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Candidate Harmonized European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
ElectroMagnetic Compatibility (EMC)
standard for radio equipment and services;
Part 5: Specific conditions for
Private land Mobile Radio (PMR) and
ancillary equipment (speech and non-speech)**



Reference

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Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [4] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility ("the EMC Directive") (89/336/EEC [3] as amended) and Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive" [2]).

The present document is part 5 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

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1 Scope

The present document, together with EN 301 489-1 [1], covers the assessment of Private land Mobile Radio (PMR) and associated ancillary equipment, in respect of ElectroMagnetic Compatibility (EMC).

The present document covers both analogue and digital Private land Mobile Radio (PMR) equipment.

Technical specifications related to the antenna port and emissions from the enclosure port of Private land Mobile Radio (PMR) equipment are not included in the present document. Such technical specifications are found in the relevant product standards for the effective use of the radio spectrum.

The present document specifies the applicable test conditions, performance assessment and performance criteria for Private land Mobile Radio (PMR) equipment and associated ancillary equipment.

Examples of Private Mobile Radio equipment are given in annex A.

In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present document and EN 301 489-1 [1], the provisions of the present document take precedence.

The environmental classification and the emission and immunity requirements used in the present document are as stated in EN 301 489-1 [1], except for any special conditions included in the present document.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] ETSI 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".

[2] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[3] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).

[4] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 301 489-1 [1], clause 3, apply.

3.2 Abbreviations

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

BER	Bit Error Ratio
CR	Continuous phenomena applied to Receivers
CT	Continuous phenomena applied to Transmitters
EUT	Equipment Under Test
PMR	Private land Mobile Radio
TR	Transient phenomena applied to Receivers
TT	Transient phenomena applied to Transmitters

4 Test conditions

For the purposes of the present document, the test conditions of EN 301 489-1 [1], clause 4 shall apply as appropriate. Further product related test conditions for PMR equipment are specified in the present document.

4.1 General

For emission and immunity tests the test modulation, test arrangements, etc., as specified in the present document, clauses 4.1 to 4.5, shall apply.

4.2 Arrangements for test signals

The provisions of EN 301 489-1 [1], clause 4.2 shall apply.

4.2.1 Arrangements for test signals at the input of transmitters

The provisions of EN 301 489-1 [1], clause 4.2.1 shall apply.

4.2.2 Arrangements for test signals at the output of transmitters

The provisions of EN 301 489-1 [1], clause 4.2.2 shall apply with the following modification.

The transmitter shall be operated at its maximum rated RF output power, modulated with normal test modulation (see clause 4.5).

4.2.3 Arrangements for test signals at the input of receivers

The provisions of EN 301 489-1 [1], clause 4.2.3 shall apply with the following modification.

A communication link shall be established at the start of the test and maintained during the test.

4.2.4 Arrangements for test signals at the output of receivers

The provisions of EN 301 489-1 [1], clause 4.2.4 shall apply.

4.2.5 Arrangements for testing transmitter and receiver together (as a system)

The provisions of EN 301 489-1 [1], clause 4.2.5 shall apply with the following modification.

For the immunity tests of duplex transceivers, the EUT may be configured in the repeater mode, consistent with the conditions given above.

4.3 Exclusion bands

The provisions of EN 301 489-1 [1], clause 4.3 shall apply.

4.3.1 Receiver and receivers of transceivers exclusion band

The exclusion band for receivers and receivers of transceivers is the frequency range determined by the switching range, as declared by the manufacturer, extended as follows:

- the lower frequency of the exclusion band is the lower frequency of the switching range, minus 5 % of the centre frequency of the switching range, or minus 10 MHz, whichever will result in the lowest frequency;
- the upper frequency of the exclusion band is the upper frequency of the switching range, plus 5 % of the centre frequency of the switching range, or plus 10 MHz, which ever will result in the highest frequency.

The switching range is the maximum frequency range over which the receiver can be operated without reprogramming or realignment.

4.3.2 Transmitter exclusion band

The exclusion band for transmitters extends ± 25 kHz from the nominal operating frequency of the transmitter.

4.4 Narrow band responses of receivers

The provision of EN 301 489-1 [1], clause 4.4 shall apply.

4.5 Normal test modulation

For analogue speech equipment:

Angle modulated equipment:

- the receiver wanted input signal shall be set to the nominal frequency of the receiver modulated with a sinusoidal audio frequency of 1 000 Hz to a deviation of 60 % peak system;
- the transmitter of the EUT shall be modulated with a sinusoidal audio frequency of 1 000 Hz at a deviation of 60 % peak system deviation.

Non-angle modulated equipment:

- the receiver wanted input signal shall be set to the nominal frequency of the receiver suitably modulated with a sinusoidal audio frequency of 1 000 Hz, which represents normal operation;
- the transmitter of the EUT shall be suitably modulated with a sinusoidal audio frequency of 1 000 Hz, which represents normal operation;
- details concerning the modulation used shall be recorded in the test report.

For digital speech equipment:

- the receiver wanted input signal shall be set to the nominal frequency of the receiver modulated with a test signal specified by the manufacturer which represents normal operation which is in accordance with the appropriate radio product standard;
- the transmitter shall be modulated with a test signal which represents normal operation as specified by the manufacturer which is in accordance with the appropriate radio product standard;
- the manufacturer may have to supply the test modulation/de-modulation equipment;
- details concerning the modulation used shall be recorded in the test report.

For non-speech equipment (data, specific response, etc.):

- the receiver wanted input signal shall be set to the nominal frequency of the receiver modulated with a test signal specified by the manufacturer which represents normal operation which is in accordance with the appropriate radio product standard;
- the transmitter shall be modulated with a test signal which represents normal operation as specified by the manufacturer which is in accordance with the appropriate radio product standard;
- the manufacturer may have to supply the test modulation/de-modulation equipment;
- details concerning the modulation used shall be recorded in the test report.

The test signal generator (modulation) shall be able to produce a continuous stream of data or a repetitive message.

The test signal receiver (de-modulator) shall be, where appropriate, able to produce a readout of Bit Error Ratio (BER) of a continuous data stream or a repetitive readout of message acceptance.

5 Performance assessment

5.1 General

The provision of EN 301 489-1 [1], clause 5.1 shall apply.

5.2 Equipment which can provide a continuous communications link

The provision of EN 301 489-1 [1], clause 5.2 shall apply.

5.3 Equipment which does not provide a continuous communications link

The provision of EN 301 489-1 [1], clause 5.3 shall apply.

5.4 Ancillary equipment

The provision of EN 301 489-1 [1], clause 5.4 shall apply.

5.5 Equipment classification

The provision of EN 301 489-1 [1], clause 5.5 shall apply.

6 Performance criteria

The equipment shall meet the minimum performance criteria as specified in clauses 6.1, 6.2, 6.3 and 6.4.

The establishment of the communication link at the start of the test, its maintenance and the assessment of the recovered signal are used as the performance criteria for the evaluation of the essential functions of the equipment during and after the test.

If an equipment is of a specialized nature and the performance criteria specified in the table are not appropriate the manufacturer shall declare a substituted specification for an acceptable performance level or performance degradation as required by the present document. The performance specification shall be included in the test report and the product description and documentation.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in the following clauses.

6.1 Performance criteria for Continuous phenomena applied to Transmitters (CT)

For speech equipment, the distortion of the audio signal shall be measured during each individual exposure in the test sequence and shall not exceed 25 % measured in a post detection bandwidth determined by a first order band pass filter with a 3 dB bandwidth of 300 Hz to 3 kHz, without the use of psophometric weighting filter.

For equipment which can be measured using continuous bit streams, a bit error shall not exceed 1×10^{-2} .

For other non-speech equipment four messages out of five or 90 % of the transmitted symbols shall be received correctly.

At the conclusion of the test the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained during the test.

Where the EUT is a transmitter only and can be operated in standby mode, tests shall be repeated with the EUT in this mode to ensure that unintentional transmission does not occur.

6.2 Performance criteria for Transient phenomena applied to Transmitters (TT)

At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.

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 during the test.

Where the EUT is a transmitter only and can be operated in standby mode, tests shall be repeated with the EUT in this mode to ensure that unintentional transmission does not occur.

6.3 Performance criteria for Continuous phenomena applied to Receivers (CR)

For speech equipment, the distortion of the audio signal shall be measured during each individual exposure in the test sequence and shall not exceed 25 % measured in a post detection bandwidth determined by a first order band pass filter with a 3 dB bandwidth of 300 Hz to 3 kHz, without the use of psophometric weighting filter.

For equipment which can be measured using continuous bit streams, the bit error rate shall not exceed 10^{-2} .

For other non-speech equipment four messages out of five or 90 % of the transmitted symbols shall be received correctly.

At the conclusion of the test the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained during the test.

Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

6.4 Performance criteria for Transient phenomena applied to Receivers (TR)

At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.

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 during the test.

Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

6.5 Performance criteria for ancillary equipment tested on a stand alone basis

The provision of EN 301 489-1 [1], clause 6.4 shall apply.

7 Applicability overview

7.1 Emission

7.1.1 General

The table 2 in EN 301 489-1 [1], contains the applicability of EMC emission measurements to the relevant ports of radio and/or associated ancillary equipment.

7.1.2 Special conditions

No special conditions shall apply to Private land Mobile Radio (PMR) equipment in the scope of the present document.

7.2 Immunity

7.2.1 General

The table 3 of EN 301 489-1 [1], contains the applicability of EMC immunity measurements to the relevant ports of radio and/or associated ancillary equipment.

7.2.2 Special conditions

No special conditions shall apply to Private land Mobile Radio (PMR) equipment in the scope of the present document.

Annex A (informative): Examples of PMR equipment in the scope of the present document

The provisions of the present document apply to radio and associated ancillary equipment intended for use in the land mobile service, that means to Private/Professional land Mobile Radio (PMR) equipment as set out in the following clauses.

A.1 Non-integral antenna PMR equipment

The present document applies in particular to angle modulated (constant envelope) radio equipment, operating on radio frequencies between 30 MHz and 1 000 MHz, with channel separations of 12,5 kHz, 20 kHz and 25 kHz, and associated ancillary equipment. It applies to:

- PMR equipment primarily intended for transmission of analogue speech, as defined in ETS 300 086;
- PMR equipment and the non-speech part of combined speech/non-speech radio equipment, intended for transmission of non-speech information to initiate a specific response in the receiver, as defined in I-ETS 300 219.
- digital and combined analogue and digital PMR equipment and parts thereof, intended for transmission of data and/or speech as defined in EN 300 113.

A.2 Integral antenna PMR equipment

The present document applies also to angle modulated (constant envelope) radio equipment, operating on radio frequencies between 30 MHz and 1 000 MHz, with channel separations of 12,5 kHz, 20 kHz and 25 kHz, and associated ancillary equipment. It applies to:

- PMR equipment intended for transmission of analogue speech, as defined in EN 300 296;
- PMR equipment and the non-speech part of combined speech/non-speech radio equipment, intended for transmission of non-speech information to initiate a specific response in the receiver, as defined in EN 300 341;
- digital and combined analogue and digital PMR equipment and parts thereof, intended for transmission of data and/or speech as defined in EN 300 390.

A.3 Narrowband channel non-integral PMR equipment

The present document applies also to radio equipment, operating on radio frequencies between 30 MHz and 3 GHz, with narrow channel separations (less than 10 kHz, and associated ancillary equipment). It applies to:

- PMR equipment intended for transmission of digitized speech and/or data, with narrow channel separation (less than 10 kHz and permitted by CEPT), and using constant or non-constant envelope type of modulation as defined in EN 301 166.

Annex B (informative): Bibliography

ETSI EN 300 086-1: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Land Mobile Service; Radio equipment with an internal or external RF connector intended primarily for analogue speech; Part 1: Technical characteristics and methods of measurement".

ETSI EN 300 086-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment with an internal or external RF connector intended primarily for analogue speech; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive".

ETSI EN 300 113-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and speech) and having an antenna connector; Part 1: Technical characteristics and methods of measurement".

ETSI EN 300 113-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and speech) and having an antenna connector; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive".

ETSI EN 300 219: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Land Mobile Service; Radio equipment transmitting signals to initiate a specific response in the receiver".

ETSI EN 300 296-1: "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".

ETSI EN 300 296-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment using integral antennas intended primarily for analogue speech; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive".

ETSI EN 300 341-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service (RP 02); Radio equipment using an integral antenna transmitting signals to initiate a specific response in the receiver; Part 1: Technical characteristics and methods of measurement".

ETSI EN 300 341-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service (RP 02); Radio equipment using an integral antenna transmitting signals to initiate a specific response in the receiver; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive".

ETSI EN 300 390-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment intended for the transmission of data (and speech) and using an integral antenna; Part 1: Technical characteristics and test conditions".

ETSI EN 300 390-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment intended for the transmission of data (and speech) and using an integral antenna; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive".

ETSI EN 301 166-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrowband channels and having an antenna connector; Part 1: Technical characteristics and methods of measurement".

ETSI EN 301 166-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrowband channels and having an antenna connector; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive".

ETSI ETS 300 086: "Radio Equipment and Systems (RES); Land mobile group; Technical characteristics and test conditions for radio equipment with an internal or external RF connector intended primarily for analogue speech".

ETSI I-ETS 300 219: "Radio Equipment and Systems (RES); Land mobile service; Technical characteristics and test conditions for radio equipment transmitting signals to initiate a specific response in the receiver".

ETSI EN 300 113: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and speech) and having an antenna connector".

ETSI EN 300 296: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Land Mobile Service; Radio equipment using integral antennas intended primarily for analogue speech".

ETSI EN 300 341: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Land Mobile Service (RP 02); Radio equipment using an integral antenna transmitting signals to initiate a specific response in the receiver".

ETSI EN 300 390: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Land Mobile Service; Radio equipment intended for the transmission of data (and speech) and using an integral antenna".

ETSI EN 301 166: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Technical characteristics and test conditions for radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrowband channels and having an antenna connector".

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