

Draft **ETSI EN 301 908-1** V15.2.0 (2022-10)



**IMT cellular networks;
Harmonised Standard for access to radio spectrum;
Part 1: Introduction and common requirements
Release 15**

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Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Mobile Standards Group (MSG), and is now submitted for the combined Public Enquiry and 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.9] 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 1 of a multi-part deliverable covering IMT cellular networks, as identified below:

Part 1: "Introduction and common requirements";

Part 2: "CDMA Direct Spread (UTRA FDD) User Equipment (UE)";

Part 3: "CDMA Direct Spread (UTRA FDD) Base Stations (BS)";

Part 4: "CDMA Multi-Carrier (cdma2000) User Equipment (UE)";

Part 5: "CDMA Multi-Carrier (cdma2000) Base Stations (BS)";

Part 6: "CDMA TDD (UTRA TDD) User Equipment (UE)";

Part 7: "CDMA TDD (UTRA TDD) Base Stations (BS)";

Part 8: "Harmonized EN for IMT-2000, TDMA Single-Carrier (UWC 136) (UE) covering essential requirements of article 3.2 of the R&TTE Directive";

- Part 9: "Harmonized EN for IMT-2000, TDMA Single-Carrier (UWC 136) (BS) covering essential requirements of article 3.2 of the R&TTE Directive";
- Part 10: "Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks";
- Part 11: "CDMA Direct Spread (UTRA FDD) Repeaters";
- Part 12: "CDMA Multi-Carrier (cdma2000) Repeaters";
- Part 13: "Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE)";
- Part 14: "Evolved Universal Terrestrial Radio Access (E-UTRA) Base Stations (BS)";
- Part 15: "Evolved Universal Terrestrial Radio Access (E-UTRA FDD) Repeaters";
- Part 16: "Harmonized EN for IMT-2000, Evolved CDMA Multi-Carrier Ultra Mobile Broadband (UMB) (UE) covering the essential requirements of article 3.2 of the R&TTE Directive";
- Part 17: "Harmonized EN for IMT-2000, Evolved CDMA Multi-Carrier Ultra Mobile Broadband (UMB) (BS) covering the essential requirements of article 3.2 of the R&TTE Directive";
- Part 18: "E-UTRA, UTRA and GSM/EDGE Multi-Standard Radio (MSR) Base Station (BS) Release 15";
- Part 19: "OFDMA TDD WMAN (Mobile WiMAX™) TDD User Equipment (UE)";
- Part 20: "OFDMA TDD WMAN (Mobile WiMAX™) TDD Base Stations (BS)";
- Part 21: "OFDMA TDD WMAN (Mobile WiMAX™) FDD User Equipment (UE)";
- Part 22: "OFDMA TDD WMAN (Mobile WiMAX™) FDD Base Stations (BS)";
- Part 23: "Active Antenna System (AAS) Base Station (BS) Release 15";
- Part 24: "New Radio (NR) Base Stations (BS) Release 15";
- Part 25: "New Radio (NR) User Equipment (UE) Release 15".

Proposed national transposition dates

Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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 user equipment, repeaters and base stations for IMT, falling within the scope of one of the other parts of ETSI EN 301 908 [i.8], except for IMT-2000 FDMA/TDMA (DECT). The present document also covers the corresponding ancillary equipment.

NOTE 1: ETSI EN 301 908-10 [i.7] contains in particular requirements for radiated spurious emissions and control and monitoring functions applicable to IMT-2000 FDMA/TDMA (DECT) equipment.

The present document includes technical requirements which are common to equipment falling within the scope of several of the other parts. It should be used in conjunction with at least another part of ETSI EN 301 908 [i.8].

NOTE 2: The other parts of ETSI EN 301 908 [i.8], which are listed in the foreword of the present document, specify technical requirements in respect of a particular type of IMT equipment.

NOTE 3: Recommendations ITU-R M.1457-15 [i.4], M.2012-4 [i.5] and M.2150.0 [i.10] define the characteristics of the members of the IMT-2000 family and IMT-Advanced respectively by means of references to technical specifications developed by Standards Development organizations. The present document applies to equipment designed to meet any version of the terrestrial specifications referenced in Recommendations ITU-R M.1457-15 [i.4] and M.2012-4 [i.5].

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.

NOTE 4: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.1] is given in annex A.

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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 <https://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] Recommendation ITU-R SM.329-12 (09-2012): "Unwanted emissions in the spurious domain".
- [2] ETSI EN 301 502 (V12.5.2) (03-2017): "Global System for Mobile communications (GSM); Base Station (BS) equipment; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".
- [3] EN 55032:2015/A11:2020: "Electromagnetic compatibility of multimedia equipment - Emission Requirements", (produced by CENELEC).
- [4] EN IEC 55016-1-4:2019/A1:2020: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements", (produced by CENELEC).

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 (V1.2.1) (05-2020): "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] Recommendation ITU-R M.1457-15 (10-2020): "Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)".
- [i.5] Recommendation ITU-R M.2012-4 (11-2019): "Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-Advanced (IMT-Advanced)".
- [i.6] Recommendation ITU-R SM.1539-1 (2002): "Variation of the boundary between the out-of-band and spurious domains required for the application of Recommendations ITU-R SM.1541 and ITU-R SM.329".
- [i.7] ETSI EN 301 908-10 (V4.2.2) (11-2016): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks; Part 10: Harmonised Standard for IMT-2000, FDMA/TDMA (DECT) covering the essential requirements of article 3.2 of the Directive 2014/53/EU".
- [i.8] ETSI EN 301 908 (all parts): "IMT cellular networks; Harmonised Standard for access to radio spectrum".
- [i.9] 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.10] Recommendation ITU-R M.2150.0 (02-2021): "Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2020 (IMT-2020)".
- [i.11] ETSI EN 301 908-24 (V15.1.1): "IMT cellular networks; Harmonised Standard for access to radio spectrum Part 24: New Radio (NR) Base Stations (BS) Release 15".
- [i.12] ETSI EN 301 908-25 (V15.1.1): "IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 25: New Radio (NR) User Equipment (UE) Release 15".
- [i.13] ETSI EN 301 908-23 (V15.1.1): "IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 23: Active Antenna System (AAS) Base Station (BS); Release 15".

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

ancillary equipment: equipment (apparatus), used in connection with a User Equipment (UE), Repeater or Base Station (BS) is considered as an ancillary equipment (apparatus) if:

- the equipment is intended for use in conjunction with a user equipment UE, repeater or BS to provide additional operational and/or control features to the radio equipment (e.g. to extend control to another position or location); and
- the equipment cannot be used on a stand-alone basis to provide user functions independently of a UE, BS or combination of BS and repeater; and
- the UE, BS or combination of BS and repeater to which it is connected, is capable of providing some intended operation, such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

applicable part: part of the multi-part harmonised standard deliverable, of which the present document is the first part, for which the scope of that document includes the equipment to be tested

Base Station RF bandwidth: bandwidth in which a Base Station transmits and receives multiple carriers and/or RATs simultaneously

BS type 1-C: NR base station operating at FR1 with requirements set consisting only of conducted requirements defined at individual antenna connectors

BS type 1-H: NR base station operating at FR1 with a requirement set consisting of conducted requirements defined at individual *TAB connectors* and OTA requirements defined at RIB

BS type 1-O: NR base station operating at FR1 with a requirement set consisting only of OTA requirements defined at the RIB

BS type 2-O: NR base station operating at FR2 with a requirement set consisting only of OTA requirements defined at the RIB

channel bandwidth: RF bandwidth supporting a single E-UTRA or Mobile WiMAX™ RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell

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

control and monitoring functions: UE features handling out of synchronization and associated output power requirement

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

NOTE: In the case of integral antenna equipment, this port is inseparable from the antenna port.

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

far field region: region far from the antenna with a distance at least of $(2 \times D^2 / \lambda)$

Free Space Open Area Test Site (FSOATS): reference test site with precautions to ensure that reflections do not influence the measurement

NOTE: The Free Space Open Area Test Site (FSOATS) is the concept of the test site. A practical approximation is a Fully-Anechoic Room (FAR).

Fully-Anechoic Room (FAR): shielded enclosure, the internal surfaces of which are lined with radio-frequency-energy absorbing material (i.e. RF absorber) that absorbs electromagnetic energy in the frequency range of interest

hybrid AAS BS: AAS BS which has both a conducted RF interface and a radiated RF interface in the far field and conforms to a *hybrid requirements set*

idle mode: state of User Equipment (UE) when switched on but with no Radio Resource Control (RRC) connection

IMT-2000: mobile systems as defined in Recommendation ITU-R M.1457-15 [i.4]

NOTE: Recommendation ITU-R M.1457-15 [i.4] identifies the detailed specifications for the IMT-2000 radio interfaces.

IMT-2020: mobile systems as defined in Recommendation ITU-R M.2150.0 [i.10]

IMT-Advanced: mobile systems as defined in Recommendation ITU-R M.2012-4 [i.5]

NOTE: Recommendation ITU-R M.2012-4 [i.5] identifies the detailed specifications for the IMT-Advanced radio interfaces.

lower 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

MSR Base Station: 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 RF bandwidth, where at least one carrier is of a different RAT than the other carrier(s)

multi-band Base Station: 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)

OTA AAS BS: AAS BS which has ≥ 8 transceiver units per cell and has a radiated RF interface only and conforms to the OTA requirements set

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

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 3.1-1).

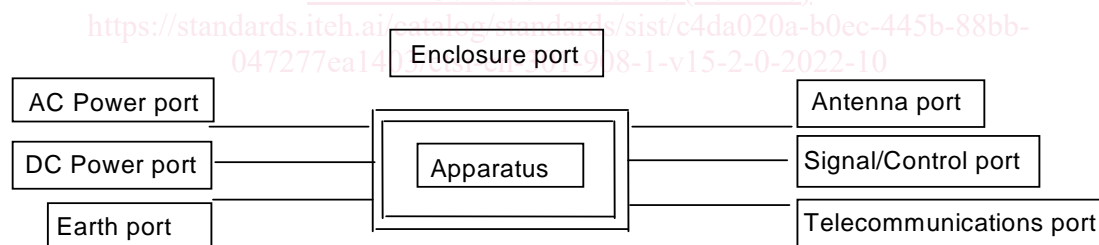


Figure 3.1-1: Examples of ports

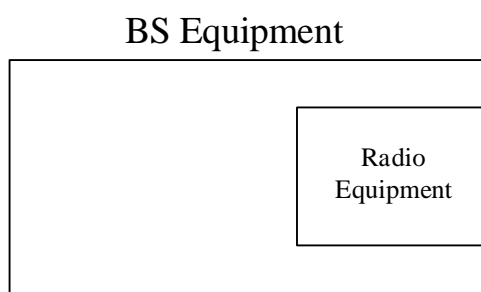


Figure 3.1-2: BS with single enclosure solution

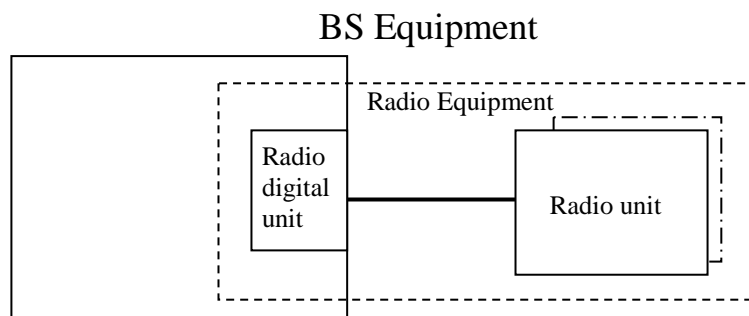


Figure 3.1-3: BS with multiple enclosure solution

radio communications equipment: telecommunications equipment which includes one or more transmitters and/or receivers and/or parts thereof for use in a fixed, mobile or portable application

NOTE: It can be operated with ancillary equipment but if so, is not dependent on it for basic functionality.

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

Semi-Anechoic Chamber (SAC): shielded enclosure in which all surfaces except the metal floor are covered with material that absorbs electromagnetic energy (i.e. RF absorber) in the frequency range of interest

signal and control port: port which carries information or control signals, excluding antenna ports

telecommunication port: port which is intended to be connected to telecommunication networks (e.g. public switched telecommunication networks, integrated services digital networks), local area networks (e.g. Ethernet, token ring) and similar networks

traffic mode: state of User Equipment (UE) when switched on and with Radio Resource Control (RRC) connection established

upper 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

WiMAX™: trademarked name for the OFDMA TDD WMAN IMT technology

3.2 Symbols

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

BW_{Channel}	Channel bandwidth
D	Antenna aperture
$F_{\text{BW RF, high}}$	Upper RF bandwidth edge
$F_{\text{BW RF, low}}$	Lower RF bandwidth edge
F_{C_1}	Centre frequency of first carrier frequency used by the BS and repeater
F_{C_2}	Centre frequency of last carrier frequency used by the BS and repeater
$F_{\text{DL_high}}$	The highest frequency of the downlink operating band
$F_{\text{DL_low}}$	The lowest frequency of the downlink operating band
M_{cps}	Megachips per second
S_{VSWR}	Site voltage standing wave ratio
Δf_{OBUE}	Maximum offset of the operating band unwanted emissions mask from the operating band edge
λ	Measurement wavelength (shortest of the ones tested)

3.3 Abbreviations

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

AAS	Active Antenna System
BS	Base Station
CDMA	Code Division Multiple Access
CW	Continuous Wave
DECT	Digital Enhanced Cordless Telecommunications
e.i.r.p.	equivalent isotropically radiated power
e.r.p.	effective radiated power
EDGE	Enhanced Data rates for GSM Evolution
EFTA	European Free Trade Association
EMC	ElectroMagnetic Compatibility
ERM	Electromagnetic compatibility and Radio spectrum Matters
EU	European Union
EUT	Equipment Under Test
E-UTRA	Evolved Universal Terrestrial Radio Access

NOTE: Also known as LTE.

FAR	Fully-Anechoic Room
FDD	Frequency Division Duplex
FDMA	Frequency Division Multiple Access
FR	Frequency Range
FSOATS	Free Space OATS
GSM	Global System for Mobile communications
IMT	International Mobile Telecommunications

NOTE: Includes IMT-2020, IMT-2000 and IMT-Advanced RITs.

ITU-R	International Telecommunication Union - Radio sector
LTE	Long Term Evolution

NOTE: Also known as E-UTRA.

MSG	Mobile Standards Group
MSR	Multi-Standard Radio
NR	New Radio
NSA	Normalized Site Attenuation
OATS	Open Area Test Site
OBUE	Operating Band Unwanted Emissions
OFDMA	Orthogonal Frequency Division Multiple Access
OTA	Over The Air
RAT	Radio Access Technology
RF	Radio Frequency
RIB	Radiated Interface Boundary
RIT	Radio Interface Technology
RMS	Root Mean Square
RRC	Radio Resource Control
RSM	Reference Site Method
SAC	Semi-Anechoic Chamber
SDO	Standards Development Organization
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TFES	Task Force for European Standards for IMT
TIA	Telecommunications Industry Association
UE	User Equipment
UMB	Ultra Mobile Broadband
UTRA	Universal Terrestrial Radio Access
UWC	Universal Wireless Communications
WCDMA	Wideband Code Division Multiple Access
WMAN	Wireless Metropolitan Area Network

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 in accordance with its intended use. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the operational environmental profile defined by its intended use.

4.2 Conformance requirements

4.2.1 Introduction

The requirements in the present document are based on the assumption that the operating band is shared between systems of the IMT family or systems having compatible characteristics. The frequency ranges FR1 and FR2 are defined in ETSI EN 301 908-24 [i.11].

For BS capable of multi-band operation, the requirements in the present document apply for each supported operating band unless otherwise stated. For emission tests, all operating bands shall be activated according to the applicable test configuration.

To meet the essential requirement under article 3.2 of Radio Equipment Directive 2014/53/EU [i.1] for IMT equipment three common essential parameters have been identified. Tables 4.2.1-1 and 4.2.1-2 provide cross-references, for UE, repeater and BS respectively, between these essential parameters and the corresponding technical requirements for equipment within the scope of the present document.

Table 4.2.1-1: Cross references for User Equipment (UE)

Essential parameter	Corresponding technical requirements	Corresponding test suite
Radiated emissions	4.2.2 Radiated emissions (UE)	5.3.1
Control and monitoring functions	4.2.4 Control and monitoring functions (UE)	5.3.3

Table 4.2.1-2: Cross references for Base Stations (BSs) and repeaters

Essential parameter	Corresponding technical requirements	Corresponding test suite
Radiated emissions	4.2.3 Radiated emissions (BS and repeater)	5.3.2

NOTE: The use of correct timing and correct code are covered in annex B.

4.2.2 Radiated emissions (UE)

4.2.2.1 Definition

This test assesses the ability of radio communications equipment and ancillary equipment to limit unwanted emissions from the enclosure port.

This test is applicable to radio communications equipment and ancillary equipment, except for NR UE operating in FR2.

NOTE: For NR UE operating in FR2, the radiated emission is covered by radiated spurious emission requirement in ETSI EN 301 908-25 [i.12].

This test shall be performed on the radio communications equipment and/or a representative configuration of the ancillary equipment.