Draft ETSI EN 301 166 V2.1.0 (2015-12)

Land mobile service;
Radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrow band channels and having an antenna connector;
Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU

Reference
REN/ERM-TGDMR-344

Keywords
analogue, antenna, connector, data, digital,
mobile, PMR, radio, speech

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Foreword

This 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 combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

The present document has been prepared in reply to the Commission's standardisation request Commission Implementing Decision C(2015) 5376 final of 04.08.2015 to provide a means of conforming to the essential requirements of Directive 2014/053/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.

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.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
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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 technical requirements for radio transmitters and receivers used in stations in the Private Mobile Radio (PMR) service. It applies to use in the land mobile service, operating on radio frequencies between 30 MHz and 3 GHz, with narrow channel separations (CSP) (less than 10 kHz) and intended for speech and/or data. It is the intention of the present document to cover any Channel Bandwidths (CBW) permitted by National Administrations for such systems, e.g. 6,25 kHz.

Table 1: Radiocommunications service frequency bands

	Radiocommunications service frequency bands
Transmit	30 MHz to 3 000 MHz
Receive	30 MHz to 3 000 MHz

In the present document different requirements are given for the different radio frequency bands, environmental conditions and types of equipment where appropriate.

In the present document, data transmission systems are defined as systems which transmit and/or receive data and/or digitized voice. The equipment comprises a transmitter and associated encoder and modulator and/or a receiver and associated demodulator and decoder.

The present document covers equipment which may use constant envelope or non-constant envelope modulation.

The types of equipment covered by the present document are as follows:

- base station: equipment fitted with antenna connector;
- mobile station: equipment fitted with antenna connector.

Handportable stations:

a) either fitted with an antenna connector; or

b) without an external antenna connector but fitted with a permanent internal or a temporary internal 50 Ω RF connector which allows access to the transmitter output and the receiver input.

Handportable station equipment without an external or internal Radio Frequency (RF) connector and without the possibility of having a temporary internal 50 Ω RF connector is not covered by the present document.

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.3].

In addition to the present document, other ENs (e.g. ETSI EN 301 489-1 [i.4] and ETSI EN 301 489-5 [i.5]) that specify technical requirements in respect of essential requirements under the Radio Equipment Directive [i.3], may apply to equipment within the scope of the present document.

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 http://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): "Electromagnetic Compatibility - Radiated Emission Measurements in Electromagnetic Interference (EMI) Control - Calibration and Qualification of Antennas (9 kHz to 40 GHz)".

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

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

[4] Recommendation ITU-R SM.329-12 (09-2012): "Unwanted emissions in the spurious domain".

[5] Recommendation ITU-T O.41 (10-1994): "Psophometer for use on telephone-type circuits".

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] ETSI TR 100 028 (V1.4.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[i.2] 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.3] 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.

NOTE: Article 3.2 and article 10.8.

[i.4] 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".

[i.5] ETSI EN 301 489-5: "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)".

[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] Commission Implementing Decision C(2015) 5376 final of 04.08.2015: Commission Implementing Decision 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.8] ETSI EN 300 793 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Presentation of equipment for type testing".

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 and alternate channels:

- adjacent channels are those two channels offset from the wanted channel by the channel spacing
- alternate channels are those two channels offset from the wanted channel by double the channel spacing

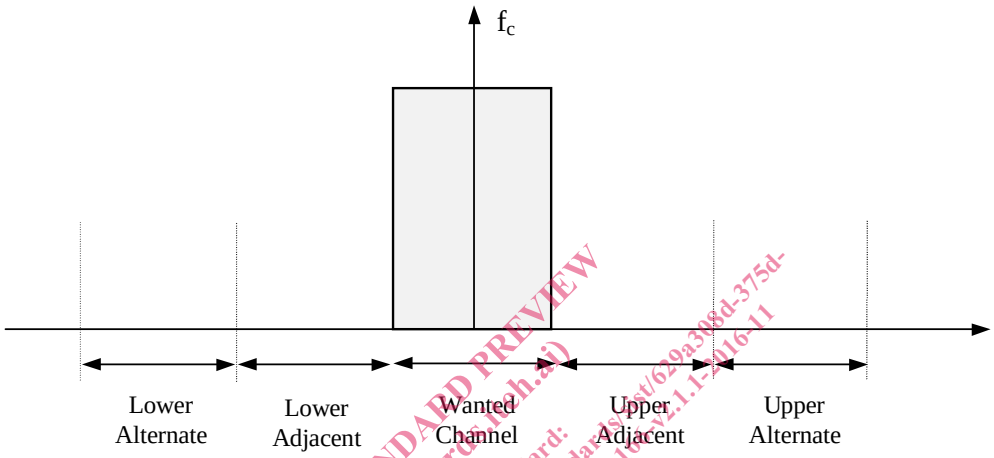

Figure 1: Adjacent and alternate channel definitions

audio frequency input socket: socket normally intended for connection to a microphone for the purpose of voice transmission

NOTE: In some cases, this socket could be expected to be used for the input of an audio sub-carrier, modulated to carry data, such as FFSK.

base station: equipment fitted with an antenna connector, for use with an external antenna and intended for use in a fixed location

bit: binary digit

block: smallest quantity of information that is sent over the radio channel

NOTE: A constant number of useful bits are always sent together with the corresponding redundancy bits.

conducted measurements: measurements which are made using direct 50 Ω connection to the equipment under test

data transmission systems: systems which transmit and/or receive data and/or digitized voice

facilities socket: any socket intended for purposes other than the transmission of voice

NOTE 1: The purpose of the socket and required input signals are specified by the supplier.

NOTE 2: The audio frequency input socket and the facilities socket may be the same physical socket in some implementations.

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

integral antenna: antenna designed to be connected to the equipment without the use of a 50 Ω external connector and considered to be part of the equipment

NOTE: An integral antenna may be fitted internally or externally to the equipment.

Listen Before Transmit mode (LBT): monitoring mode in which the RF channel is checked for activity before transmitting

message: user data to be transferred in one or more packets in a session

mobile station: mobile equipment fitted with an antenna connector, for use with an external antenna, normally used in a vehicle or as a transportable station

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

NOTE: See Recommendation ITU-R SM.329-12 [4].

packet: one block or a contiguous stream of blocks sent by one (logical) transmitter to one particular receiver or one particular group of receivers

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

session: set of inter-related exchange of packets occupying one or several windows or part thereof (if applicable)

NOTE: A session corresponds to a complete interactive procedure for interchanging data between users, comprising initiation, data transmission and termination procedures. The session can be short (e.g. 2 packets), or long (e.g. one full page of text).

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

transmission (physical): one or several packets transmitted between power on and power off of a particular transmitter

window: set of inter-related transmissions which may be limited in time by an appropriate access protocol and corresponding occupation rules.

3.2 Symbols

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

dB	decibel
dBm	dB relative to 1 mW
dBµV	dB relative to 1 µV
f_c	Channel centre frequency
f_{I1}	1^{st} intermediate frequency
f_{I2}	2^{nd} intermediate frequency
f_{In}	n^{th} intermediate frequency
f_{LO}	Local oscillator frequency
M1, M2, etc.	names of test signals defined in clause 6.1
PR	rms power
PX	Maximum power
Vmin	Minimum extreme test voltage
Vmax	Maximum extreme test voltage
Tmin	Minimum extreme test temperature
Tmax	Maximum extreme test temperature
λ	wavelength

3.3 Abbreviations

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

ac	alternating current
Bit	Binary digit
CBW	Channel BandWidth
CEPT	European Conference of Postal and Telecommunications Administrations
CSP	Channel SeParation
CW	Continuous Wave
dc	direct current
EC	European Community
EFTA	European Free Trade Association
EMC	ElectroMagnetic Compatibility
emf	electromotive force
EUT	Equipment Under Test
FFSK	Fast Frequency Shift Keying
GMSK	Gaussian Minimum Shift Keying
IEC	International Electrotechnical Commission
IF	Intermediate Frequency
ITU-R	International Telecommunication Union - Radiocommunication Standardization Sector
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
LBT	Listen Before Transmit
OATS	Open Area Test Site
PEP	Peak Envelope Power
PMR	Professional Mobile Radio
PTT	Push To Talk
RBW	Resolution BandWith
RF	Radio Frequency
rms	root mean square
SINAD	(signal + noise + distortion)/(noise + distortion)
sr	switching range
Tx	Transmitter
VSWR	Voltage Standing Wave Radio

4 General

4.1 Testing

4.1.0 Presentation of equipment for testing purposes

Technical documentation and operating manuals, sufficient to make the test, shall be supplied. All necessary setting up instructions and other product information shall be made available with the equipment to be tested, in accordance with article 10.8 of Directive 2014/53/EU [i.3].

Guidance on the presentation of equipment is also given in ETSI EN 300 793 [i.8].

4.1.1 Choice of model for testing

4.1.1.0 General

Stand-alone equipment shall 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 be performed on the equipment configured with the combination of features considered to be the most complex.

Where practicable, equipment to be tested shall provide a 50 Ω connector for conducted RF power level measurements.

In the case of integral antenna equipment, if the equipment does not have an internal permanent 50 Ω connector then it is permissible to use a second sample of the equipment with a temporary antenna connector fitted to facilitate testing. Any such modified sample shall not be used for any radiated measurements, except as noted in clause 5.5.3.