



**Training Course on Conformity and Interoperability on Type Approval testing
for Mobile Terminals, Homologation Procedures and Market Surveillance,
Tunis-Tunisia, from 20 to 24 April 2015**



Speed up your compliance

EMC for Radio equipments

Presented by: Karim Loukil & Kaïs Siala





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 arrangements
- Test modulation, test conditions and tests arrangements, etc.
- The signal source providing the transmitter under test with the modulation signal
- The transmitter shall be modulated with normal test modulation

as specified in the relevant part of EN 301 489 series.



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.



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)
- 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.

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

- 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



- The test method shall be in accordance with EN 61000-4-4
- 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 if the cables may be longer than 3 m.



- 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)

- 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.

- 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.



Performance criteria



- The establishment and maintenance of a communications link, the assessment of RXQUAL
- 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.



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