



**IMT cellular networks;  
Harmonised Standard covering the essential requirements  
of article 3.2 of the Directive 2014/53/EU;  
Part 18: E-UTRA, UTRA and GSM/EDGE  
Multi-Standard Radio (MSR) Base Station (BS)**

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## Foreword

This final draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Mobile Standards Group (MSG), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure.

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.6] 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.

The present document is part 18 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.4].

### Proposed national transposition dates

|  |                                 |
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## Modal verbs terminology

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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 equipment types:

- 1) Multi-Standard Radio capable Base stations (E-UTRA, UTRA, GSM/EDGE).

These radio equipment types are capable of operating in all or any part of the frequency bands given in table 1-1.

**Table 1-1: Base station operating bands**

| Band designation and Band Category  | Direction of transmission | MSR Base Station operating bands |
|---|---------------------------|----------------------------------|
| 1 (BC1)   | Transmit                  | 2 110 MHz to 2 170 MHz           |
|   | Receive                   | 1 920 MHz to 1 980 MHz           |
| 3 (BC2)   | Transmit                  | 1 805 MHz to 1 880 MHz           |
|   | Receive                   | 1 710 MHz to 1 785 MHz           |
| 7 (BC1)   | Transmit                  | 2 620 MHz to 2 690 MHz           |
|   | Receive                   | 2 500 MHz to 2 570 MHz           |
| 8 (BC2)   | Transmit                  | 925 MHz to 960 MHz               |
|   | Receive                   | 880 MHz to 915 MHz               |
| 20 (BC1)  | Transmit                  | 791 MHz to 821 MHz               |
|   | Receive                   | 832 MHz to 862 MHz               |
| 22 (BC1)  | Transmit                  | 3 510 MHz to 3 590 MHz           |
|   | Receive                   | 3 410 MHz to 3 490 MHz           |
| 28 (BC1)  | Transmit                  | 758 MHz to 803 MHz               |
|   | Receive                   | 703 MHz to 748 MHz               |
| 32 (BC1)<br>(note)  | Transmit                  | 1 452 MHz to 1 496 MHz           |
|   | Receive                   | N/A                              |
| 33 (BC3)  | Transmit and Receive      | 1 900 MHz to 1 920 MHz           |
| 34 (BC3)  | Transmit and Receive      | 2 010 MHz to 2 025 MHz           |
| 38 (BC3)  | Transmit and Receive      | 2 570 MHz to 2 620 MHz           |
| 40 (BC3)  | Transmit and Receive      | 2 300 MHz to 2 400 MHz           |
| 42 (BC3)  | Transmit and Receive      | 3 400 MHz to 3 600 MHz           |
| 43 (BC3)  | Transmit and Receive      | 3 600 MHz to 3 800 MHz           |
| NOTE: Restricted to E-UTRA operation when carrier aggregation is configured. The downlink operating band is paired with the uplink operating band (external) of the carrier aggregation configuration that is supporting the configured Pcell. Restricted to UTRA operation when dual band is configured (e.g. DB-DC-HSDPA or dual band 4C-HSDPA). The down link frequency(ies) of this band are paired with the uplink frequency(ies) of the other FDD band (external) of the dual band configuration. |                           |                                  |

NOTE: For BS capable of multi-band operation, the supported operating bands may belong to different Band Categories.

The present document covers requirements for multi-RAT capable E-UTRA, UTRA and GSM/EDGE MSR Base Stations for 3GPP™ Release 9, 10 and 11. This includes the requirements for E UTRA Base Station operating bands and E-UTRA CA operating bands from 3GPP Release 12.

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

## 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.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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

- [1] ETSI TS 137 141 (V11.13.0) (01-2016): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing (3GPP TS 37.141 version 11.13.0 Release 11)".
- [2] ETSI TS 125 104 (V11.12.0) (01-2016): "Universal Mobile Telecommunications System (UMTS); Base Station (BS) radio transmission and reception (FDD) (3GPP TS 25.104 version 11.12.0 Release 11)".
- [3] ETSI TS 125 105 (V11.9.0) (01-2016): "Universal Mobile Telecommunications System (UMTS); Base Station (BS) radio transmission and reception (TDD) (3GPP TS 25.105 version 11.9.0 Release 11)".
- [4] ETSI TS 136 104 (V11.14.0) (01-2016): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (3GPP TS 36.104 version 11.14.0 Release 11)".
- [5] ETSI TS 145 005 (V11.4.0) (01-2014): "Digital cellular telecommunications system (Phase 2+); Radio transmission and reception (3GPP TS 45.005 version 11.4.0 Release 11)".
- [6] ETSI EN 301 908-3 (V11.1.1) (05-2016): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 3: CDMA Direct Spread (UTRA FDD) Base Stations (BS)".
- [7] ETSI EN 301 908-14 (V11.1.1) (05-2016): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Radio Equipment Directive 2014/53/EU; Part 14: Evolved Universal Terrestrial Radio Access (E-UTRA) Base Stations (BS)".
- [8] ETSI TS 136 104 (V12.10.0) (01-2016): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (3GPP TS 36.104 version 12.10.0 Release 12)".
- [9] ETSI EN 301 502 (V12.1.6) (01-2016): "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".
- [10] ETSI TS 137 104 (V11.13.0) (01-2016): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception (3GPP TS 37.104 version 11.13.0 Release 11)".
- [11] ETSI TS 136 141 (V11.14.0) (01-2016): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing (3GPP TS 36.141 version 11.14.0 Release 11)".
- [12] ETSI TS 125 141 (V11.12.0) (01-2016): "Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 11.12.0 Release 11)".



- [13] ETSI TS 125 142 (V11.5.0) (01-2016): "Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (TDD) (3GPP TS 25.142 version 11.5.0 Release 11)".
- [14] ETSI TS 151 021 (V11.4.0) (10-2013): "Digital cellular telecommunications system (Phase 2+); Base Station System (BSS) equipment specification; Radio aspects (3GPP TS 51.021 version 11.4.0 Release 11)".

## 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.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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 (V1.1.1) (08-2015): "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] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.4] ETSI EN 301 908-1 (V11.1.1): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 1: Introduction and common requirements".
- [i.5] Recommendation ITU-R SM.329-12 (09-2012): "Unwanted emissions in the spurious domain".
- [i.6] 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.

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**band category:** group of operating bands for which the same MSR scenarios apply

NOTE: The band categories for MSR BS are defined in clause 4.4 of ETSI TS 137 141 [1] and are listed in table 1-1.

**Base Station class:** wide area Base Station, medium range Base Station or local Area Base Station, as declared by the manufacturer

**Base Station RF bandwidth:** bandwidth in which a Base Station transmits and/or receives single or multiple carrier(s) and/or RATs simultaneously within a supported operating band

NOTE: In single carrier operation, the Base Station RF bandwidth is equal to the channel bandwidth.

**Base Station RF bandwidth edge:** frequency of one of the edges of the Base Station RF bandwidth

**carrier:** modulated waveform conveying the E-UTRA, UTRA or GSM/EDGE physical channels

**carrier aggregation:** aggregation of two or more E-UTRA component carriers in order to support wider transmission bandwidths

**carrier aggregation band:** set of one or more operating bands across which multiple E-UTRA carriers are aggregated with a specific set of technical requirements

NOTE: Carrier aggregation band(s) for an E-UTRA BS is declared by the manufacturer according to the designations in tables 4.2.1-2 to 4.2.1-5.

**carrier power:** power at the antenna connector in the channel bandwidth of the carrier averaged over at least one subframe for E-UTRA, at least one slot for UTRA and the useful part of the burst for GSM/EDGE

**channel bandwidth:** RF bandwidth supporting a single E-UTRA, UTRA or GSM/EDGE RF carrier

NOTE: The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

**configured carrier power:** target maximum power for a specific carrier for the operating mode set in the BS

**contiguous spectrum:** spectrum consisting of a contiguous block of spectrum with no sub-block gap(s)

**downlink operating band:** part of the operating band designated for downlink

**Inter RF bandwidth gap:** frequency gap between two consecutive Base Station RF bandwidths that are placed within two supported operating bands

**inter-band gap:** frequency gap between two supported consecutive operating bands

**intra-band contiguous carrier aggregation:** contiguous E-UTRA carriers aggregated in the same operating band

**local area Base Station:** Base Stations characterized by requirements derived from picocell scenarios with a BS to UE minimum coupling loss equal to 45 dB

**lower Base Station RF bandwidth edge:** frequency of the lower edge of the Base Station RF bandwidth, used as a frequency reference point for transmitter and receiver requirements

**lower sub-block edge:** frequency at the lower edge of one sub-block

NOTE: It is used as a frequency reference point for both transmitter and receiver requirements.

**maximum Base Station RF bandwidth:** maximum RF bandwidth supported by a Base Station within each supported operating band

NOTE: The Maximum Base Station RF bandwidth for BS configured for contiguous and non-contiguous operation within each supported operating band is declared separately.

**maximum carrier output power:** carrier power available at the antenna connector for a specified reference condition

**Maximum Radio Bandwidth:** maximum frequency difference between the upper edge of the highest used carrier and the lower edge of the lowest used carrier

**maximum throughput:** maximum achievable throughput for a reference measurement channel

**maximum total output power:** sum of the power of all carriers available at the antenna connector for a specified reference condition

**MB-MSR Base Station:** MSR Base Station characterized by the ability of its transmitter and/or receiver to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different non-overlapping operating band than the other carrier(s)

**mean power:** power measured in the bandwidth and period of measurement applicable for each RAT

NOTE: Mean power for an E-UTRA carrier is defined in ETSI TS 136 141 [11] and mean power for a UTRA carrier is defined in ETSI TS 125 141 [12]. In case of multiple carriers, the mean power is the sum of the mean power of all carriers.

**measurement bandwidth:** bandwidth in which an emission level is specified

**medium range Base Station:** Base Stations characterized by requirements derived from micro cell scenarios with a BS to UE minimum coupling loss equal to 53 dB

**MSR Base Station (BS):** Base Station characterized by the ability of its receiver and transmitter to process two or more carriers in common active RF components simultaneously in a declared Base Station RF bandwidth, where at least one carrier is of a different RAT than the other carrier(s)

**multi-band receiver:** receiver characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different non-overlapping operating band than the other carrier(s)

**multi-band transmitter:** transmitter characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different non-overlapping operating band than the other carrier(s)

**non-contiguous spectrum:** spectrum consisting of two or more sub-blocks separated by sub-block gap(s)

**operating band:** frequency range in which E-UTRA, UTRA or GSM/EDGE operates (paired or unpaired), that is defined with a specific set of technical requirements

NOTE: The operating band(s) for a Base Station is declared by the manufacturer. Operating bands have designations according to table 1-1.

**single-RAT operation:** operation of a Base Station in an operating band with only one RAT configured in that operating band

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

NOTE: There may be multiple instances of sub-blocks within a Base Station RF bandwidth.

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

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

**throughput:** number of payload bits successfully received per second for a reference measurement channel in a specified reference condition

**total RF bandwidth:** maximum sum of Base Station RF bandwidths in all supported operating bands

**transmission bandwidth:** bandwidth of an instantaneous E-UTRA transmission from a UE or BS, measured in Resource Block units

**transmitter OFF period:** time period during which the BS transmitter is not allowed to transmit

**transmitter ON period:** time period during which the BS transmitter is transmitting data and/or reference symbols, e.g. data subframes or DwPTS

**transmitter transient period:** time period during which the transmitter is changing from the OFF period to the ON period or vice versa

**uplink operating band:** part of the operating band designated for uplink

**upper Base Station RF bandwidth edge:** frequency of the upper edge of the Base Station RF bandwidth, used as a frequency reference point for transmitter and receiver requirements

**upper sub-block edge:** frequency at the upper edge of one sub-block

NOTE: It is used as a frequency reference point for both transmitter and receiver requirements.

**wide area Base Station:** Base Stations characterized by requirements derived from macro cell scenarios with a BS to UE minimum coupling loss equal to 70 dB

NOTE: This Base Station class has the same requirements as the general purpose Base Station in the sixth release version of the present document, corresponding to 3GPP Release 8.

## 3.2 Symbols

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

|                     |  |
|---------------------|--|
| $BW_{RF}$           | Base Station RF bandwidth, where $BW_{RF} = F_{BW\ RF,high} - F_{BW\ RF,low}$  |
| $B_{RFBW}$          | Maximum Base Station RF bandwidth located at the bottom of the supported frequency range in the operating band   |
| CA_X                | CA for band X where X is the applicable E-UTRA operating band  |
| f                   | Frequency  |
| $\Delta f$          | Separation between the Base Station RF bandwidth edge frequency and the nominal -3 dB point of the measuring filter closest to the carrier frequency   |
| $\Delta f_{max}$    | The largest value of $\Delta f$ used for defining the requirement  |
| $F_C$               | Carrier centre frequency   |
| $F_{filter}$        | Filter centre frequency  |
| $f_{offset}$        | Separation between the Base Station RF bandwidth edge frequency and the centre of the measuring filter   |
| $f_{offset_{max}}$  | The maximum value of $f_{offset}$ used for defining the requirement  |
| $F_{block,high}$    | Upper sub-block edge, where $F_{block,high} = F_{C,block,high} + F_{offset, RAT}$  |
| $F_{block,low}$     | Lower sub-block edge, where $F_{block,low} = F_{C,block,low} - F_{offset, RAT}$  |
| $F_{BW\ RF,high}$   | Upper Base Station RF bandwidth edge, where $F_{BW\ RF,high} = F_{C,high} + F_{offset, RAT}$   |
| $F_{BW\ RF,low}$    | Lower Base Station RF bandwidth edge, where $F_{BW\ RF,low} = F_{C,low} - F_{offset, RAT}$   |
| $F_{C,block, high}$ | Center frequency of the highest transmitted/received carrier in a sub-block  |
| $F_{C,block, low}$  | Center frequency of the lowest transmitted/received carrier in a sub-block   |
| $F_{C,high}$        | Center frequency of the highest transmitted/received carrier   |
| $F_{C,low}$         | Center frequency of the lowest transmitted/received carrier  |
| $F_{offset, RAT}$   | Frequency offset from the centre frequency of the <i>highest</i> transmitted/received carrier to the <i>upper</i> Base Station RF bandwidth edge, sub-block edge or inter-RF bandwidth edge, or from the centre frequency of the <i>lowest</i> transmitted/received carrier to the <i>lower</i> Base Station RF bandwidth edge, sub-block edge or inter-RF bandwidth edge for a specific RAT |
| $F_{UL,low}$        | The lowest frequency of the uplink operating band  |
| $F_{UL,high}$       | The highest frequency of the uplink operating band   |
| $M_{RFBW}$          | Maximum Base Station RF bandwidth located in the middle of the supported frequency range in the operating band   |
| $P_{EM,B32,ind}$    | Declared emission level (a) for Band 3, ind = a, b, c, d, e  |
| $P_{EM,N}$          | Declared emission level for channel N  |
| $P_{GSMcarrier}$    | Power level of the GSM/EDGE carrier adjacent to the RF bandwidth edge  |
| $P_{max}$           | Maximum total output power   |
| $P_{max,c}$         | Maximum carrier output power   |
| $P_{REFSENS}$       | Reference Sensitivity power level  |
| $T_{RFBW}$          | Maximum Base Station RF bandwidth located at the top of the supported frequency range in the operating band  |
| $W_{gap}$           | Sub-block gap size or Inter RF bandwidth gap size  |

## 3.3 Abbreviations

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

|          |   |
|----------|---|
| 4C-HSDPA | Four-Carrier HSDPA                      |
| ACLR     | Adjacent Channel Leakage Ratio          |
| AM       | Amplitude Modulation                    |
| ARFCN    | Absolute Radio Frequency Channel Number |
| ATT      | Attenuator                              |
| BC       | Band Category                           |
| BER      | Bit Error Ratio                         |
| BS       | Base Station                            |
| BTS      | Base Transceiver Station                |

|             |  |
|-------------|--|
| BW          | Bandwidth  |
| CA          | Carrier Aggregation  |
| CACLR       | Cumulative Adjacent Channel Leakage Ratio                            |
| CEPT        | European Conference of Postal and Telecommunications Administrations |
| CS          | Capability Set   |
| CW          | Continuous Wave  |
| DB-DC-HSDPA | Dual Band Dual Cell HSDPA  |
| DC          | Direct Current   |
| DTT         | Digital Terrestrial Television                                       |
| DwPTS       | Downlink part of the special subframe (for E-UTRA TDD operation)     |
| EC          | European Communities   |
| ECC         | Electronic Communications Committee                                  |
| EDGE        | Enhanced Data rates for GSM Evolution                                |
| EFTA        | European Free Trade Association                                      |
| EU          | European Union   |
| EUT         | Equipment Under Test   |
| E-UTRA      | Evolved Universal Terrestrial Radio Access                           |
| FDD         | Frequency Division Duplex  |
| FRC         | Fixed Reference Channel  |

NOTE: The fixed reference channels for E-UTRA are detailed in annex A of ETSI TS 136 141 [11].

|        |   |
|--------|---|
| GMSK   | Gaussian Minimum Shift Keying                                   |
| GSM    | Global System for Mobile communications                         |
| IMT    | International Mobile Telecommunications                         |
| ITU-R  | International Telecommunication Union Radiocommunication sector |
| LA     | Local Area  |
| MB-MSR | Multi-Band Multi-Standard Radio                                 |
| MBT    | Multi-Band Testing  |
| MC-BTS | Multi-Carrier Base Transceiver Station                          |
| MR     | Medium Range  |
| MS     | Mobile Station  |
| MSR    | Multi-Standard Radio  |
| Pcell  | Primary cell  |
| RAT    | Radio Access Technology   |
| RB     | Resource Block (for E-UTRA)                                     |
| RF     | Radio Frequency   |
| RMS    | Root Mean Square (value)  |
| RRC    | Root-Raised Cosine  |
| RX     | Receiver  |
| SBT    | Single Band Testing   |
| TC     | Test Configuration  |
| TDD    | Time Division Duplex  |
| TX     | Transmitter   |
| UARFCN | UTRA Absolute Radio Frequency Channel Number                    |
| UE     | User Equipment  |
| UEM    | operating band Unwanted Emissions Mask                          |
| UTRA   | Universal Terrestrial Radio Access                              |
| WA     | Wide Area   |

## 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 supplier. 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 supplier can declare the environmental profile, see annex C.