Final draft ETSI EN 301 489-52 V1.2.0 (2021-09)

ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication User Equipment (UE) radio and ancillary equipment; Harmonised Standard for ElectroMagnetic Compatibility

Reference

DEN/ERM-EMC-354

Keywords

EMC, GSM, harmonised standard, LTE, MSR, NR, OFDMA, WCDMA, WMAN

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Foreword

This final draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.4] 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.2].

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 52 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

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.

1 Scope

The present document specifies the applicable test conditions, performance assessment, and performance criteria for Cellular Communication User Equipment (UE), including Customer Premise Equipment (CPE), Set Top Box (STB) containing cellular communication technologies, and the associated ancillary equipment in respect of ElectroMagnetic Compatibility (EMC) for equipment utilizing the technologies in table 1.

Table 1: Technologies User Equipment (UE) radio and ancillary equipment Cellular Communication

Cellular Mobile Communication Technology	Technology Generation	Standard Set	ETSI Standard
Global System for Mobile communications (GSM)	2G/3G	IMT-2000 SC single carrier	ETSI EN 301 511 [i.9]
CDMA Multi-Carrier (cdma2000)	2G/3G	IS-95/CDMA2000 - IMT-MC multi carrier	ETSI EN 301 908-4 [i.10]
CDMA Direct Spread (UTRA FDD)	3G	IMT-2000 Direct Spread	ETSI EN 301 908-2 [i.11]
Evolved Universal Terrestrial Radio Access (E-UTRA)	4G	IMT-advanced	ETSI EN 301 908-13 [i.12]
New Radio (NR)	5G	IMT-2020	ETSI TS 138 521-1 [15], ETSI TS 138 521-3 [16]

Technical specifications related to the antenna port of radio equipment and radiated emissions from the enclosure port of radio equipment and combinations of radio and associated ancillary equipment are not included in the present document. Such technical specifications are normally found in the relevant product standards for the effective use of the radio spectrum.

NOTE 1: The relationship between the present document and essential requirements of article 3.1(b) of Directive 2014/53/EU [i.2] is given in annex A.

NOTE 2: The present document does not cover the radio base stations as specified in ETSI EN 301 489-50 [i.13].

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] ETSI EN 301 489-1 (V2.2.3) (11-2019): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility".

[2] ETSI TS 134 108 (V15.2.0) (10-2019): "Universal Mobile Telecommunications System (UMTS); LTE; Common test environments for User Equipment (UE); Conformance testing (3GPP TS 34.108 version 15.2.0 Release 15)".

[3] ETSI TS 125 101 (V16.1.0) (11-2020): "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (FDD) (3GPP TS 25.101 version 16.1.0 Release 16)".

[4] ETSI TS 134 109 (V16.0.0) (07-2020): "Universal Mobile Telecommunications System (UMTS); Terminal logical test interface; Special conformance testing functions (3GPP TS 34.109 version 16.0.0 Release 16)".

[5] ETSI EN 300 296-1 (V1.4.1) (08-2013): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment using integral antennas intended primarily for analogue speech; Part 1: Technical characteristics and methods of measurement".

[6] Recommendation ITU-T P.64 (06/2019): "Determination of sensitivity/frequency characteristics of local telephone systems".

[7] Recommendation ITU-T P.76 (11/1988): "Determination of loudness ratings; fundamental principles".

[8] ETSI TS 125 102 (V16.0.0) (08-2020): "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (TDD) (3GPP TS 25.102 version 16.0.0 Release 16)".

[9] ETSI TS 136 101 (V14.18.0) (05-2021): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (3GPP TS 36.101 version 14.18.0 Release 14)".

[10] ETSI TS 136 508 (V16.8.0) (06-2021): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing (3GPP TS 36.508 version 16.8.0 Release 16)".

[11] ETSI TS 136 509 (V16.0.0) (05-2021): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Special conformance testing functions for User Equipment (UE) (3GPP TS 36.509 version 16.0.0 Release 16)".

[12] ETSI TS 136 521-1 (V16.8.1) (06-2021): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Conformance testing (3GPP TS 36.521-1 version 16.8.1 Release 16)".

[13] ETSI TS 138 508-1 (V16.7.0) (06-2021): "5G; 5GS; User Equipment (UE) conformance specification; Part 1: Common test environment (3GPP TS 38.508-1 version 16.7.0 Release 16)".

[14] ETSI TS 138 101-1 (V16.7.0) (05-2021): "5G; NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone (3GPP TS 38.101-1 version 16.7.0 Release 16)".

[15] ETSI TS 138 521-1 (V16.6.0) (02-2021): "5G; NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Range 1 standalone (3GPP TS 38.521-1 version 16.6.0 Release 16)".

[16] ETSI TS 138 521-3 (V16.5.0) (11-2020): "5G; NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios (3GPP TS 38.521-3 version 16.5.0 Release 16)".

[17] EN 55035:2017 + A11:2020: "Electromagnetic compatibility of multimedia equipment - Immunity requirements" (produced by CENELEC).

[18] ETSI TS 100 910 (V8.20.0): "Digital cellular telecommunications system (Phase 2+); Radio Transmission and Reception (3GPP TS 05.05 version 8.20.0 Release 1999)".

[19] Void.

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] ETSI TR 121 905 (V15.1.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Vocabulary for 3GPP Specifications (3GPP TR 21.905 version 15.1.0 Release 15)".

[i.2] 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.3] ETSI TR 125 990 (V3.0.0): "Universal Mobile Telecommunications System (UMTS); Vocabulary (3G TR 25.990 version 3.0.0 Release 1999)".

[i.4] 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.5] ETSI GTS 05.08 (V3.8.0) (01-1995): "European digital cellular telecommunications system (Phase 1); Radio Subsystem Link Control (GSM 05.08)".

NOTE: The technical content of ETSI I-ETS 300 034-1 has been transferred into ETSI GTS 05.08 (V3.8.0).

[i.6] ETSI GTS 05.08-DCS (V3.0.0) (01-1995): "European digital cellular telecommunications system (Phase 1); Radio Subsystem Link Control; (GSM 05.08 - DCS-1800)".

NOTE: The technical content of ETSI I-ETS 300 034-2 has been transferred into ETSI GTS 05.08-DCS (V3.0.0).

[i.7] ETSI ETS 300 578 (Edition 13) (03-1999): "Digital cellular telecommunications system (Phase 2) (GSM); Radio subsystem link control (GSM 05.08 version 4.22.1)".

[i.8] Void.

[i.9] ETSI EN 301 511 (V12.5.1) (03-2017): "Global System for Mobile communications (GSM); Mobile Stations (MS) equipment; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".

[i.10] ETSI EN 301 908-4 (V6.2.1) (06-2013): "IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 4: CDMA Multi-Carrier (cdma2000) User Equipment (UE)".

[i.11] ETSI EN 301 908-2 (V11.1.2) (08-2017): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Part 2: CDMA Direct Spread (UTRA FDD) User Equipment (UE)".

[i.12] ETSI EN 301 908-13 (V11.1.2) (07-2017): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE)".

[i.13] ETSI EN 301 489-50 (V2.2.1) (04-2019): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 50: Specific conditions for Cellular Communication Base Station (BS), repeater and ancillary equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 301 489-1 [1] and the following apply:

ancillary equipment: electrical or electronic equipment, that is intended to be used with a receiver or transmitter

NOTE 1: It is considered as an ancillary equipment if:

- the equipment is intended for use with a receiver or transmitter to provide additional operational and/or control features to the radio equipment (e.g. to extend control to another position or location);
- the ancillary equipment cannot be used without being connected to radio equipment to provide user functions independently of a receiver or transmitter; and
- the receiver or transmitter, 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).

NOTE 2: An example of ancillary equipment would be a docking station for radio equipment whose interface is dedicated to a particular product or range of products.

bearer: information transmission path of defined characteristics for transfer of user data or predefined test data

camped on a cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell

NOTE 1: The UE monitors system information and (in most cases) paging information.

NOTE 2: The services may be limited and the PLMN may not be aware of the existence of the UE within the chosen cell.

channel bandwidth: RF bandwidth supporting a single E-UTRA 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.

critical stored data: data that is essential for an EUT to perform a primary function in accordance with that EUT's specification

NOTE: This may include data previously stored by the user.

data application ancillary: ancillary which provides, sends and/or receives data access to UMTS services via UE

end-user data: manufacturer defined data patterns for data transfer testing

NOTE: Represents EUT's typical user application data pattern (e.g. photo, video, text file, message) in its characteristics.

fixed equipment: equipment intended for use in a fixed location and fitted with one or more antennas

NOTE: The equipment may be fitted with either antenna socket(s) or integral antenna(s) or both.

idle mode:

- For UTRA/EUTRA equipment: state of User Equipment (UE) when switched on but with no Radio Resource Control (RRC) connection.
- For GSM: mode of operation of a receiver or a transceiver, where the Equipment Under Test (EUT) is powered, available for service and available to respond to a request to set up a call.

- NR equipment: state of User Equipment (UE) when switched on but with no Radio Resource Control (RRC) connection.

International Mobile Telecommunications 2000 (IMT-2000): third generation mobile systems which provide access, by means of one or more radio links, to a wide range of telecommunications services supported by the fixed telecommunication networks (e.g. PSTN, ISDN or IP) and to other services which are specific to mobile users

License Assisted Access (LAA): LTE based base station operating in unlicensed frequency spectrum

maximum average power: average transmitter output power obtained over any specified time interval, including periods with no transmission, when the transmit time slots are at the maximum power setting

maximum throughput: maximum achievable throughput for a reference measurement channel

NB-IoT guard band operation: operation of NB-IOT guard band utilizing the unused resource block(s) within an E-UTRA carrier's guard-band

NB-IoT In-band operation: operation of NB-IOT in-band utilizing the resource block(s) within a normal E-UTRA carrier

NB-IoT standalone operation: operation of NB-IOT standalone utilizing its own spectrum, for example the spectrum currently being used by GERAN systems as a replacement of one or more GSM carriers, as well as scattered spectrum for potential IoT deployment

necessary bandwidth: for a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions

portable equipment: radio equipment intended for portable use and powered by integral batteries or battery

NOTE: Devices will typically be handheld.

RXQUAL: measure of the received signal quality, which is generated by the mobile or portable equipment, for use as a criterion in the Radio Frequency (RF) power control and handover processes

NOTE: For more information, see:

- ETSI GTS 05.08 [i.5], clause 8.2 for Phase 1 GSM 900 equipment;
- ETSI GTS 05.08-DCS [i.6], clause 8.2 for Phase 1 GSM 1800 equipment;
- ETSI ETS 300 578 [i.7], clause 8.2 for Phase 2 GSM 900 or Phase 2 GSM 1800 equipment;
- ETSI TS 100 910 [18] clause 8.2 for Phase 2+ GSM 900 or Phase 2+ GSM 1800 equipment.

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

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

Universal Terrestrial Radio Access (UTRA): radio access network of the telecommunications system, incorporating mobile cellular and other functionality, which is the subject of specifications produced by 3GPP

User Equipment (UE): entity capable of accessing a set of cellular services via one or more radio interfaces

NOTE: This entity may be stationary or in motion within the cellular service area while accessing the Cellular services, and may simultaneously serve one or more users.

vehicular equipment: radio equipment intended for installation and use in a vehicle, and powered by the main battery of the vehicle

voice call function: establishment and use of a complete connection for voice communication

3.2 Symbols

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

TR	Transient phenomena applied to Receivers
TT	Transient phenomena applied to Transmitters

3.3 Abbreviations

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

NOTE: Refer to Terminology specifications ETSI TR 121 905 [i.1] and ETSI TR 125 990 [i.3] for further details.

AC	Alternating Current
BER	Bit Error Ratio
BLER	BLock Error Ratio
BS	Base Station
BW	BandWidth
CDMA	Code Division Multiple Access
CPE	Customer Premise Equipment
CR	Continuous phenomena applied to Receivers
CRC	Cyclic Redundancy Check
CT	Continuous phenomena applied to Transmitters
DC	Direct Current
DL	Down Link (from BS to UE)
DRX	Discontinuous Reception
DTX	Discontinuous Transmission
EFTA	European Free Trade Association
EMC	ElectroMagnetic Compatibility
EN-DC	E-UTRA-NR Dual Connectivity
EUT	Equipment Under Test
E-UTRA	Evolved Universal Terrestrial Radio Access
FDD	Frequency Division Duplex
FR1	Frequency Range 1
GSM	Global System for Mobile communication
IMT-2000	International Mobile Telecommunications 2000
IMT-MC	International Mobile Telecommunication-Multi Carrier
LAA	License Assisted Access
LR	Location Registration
MCG	Master Cell Group
Mcps	Megachips per second
MRP	Mouth Reference Point (artificial head)
MS	Mobile Station
NB-IoT	Narrow Band Internet of Things
NR	New Radio
NSA	Non-StandAlone
PC	Personal Computer
PLMN	Public Land Mobile Network
RF	Radio Frequency
RRC	Radio Resource Control
RXQUAL	Receiver QUALity
SA	StandAlone
SC	Single Carrier
SCG	Secondary Cell Group
SPL	Sound Pressure Level
SS	System Simulator
STB	Set Top Box
TDD	Time Division Duplex
UARFCN	UTRA Appropriate Radio Frequency Channel Number
UE	User Equipment
UL	Up Link (from UE to BS)