



EMC for Radio equipments

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EN 301 489-1

Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC)

**standard for radio equipment and services;
Part 1: Common technical requirements**



Introduction

- Product dependent arrangements necessary to perform the EMC tests
- Test modulation, test conditions and tests arrangements, etc.
- The signal source providing the transmitter under test with the modulation signal for the normal test modulation shall be located outside the test environment.
- The transmitter shall be modulated with normal test modulation as specified in the relevant part of EN 301 489 series.



The manufacturer supply

- the primary functions of the radio equipment to be assessed during and after the EMC exposure;
- the intended functions of the radio equipment which shall be in accordance with the documentation accompanying the equipment;
- the user control functions and stored data that are required for normal operation and the method to be used to assess whether these have been lost after the EMC exposure;
- the type of modulation, the characteristics of the transmission used for testing (random bit stream, message format, etc.) and the necessary test equipment delivered to enable the assessment of the EUT;
- the ancillary equipment to be combined with the radio equipment for testing (where applicable);





The manufacturer supply

- an exhaustive list of ports, with the maximum cable lengths allowed, classified as either power or telecommunication/signal/control. Power ports shall further be classified as AC or DC power.
- Telecommunication ports shall be further classified as being connected to either indoor or outdoor cables;
- the method to be used to verify that a communication link is established and maintained (if appropriate);
- the operating frequency bands over which the equipment is intended to operate;
- any equipment thermal limitation which prevent continuous testing of the EUT;
- the environment(s) in which the equipment is intended to be used.

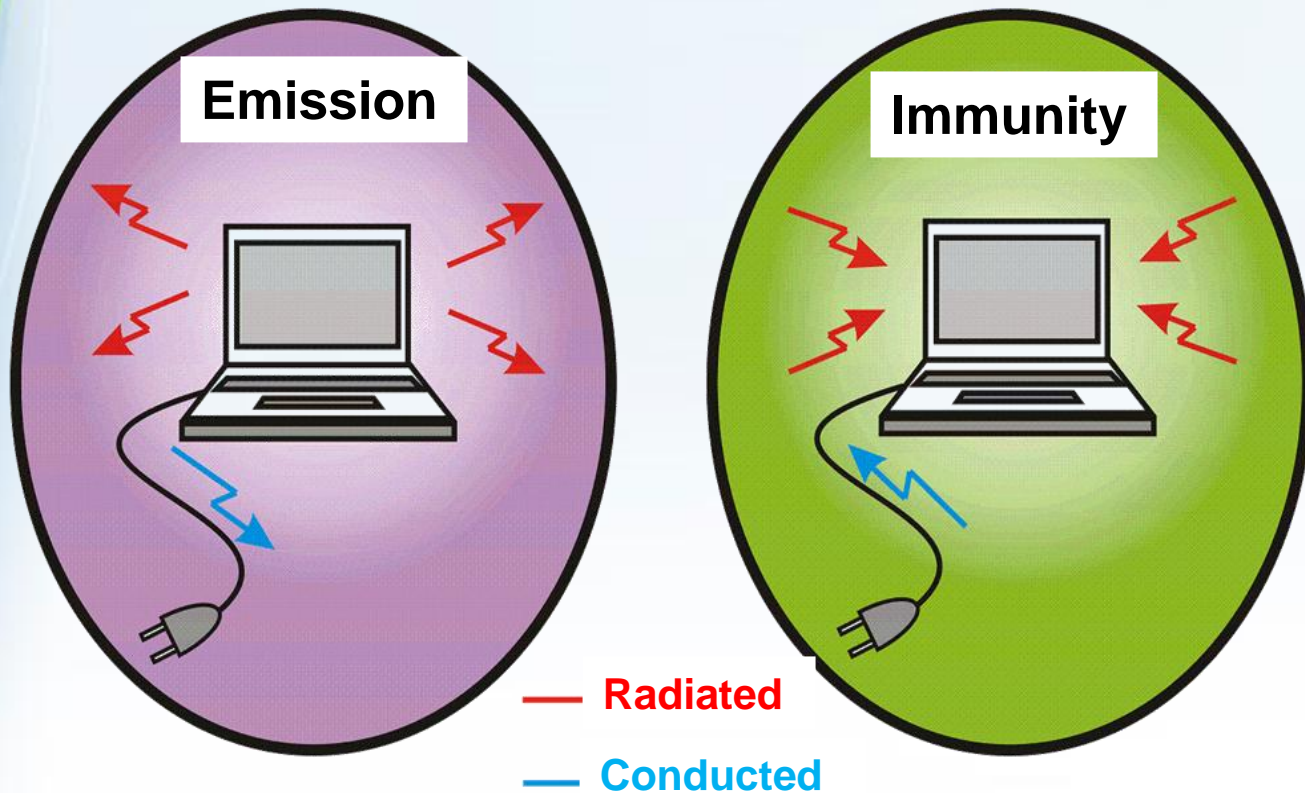


Additional info

If additional product related information is required, these can be found in the relevant part of EN 301 489 series dealing with the particular type of radio equipment.



Mesures CEM





Emission tests



- The test method shall be in accordance with EN 55022.
- For radio and ancillary equipment for fixed use, the Artificial Mains Networks (AMN) as specified in EN 55022 shall be used and be connected to a DC power source.
- For mobile radio and ancillary equipment intended to be connected to the vehicle's onboard DC mains, an Artificial Network (AN) as specified in CISPR 25 shall be used and be connected to a DC power source.
- For emission measurements on DC output ports the relevant port shall be connected via an AMN/AN to a load drawing the rated current of the source.

Table 3: Limits for conducted emissions

Frequency range	Limit (quasi-peak) (dB μ V)	Limit (average) (dB μ V)
0,15 MHz to 0,5 MHz	66 – 56	56 - 46
> 0,5 MHz to 5 MHz	56	46
> 5 MHz to 30 MHz	60	50

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.

Table 4: Limits for conducted emissions of equipment intended to be used in telecommunication centres only

Frequency range	Limit (quasi-peak) (dB μ V)	Limit (average) (dB μ V)
0,15 MHz to 0,5 MHz	79	66
> 0,5 MHz to 30 MHz	73	60



Immunity tests



Performance criteria



- For the purpose of the present document four categories of performance criteria apply:
- performance criteria for continuous phenomena applied to transmitters;
- performance criteria for transient phenomena applied to transmitters;
- performance criteria for continuous phenomena applied to receivers;
- performance criteria for transient phenomena applied to receivers.



Performance criteria for continuous phenomena



- transmitters and receivers
- During and after the test, the apparatus shall continue to operate as intended.
- No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended.
- In some cases this permissible performance level may be replaced by a permissible loss of performance.
- During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.



Performance criteria for transient phenomena



- applied to transmitters and receivers
- After the test, the apparatus shall continue to operate as intended.
- No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended.
- In some cases this permissible performance level may be replaced by a permissible loss of performance.
- During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed.
- No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.



Radio frequency electromagnetic field



- This test assesses the ability of the EUT to operate as intended in the presence of a radio frequency electromagnetic field disturbance.
- The test method shall be in accordance with EN 61000-4-3
Frequency range : 80 MHz to 1 000 MHz and 1 400 MHz to 2 700 MHz





Test parameters

- The test level shall be 3 V/m.
- The test signal shall be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1 000 Hz.
- frequency range 80 MHz to 1 000 MHz and 1 400 MHz to 2 700 MHz
- with the exception of the exclusion band for transmitters, receivers and duplex transceivers
- 1 % frequency increment



Electrostatic discharge



- The test method shall be in accordance with EN 61000-4-2
- For radio equipment and ancillary equipment the following requirements and evaluation of test results shall apply.
- The test severity level for contact discharge shall be 4 kV and 8 kV for air discharge



Fast transients, common mode



- This test shall be performed on the AC mains power port (if any) of radio equipment and associated ancillary equipment.
- This test shall be additionally performed on signal ports, telecommunication ports, control ports, and DC power ports, of radio equipment and associated ancillary equipment, if the cables may be longer than 3 m.



Fast transients, common mode



- The test method shall be in accordance with EN 61000-4-4
- The following requirements and evaluation of test results shall apply:
 - the test level for signal ports, telecommunication ports, and control ports shall be 0,5 kV open circuit voltage at a repetition rate of 5kHz;
 - the test level for DC power input ports shall be 0,5 kV open circuit voltage;
 - the test level for AC mains power input ports shall be 1 kV open circuit voltage

Surges

- The test level for ac mains power input ports shall be 2 kV line to ground, and 1 kV line to line
- In telecom centres 1 kV line to ground and 0,5 kV line to line shall be used.
- The test generator shall provide the 1,2/50 μ s pulse as defined in EN 61000-4-5



Radio frequency, common mode



- The test method shall be in accordance with EN 61000-4-6 .
- The following requirements and evaluation of test results shall apply:
 - the test level shall be severity level 2 as given in EN 61000-4-6 corresponding to 3 V rms unmodulated.
 - The test signal shall then be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1 000 Hz.



Voltage dips and interruptions



- The test method shall be in accordance with EN 61000-4-11.
- The test levels shall be:
 - voltage dip: 0 % residual voltage for 0,5 cycle;
 - voltage dip: 0 % residual voltage for 1 cycle;
 - voltage dip: 70 % residual voltage for 25 cycles (at 50 Hz);
 - voltage interruption: 0 % residual voltage for 250 cycles (at 50 Hz).



EN 301 489-7

Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)



scope



- This standard specifies the applicable test conditions, performance assessment and performance criteria for
 - Phase 1, Phase 2, and Phase 2+ GSM
 - and DCS digital cellular mobile
 - and portable radio equipment, transmitting and receiving speech and/or data,
 - and associated ancillary equipment.



precedence



In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present Standard and EN 301489-1, the provisions of the present standard take precedence.

conditions

- A communication link shall be set up with a suitable base station simulator (hereafter called "the test system").
- When the EUT is required to be in the transmit/receive mode, the following conditions shall be met:
 - the EUT shall be commanded to operate at maximum transmit power;
 - the downlink RXQUAL shall be monitored.

Idle mode

- When the EUT is required to be in the idle mode, the test system shall simulate a Base Station (BS) with Broadcast Control Channel/Common Control Channel (BCCH/CCCH) on one carrier.
- The EUT shall be synchronized to the BCCH, listening to the CCCH and able to respond to paging messages.



Performance criteria



- The establishment and maintenance of a communications link, the assessment of RXQUAL, and the assessment of the audio breakthrough by monitoring the speech output signal level, are used as performance criteria to ensure that all primary functions of the transmitter and receiver are evaluated during the immunity tests.
- In addition, the test shall also be performed in idle mode to ensure the transmitter does not unintentionally operate.
- The maintenance of a communications link shall be assessed using an indicator which may be part of the test system or the EUT.



Performance criteria



- Performance criteria for Continuous phenomena applied to Transmitters (CT)
- A communication link shall be established at the start of the test, and maintained during the test



Performance criteria



- Performance criteria for Transient phenomena applied to Transmitters (TT)
- At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained.
- In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.



Performance criteria



- Performance criteria for Continuous phenomena applied to Receivers (CR)
- A communications link shall be established at the start of the test.
- During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence.



Performance criteria



- Performance criteria for Transient phenomena applied to Receivers (TR)
- A communications link shall be established at the start of the test, clauses 4.2.1 to 4.2.4.
- At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.



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