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Land Mobile Service;
Analogue and Digital PMR446 Equipment;
Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

Reference

DEN/ERM-TGDMR-354

Keywords

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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.8] 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.7].

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 C.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.

National transposition dates	
Date of adoption of this EN:	19 May 2017
Date of latest announcement of this EN (doa):	31 August 2017
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	28 February 2018
Date of withdrawal of any conflicting National Standard (dow):	28 February 2019

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).

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1 Scope

The present document covers the minimum characteristics considered necessary in order to avoid harmful interference and to make acceptable use of the available frequencies for analogue and digital PMR446 equipment in the land mobile service.

PMR 446 equipment is hand portable (no base station or repeater use); short range peer to peer mode; uses integral antennas only; effective radiated power not exceeding 500 mW and angle modulated.

The band from 446,0 MHz to 446,2 MHz is designated for the use of analogue PMR 446 with a channel plan based on 12,5 kHz spacing where the lowest carrier frequency is 446,006 25 MHz.

The band from 446,1 MHz to 446,2 MHz is designated for the use of digital PMR 446 with a channel plan based on 6,25 kHz and 12,5 kHz spacing where the lowest carrier frequencies are 446,103 125 MHz and 446,106 25 MHz respectively.

The band from 446,0 MHz to 446,2 MHz is designated for the use of digital PMR 446 with a channel plan based on 6,25 kHz and 12,5 kHz spacing where the lowest carrier frequencies are 446,003 125 MHz and 446,006 25 MHz respectively as of 1 January 2018.

Analogue PMR446 equipment operating in the frequency range from 446,1 MHz to 446,2 MHz uses more robust receivers as specified in ETSI TS 103 236 [2].

As defined in ECC/DEC/(15)05 [i.6] Analogue PMR446 equipment operating in the frequency range from 446,0 MHz to 446,1 MHz should use more robust receivers as specified in ETSI TS 103 236 [2] or equivalent technical specifications when placed on the market as of 1 January 2017.

As defined in ECC/DEC/(15)05 [i.6] all analogue and digital PMR 446 radio equipment should have reception capability and equipment having Push-To-Talk (PTT) functionality capable of being latched 'on' should apply a 180 seconds maximum transmitter time-out; equipment having no Push-To-Talk (PTT) functionality should apply a 180 seconds maximum transmitter time-out and VOX (Voice activation exchange) control.

The present document assumes that digital PMR446 equipment using 6,25 kHz channel spacing is compliant with ETSI TS 102 490 [4].

The present document assumes that digital PMR446 equipment using 12,5 kHz channel spacing is compliant with ETSI TS 102 361-1 [5].

The present document contains requirements to demonstrate that "... *Radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference*" and that *"....radio equipment supports certain features ensuring access to emergency services"* [i.7].

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the Radio Equipment Directive [i.7] may apply to equipment within the scope of the present document.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version 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] ANSI C63.5 (2006): "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".

[2] ETSI TS 103 236 (V1.1.1) (01-2014): "Electromagnetic compatibility and Radio spectrum Matters (ERM);Continuous Tone Controlled Signalling System (CTCSS) and Digitally Coded Squelch Signalling (DCSS) system".

[3] Recommendation ITU-T O.153 (10-1992): "Basic parameters for the measurement of error performance at bit rates below the primary rate".

[4] ETSI TS 102 490 (V1.9.1) (08-2016): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Peer-to-Peer Digital Private Mobile Radio using FDMA with a channel spacing of 6,25 kHz with e.r.p. of up to 500 mW".

[5] ETSI TS 102 361-1 (V2.4.1) (02-2016): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 1: DMR Air Interface (AI) protocol".

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] CEPT/ERC/REC 74-01E: "Unwanted emissions in the spurious domain" (Siófok 1998, Nice 1999, Sesimbra 2002; Hradec Kralove 2005).

[i.2] ETSI EN 300 793 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Presentation of equipment for type testing".

[i.3] ETSI TR 102 273 (V1.2.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".

[i.4] IEC 60489-3 (1988): "Methods of measurement for radio equipment used in the mobile services; Part 3: Receivers for A3E or F3E emissions".

[i.5] Recommendation ITU-T O.41 (1994): "Psophometer for use on telephone-type circuits".

[i.6] ECC/DEC/(15)05: "The harmonised frequency range 446.0-446.2 MHz, technical characteristics, exemption from individual licensing and free carriage and use of analogue and digital PMR 446 applications".

[i.7] 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.8] 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.9] ETSI TR 100 028 (V1.4.1) (12-2001) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[i.10] ETSI TR 100 028-2 (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

50 Ω: 50 ohm non-reactive impedance

adjacent channels: those two channels offset from the wanted channel by the channel spacing

alternate channels: those two channels offset from the wanted channel by double the channel spacing

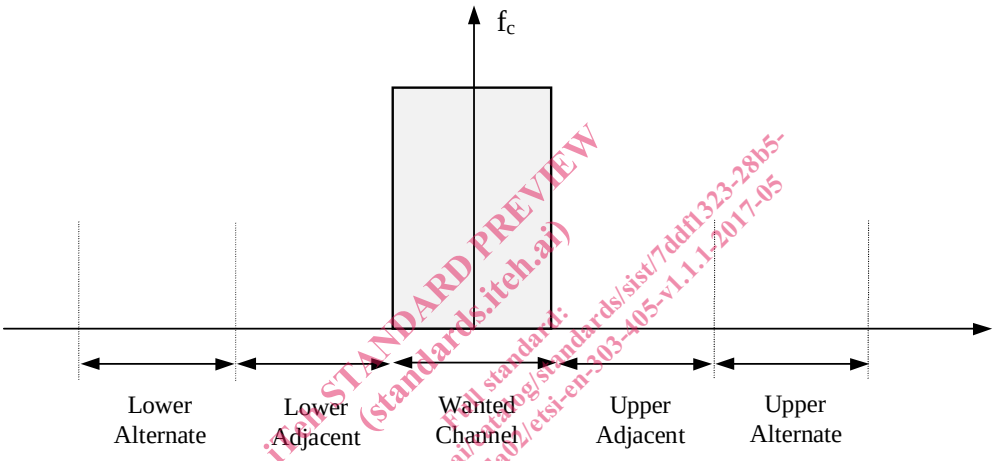

Figure 1: Adjacent and alternate channel definitions

angle modulation: either phase modulation or frequency modulation

audio frequency load: resistor, or suitable alternative, having a value equal to the impedance of the audio transducer at 1 000 Hz, as stated by the manufacturer, and of sufficient power rating to accept the maximum audio output power from the equipment under test

NOTE: In some cases it may be necessary to place an isolating transformer between the output terminals of the receiver under test and the load.

audio frequency termination: any connection other than the audio frequency load which may be required for the purpose of testing the receiver

NOTE: The termination device should be, as appropriate, either chosen by the manufacturer or agreed between the manufacturer and the testing laboratory and details included in test reports. If special equipment is required then it should be provided by the manufacturer.

conducted measurements: measurements which are made using a direct connection to the equipment under test

hand portable station: equipment fitted with an integral antenna, normally used on a stand-alone basis, to be carried on a person or held in the hand

integral antenna: antenna designed as a fixed part of the equipment (without the use of an external connector) which cannot be disconnected from the equipment by a user with the intent to connect another antenna

psophometric weighting network: As described in Recommendation ITU-T O.41 [i.5].

radiated measurements: measurements which involve the absolute measurement of a radiated field

SINAD Meter: measurement instrument used to measure SND/ND using a band-stop filter

switching range (sr): maximum frequency range, as specified by the manufacturer, over which the receiver or the transmitter can be operated within the alignment range without reprogramming or realignment

3.2 Symbols

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

dBc	dB relative to the carrier power
f_{I1}	1st intermediate frequency
f_{I2}	2nd intermediate frequency
f_{In}	nth intermediate frequency
f_l	frequency of the limited frequency range
f_{LO}	Local oscillator frequency
PR	wanted channel power
V_{min}	Minimum extreme test voltage
V_{max}	Maximum extreme test voltage
T_{min}	Minimum extreme test temperature
T_{max}	Maximum extreme test temperature

3.3 Abbreviations

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

AF	Audio Frequency
CBW	Channel BandWidth
CEPT	Commission Européenne des Postes et Télécommunications
CSP	Channel SeParation
CTCSS	Continuous Tone Controlled Squelch System
CW	Continuous Wave
DCS	Digital Controlled Squelch
EC	European Community
emf	electro-motive force
EUT	Equipment Under Test
IEC	International Electrotechnical Commission
IF	Intermediate Frequency
ITU-T	International Telecommunications Union - Telecommunication Standardization Sector
MPFD	Maximum Permissible Frequency Deviation
OATS	Open Area Test Site
PMR	Private Mobile Radio
PTT	Push To Talk
RBW	Resolution BandWidth
RF	Radio Frequency
rms	root mean squared
Rx	Receiver
SINAD	Received signal quality based on (Signal + Noise + Distortion)/(Noise + Distortion)
SND/ND	(signal + noise + distortion)/(noise + distortion)
sr	switching range
TDMA	Time Division Multiple Access
Tx	Transmitter
VOX	Voice Operated Transmitter
VSWR	Voltage Standing Wave Ratio

4 General and operational requirements

4.1 General

4.1.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer, but as a minimum, shall be that specified in the test conditions contained in the present document.

4.1.2 Choice of model for testing

Equipment should be complete with any ancillary equipment needed for testing.

If an equipment has several optional features, considered not to affect the RF parameters then the tests need only to be performed on the equipment configured with the combination of features considered to be the most complex.

The performance of the equipment to be tested shall be representative of the performance of the corresponding production model.

NOTE: Guidance may be found in ETSI EN 300 793 [i.2].

4.1.3 Auxiliary test equipment

All necessary auxiliary test equipment, setting up instructions and other product information should be available.

4.2 Mechanical and electrical design

4.2.1 General

The equipment shall be a handheld device with an integral antenna and an integrated battery.

The equipment shall not be any of the following:

- vehicle mounted device using an external power source;
- base station device using an external power source;
- capable of re-transmitting received signals either by two frequency duplex or other TDMA method.

4.2.2 Controls

Those controls, which if maladjusted, might increase the interfering potentialities of the equipment shall not be accessible directly or indirectly (by hardware or software) for adjustment by the user and shall not make it possible to transmit with an effective radiated power exceeding 500 mW at the PMR446 frequencies.

4.2.3 Transmitter shut-off facility

When a timer for an automatic shut-off facility is operative, at the moment of the time-out the transmitter should automatically be switched off (the re-activation of the transmitter shall reset the timer).

A shut-off facility should be inoperative for the duration of the measurements unless it has to remain operative to protect the equipment. If the shut-off facility is left operative the status of the equipment should be indicated.

4.3 Combined analogue/digital equipment

In the case where equipment has already been measured according to the present document in analogue mode and is to be measured again in data only the following additional tests shall be performed:

- In accordance with clause 7.4 "Adjacent and alternate channel power".
- In accordance with clause 7.5 "Radiated unwanted emissions in the spurious domain".
- In accordance with clause 7.8 "Transient power".
- In accordance with clause 8.1 "Average usable sensitivity".
- In accordance with clause 8.2 "Spurious radiations".
- In accordance with clause 8.3 "Co-channel rejection".
- In accordance with clause 8.4 "Adjacent channel selectivity".

5 Test conditions, power sources and ambient temperatures

5.1 Normal and extreme test conditions

Testing shall be performed under normal test conditions, and also, where stated, under extreme test conditions.

The test conditions and procedures shall be as specified in clauses 5.2 to 5.5.

5.2 Test power source

During testing the equipment battery shall be replaced by a test power source capable of producing normal and extreme test voltages as specified in clauses 5.3.2 and 5.4.2. The internal impedance of the test power source shall be low enough for its effect on the test results to be negligible. For the purpose of tests, the voltage of the power source shall be measured at the input terminals of the equipment.

The battery shall be removed and the test power source shall be applied as close to the battery terminals as practicable.

5.3 Normal test conditions

5.3.1 Normal temperature and humidity

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

- temperature: +15 °C to +35 °C;
- relative humidity: 20 % to 75 %.

When it is impracticable to carry out the tests under these conditions, a note to this effect, stating the ambient temperature and relative humidity during the tests, shall be added to the test report.

5.3.2 Normal test power source

The normal test voltage shall be the nominal battery voltage as declared by the equipment manufacturer.