specified for a test, the test should be performed under any combination of conditions between the minimum and maximum limits stated in table C.1-1.

**Table C.1-1: Limits of conditions for Normal Test Environment**

Condition	Minimum	Maximum
Barometric pressure	86 kPa	106 kPa
Temperature	15 °C	30 °C
Relative Humidity	20 %	85 %
Power supply	Nominal, as declared by the manufacturer	

The ranges of barometric pressure, temperature and humidity represent the maximum variation expected in the uncontrolled environment of a test laboratory. If it is not possible to maintain these parameters within the specified limits, the actual values shall be recorded in the test report.

NOTE: This may, for instance, be the case for measurements of radiated emissions performed on an open field test site.

### C.2 Extreme test environment

#### C.2.0 General

The manufacturer shall declare one of the following:

- the equipment class for the equipment under test, as defined in ETSI EN 300 019-1-3 [8], (Equipment Engineering (EE); Environmental conditions and environmental test for telecommunications equipment, Part 1-3: Classification of environmental conditions, Stationary use at weather protected locations);
- the equipment class for the equipment under test, as defined in ETSI EN 300 019-1-4 [9], (Equipment Engineering (EE); Environmental conditions and environmental test for telecommunications equipment, Part 1-4: Classification of environmental conditions, Stationary use at non-weather protected locations);
- for equipment that does not comply with an ETSI EN 300 019-1-0 [7] class, the relevant classes from IEC EN 60721 [16], [17], [18] and [19] documentation for Temperature and Humidity shall be declared.

NOTE: Reduced functionality for conditions that fall outside of the standard operational conditions is not tested in the present document. This may be stated and tested separately.

#### C.2.1 Extreme temperature

When an extreme temperature test environment is specified for a test, the test shall be performed at the standard minimum and maximum operating temperatures defined by the manufacturer's declaration for the equipment under test.

Minimum temperature:

- The test shall be performed with the environmental test equipment and methods of inducing the required environmental phenomena into the equipment, conforming to the test procedure of ETSI EN 300 019-2-3 [14] or ETSI EN 300 019-2-4 [15], Tests Ab/Ad: Cold. The equipment shall be maintained at the stabilized condition for the duration of the test sequence.

Maximum temperature:

- The test shall be performed with the environmental test equipment and methods of inducing the required environmental phenomena into the equipment, conforming to the test procedure of ETSI EN 300 019-2-3 [14] or ETSI EN 300 019-2-4 [15], Tests Bd Dry heat. The equipment shall be maintained at the stabilized condition for the duration of the test sequence.

NOTE: It is recommended that the equipment is made fully operational prior to the equipment being taken to its lower operating temperature.

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## C.3 Void

## C.4 Power supply

When extreme power supply conditions are specified for a test, the test shall be performed at the standard upper and lower limits of operating voltage defined by the manufacturer's declaration for the equipment under test.

### Upper voltage limit

The equipment shall be supplied with a voltage equal to the upper limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in ETSI EN 300 019-2-3 [14] or ETSI EN 300 019-2-4 [15], Test Ab/Ad: Cold and Test Bb/Bd: Dry Heat.

### Lower voltage limit

The equipment shall be supplied with a voltage equal to the lower limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in ETSI EN 300 019-2-3 [14] or ETSI EN 300 019-2-4 [15], Test Ab/Ad: Cold and Test Bb/Bd: Dry Heat.

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Annex D (informative):  
Void

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## Annex E (informative): Change History

<b>Date</b>	<b>Version</b>	<b>Information about changes</b>
September 2015	12.5.1 _12.1.1	Draft to align with Radio Equipment Directive 2014/53/EU
September 2015	12.5.1 _12.1.2	Taking comments at MSG#45 into account
September 2015	12.5.1 _12.1.3	Taking comments at MSG#45 into account
December 2015	12.5.1 _12.1.4	Alignment at MSG#46 to changed done in other ENs at corresponding TFES meeting
December 2015	12.5.1 _12.1.5	Updates of normative references at MSG#46

## History

<b>Document history</b>		
V7.0.1	August 2000	Publication
V8.0.1	January 2001	Publication
V8.1.2	July 2001	Publication
V9.2.1	October 2010	Publication
V10.2.1	November 2012	Publication
V11.1.1	July 2014	Publication
V12.1.1	March 2015	Publication
V12.1.6	January 2016	EN Approval Procedure AP 20160420: 2016-01-21 to 2016-04-20
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