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Ground-based VHF hand-held, mobile and fixed radio transmitters, receivers and transceivers for the VHF aeronautical mobile service using amplitude modulation;
Part 2: Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU

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Contents

Intellectual Property Rights 5
Foreword 5
Modal verbs terminology 5
Executive summary 6
1 Scope 7
2 References 7
2.1 Normative references 7
2.2 Informative references 7
3 Definitions and abbreviations 8
3.1 Definitions 8
3.2 Abbreviations 8
4 Technical requirements specifications 9
4.1 Environmental profile 9
4.2 Conformance requirements 9
4.2.1 Transmitter requirements 9
4.2.1.0 Applicability 9
4.2.1.1 Frequency error 9
4.2.1.2 Carrier power (conducted) 9
4.2.1.3 Adjacent channel power 9
4.2.1.4 Conducted spurious emissions 9
4.2.1.5 Intermodulation attenuation 9
4.2.1.6 Keying transient frequency behaviour 9
4.2.1.7 Cabinet radiation 10
4.2.2 Receiver requirements 10
4.2.2.0 Applicability 10
4.2.2.1 Sensitivity 10
4.2.2.2 Adjacent channel rejection 10
4.2.2.3 Spurious response rejection 10
4.2.2.4 Intermodulation response rejection 10
4.2.2.5 Blocking or desensitization 10
4.2.2.6 Conducted spurious emissions 10
4.2.2.7 Cross modulation rejection 10
4.2.2.8 Cabinet radiation 11
5 Testing for compliance with technical requirements 11
5.1 Environmental conditions for testing 11
5.2 Interpretation of the measurement results 11
5.3 Conformance tests 12
5.3.1 Transmitter test specifications 12
5.3.1.1 Frequency error 12
5.3.1.2 Carrier power (conducted) 12
5.3.1.3 Adjacent channel power 12
5.3.1.4 Conducted spurious emissions 12
5.3.1.5 Intermodulation attenuation 12
5.3.1.6 Keying transient frequency behaviour 12
5.3.1.7 Cabinet Radiation 12
5.3.2 Receiver test specifications 12
5.3.2.1 Sensitivity 12
5.3.2.2 Adjacent channel rejection 13
5.3.2.3 Spurious response rejection 13
5.3.2.4 Intermodulation response rejection 13
5.3.2.5 Blocking or desensitization 13
5.3.2.6 Conducted spurious emissions 13
5.3.2.7 Cross modulation rejection 13
5.3.2.8 Cabinet radiation 13

Annex A (normative): Relationship between the present document and the essential requirements of Directive 2014/53/EU 14

History 16

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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 to provide a means of conforming to the essential requirements of Directive 2014/53/EU [i.1] 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: The corresponding Commission's standardization request is expected shortly.

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.

The present document is part 2 of a multi-part deliverable covering the Ground-based VHF hand-held, mobile and fixed radio transmitters, receivers and transceivers for the VHF aeronautical mobile service using amplitude modulation; as identified below:

Part 1: "Technical characteristics and methods of measurement";

Part 2: "Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU".

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Executive summary

The present document covers the essential requirements for efficient use of radio spectrum by DSB AM ground base stations, with channel separations of 8,33 kHz or 25 kHz intended for analogue speech intended for ACARS data communication. The current version includes necessary changes due to adaption to the new Radio Equipment Directive.

1 Scope

The present document applies to ground based stations, ground mobile, ground-based direction finders and hand held radios for ground use. These radio equipment types are capable of operating in all or any part of the Aeronautical frequency band- between 118 MHz and 136,975 MHz.

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*" [i.1].

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 RE Directive [i.1] as well as essential requirements under the SES Interoperability Regulation 552/2004 [i.2] and related implementing rules and/or essential requirements under the EASA basic regulation 216/2008 [i.5] 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] ETSI EN 300 676-1 (V1.5.2) (03-2011): "Ground-based VHF hand-held, mobile and fixed radio transmitters, receivers and transceivers for the VHF aeronautical mobile service using amplitude modulation; Part 1: Technical characteristics and methods of measurement".

[2] ETSI EN 300 113-1 (V1.6.2) (11-2009): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and/or speech) using constant or non-constant envelope modulation and having an antenna connector; Part 1: Technical characteristics and methods of measurement".

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.

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 not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] 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.2] Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (interoperability Regulation), OJ L 96, 31.03.2004, p. 26 as amended by Regulation (EC) No 1070/2009, OJ L 300, 14.11.2009, p. 34.

[i.3] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[i.4] ETSI TR 100 028-2 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".

[i.5] Regulation (EC) 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the RE Directive [i.1] and the following apply:

aeronautical mobile service: mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate

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

environmental profile: range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

ground base station: aeronautical station equipment, in the aeronautical mobile service, for use with an external antenna and intended for use at a fixed location

hand held: radio equipment with integral batteries, designed to be hand portable and operated hand held

integral antenna equipment: radio communications equipment with an antenna integrated into the equipment without the use of an external connector and considered to be part of the equipment

NOTE: An integral antenna may be internal or external to the equipment. In equipment of this type, a 50 Ω RF connection point should be provided for test purposes. A connection point for an AF modulating input and for AF output measurements should also be provided.

mobile station: radio equipment designed for permanent or temporary vehicle installation and operation, including provision for vehicle DC power supply, and connections for external antenna, PTT key, microphone, speaker and/or headphone

non-integral antenna equipment: radio communications equipment with a connector intended for connection to an antenna

portable station: radio equipment with integral battery for independent hand-carried use

NOTE: Provisions may be made for connections of an external antenna, PTT key, microphone, headphone and charger, but principally to be operated as a self contained unit.

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

3.2 Abbreviations

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

ACARS	Aircraft Communications Addressing and Reporting System
AF	Audio Frequency
AM	Amplitude Modulation
DC	Direct Current (feeding, signalling)
DSB	Double Side Band
IF	Intermediate Frequency
PTT	Press To Talk
RE	Radio Equipment
RF	Radio Frequency
SES	Single European Sky

TX	Transmitter
VHF	Very High Frequency

4 Technical requirements specifications

4.1 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 supplier, but as a minimum, shall be that specified in the test conditions contained in the present document. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

4.2 Conformance requirements

4.2.1 Transmitter requirements

4.2.1.0 Applicability

All technical requirements in clause 4.2.1 shall only be applicable to transmitter equipment (including transceiver equipment).

4.2.1.1 Frequency error

The frequency error as defined in clause 7.2 of ETSI EN 300 676-1 [1] shall not exceed the values shown in table 1 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.1.1.

4.2.1.2 Carrier power (conducted)

The carrier power as defined in clause 7.3.1 of ETSI EN 300 676-1 [1] shall conform to the requirements in clause 7.3.3 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.1.2.

4.2.1.3 Adjacent channel power

Adjacent channel power as defined in clause 7.5.1 of ETSI EN 300 676-1 [1] shall conform to the requirements in clause 7.5.3 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.1.3.

4.2.1.4 Conducted spurious emissions

Conducted spurious emissions as defined in clause 7.7.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 7.7.3, table 3 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.1.4.

4.2.1.5 Intermodulation attenuation

Intermodulation attenuation as defined in clause 7.8.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 7.8.3 of ETSI EN 300 676-1 [1].

This requirement shall not apply to ground mobile and hand held radio.

The conformance test shall be as given clause 5.3.1.5.

4.2.1.6 Keying transient frequency behaviour

Keying transient frequency behaviour as defined in clause 7.10.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 7.10.3 of ETSI EN 300 676-1 [1].

This requirement shall not apply to ground mobile and hand held radio.

The conformance test shall be as given clause 5.3.1.6.

4.2.1.7 Cabinet radiation

The transmitter shall conform to clause 7.12 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.1.7.

4.2.2 Receiver requirements

4.2.2.0 Applicability

All technical requirements in clause 4.2.2 shall only be applicable to receiver equipment (including transceiver equipment).

4.2.2.1 Sensitivity

Sensitivity as defined in clause 8.1.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 8.1.3 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.2.1.

4.2.2.2 Adjacent channel rejection

Adjacent channel rejection as defined in clause 8.6.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 8.6.3 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.2.2.

4.2.2.3 Spurious response rejection

Spurious response rejection as defined in clause 8.7.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 8.7.5 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.2.3.

4.2.2.4 Intermodulation response rejection

Intermodulation response rejection as defined in clause 8.8.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 8.8.3 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.2.4.

4.2.2.5 Blocking or desensitization

Blocking or desensitization as defined in clause 8.9.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 8.9.3 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.2.5.

4.2.2.6 Conducted spurious emissions

Conducted spurious emissions as defined in clause 8.10.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 8.10.3 (see table 4) of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.2.6.

4.2.2.7 Cross modulation rejection

Cross modulation rejection as defined in clause 8.12.1 of ETSI EN 300 676-1 [1] shall conform to the limits in clause 8.12.3 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.2.7.

4.2.2.8 Cabinet radiation

The receiver shall conform to clause 8.17 of ETSI EN 300 676-1 [1].

The conformance test shall be as given clause 5.3.2.8.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile which, as a minimum, shall be that specified in the test conditions contained in the present document.

As technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions as specified in the present document to give confidence of compliance for the affected technical requirements. The test conditions are defined in clause 5 of ETSI EN 300 676-1 [1].

General conditions for measurements are specified in clause 6 of ETSI EN 300 676-1 [1].

5.2 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 1.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028 [i.3], in particular in annex D of the ETSI TR 100 028-2 [i.4].

Table 1 is based on such expansion factors.

Table 1: Maximum measurement uncertainty

Parameter	Uncertainty
Adjacent channel power	±2,5 dB
Adjacent channel rejection	±4 dB
Blocking and desensitization	±4 dB
Carrier power (normal and extreme test conditions)	±0,75 dB
Conducted spurious emissions: below 1 GHz between 1 GHz and 4 GHz	 ±3 dB ±6 dB
Conducted spurious radiation: below 1 GHz between 1 GHz and 4 GHz	 ±3 dB ±6 dB
Cabinet radiation	
Cross modulation rejection	±4 dB
Frequency error	$\pm 1 \times 10^{-9}$
Intermodulation	±3 dB
Intermodulation response rejection	±3 dB
Keying transient frequency behaviour	±3 dB
Receiver dynamic range	±2 dB
Receiver sensitivity	±3 dB
Spurious response rejection	±4 dB
Transient frequency behaviour	±250 Hz

5.3 Conformance tests

5.3.1 Transmitter test specifications

5.3.1.1 Frequency error

The test procedure shall be as specified in clause 7.2.2 of ETSI EN 300 676-1 [1].

5.3.1.2 Carrier power (conducted)

The test procedure shall be as specified in clause 7.3.2 of ETSI EN 300 676-1 [1].

5.3.1.3 Adjacent channel power

The test procedure shall be as specified in clause 7.5.2 of ETSI EN 300 676-1 [1].

5.3.1.4 Conducted spurious emissions

The test procedure shall be as specified in clause 7.7.2 of ETSI EN 300 676-1 [1].

5.3.1.5 Intermodulation attenuation

The test procedure shall be as specified in clause 7.8.2 of ETSI EN 300 676-1 [1].

5.3.1.6 Keying transient frequency behaviour

The test procedure shall be as specified in clause 7.10.2 of ETSI EN 300 676-1 [1].

5.3.1.7 Cabinet Radiation

The test is specified in clause 7.12 of ETSI EN 300 676-1 [1] and shall use the test procedure as defined in ETSI EN 300 113-1 [2] to measure the cabinet radiation.

5.3.2 Receiver test specifications

5.3.2.1 Sensitivity

The test procedure shall be as specified in clause 8.1.2 of ETSI EN 300 676-1 [1].

5.3.2.2 Adjacent channel rejection

The test procedure shall be as specified in clause 8.6.2 of ETSI EN 300 676-1 [1].

5.3.2.3 Spurious response rejection

The test procedures shall be as specified in clause 8.7.3 and clause 8.7.4 of ETSI EN 300 676-1 [1].

5.3.2.4 Intermodulation response rejection

The test procedure shall be as specified in clause 8.8.2 of ETSI EN 300 676-1 [1].

5.3.2.5 Blocking or desensitization

The test procedure shall be as specified in clause 8.9.2 of ETSI EN 300 676-1 [1].

5.3.2.6 Conducted spurious emissions

The test procedure shall be as specified in clause 8.10.2 of ETSI EN 300 676-1 [1].

5.3.2.7 Cross modulation rejection

The test procedure shall be as specified in clause 8.12.2 of ETSI EN 300 676-1 [1].

5.3.2.8 Cabinet radiation

The test is specified in clause 8.17 of ETSI EN 300 676-1 [1] and shall use the test procedure as defined in ETSI EN 300 113-1 [2] to measure the cabinet radiation.

Annex A (normative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared to provide a means of conforming to the essential requirements of Directive 2014/53/EU [i.1] 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: The corresponding Commission's standardization request is expected shortly.

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.

Table A.1: Relationship between the present document and the essential requirements of Directive 2014/53/EU [i.1]

Harmonised Standard ETSI EN 300 676-2 The following requirements are relevant to the presumption of conformity under the article 3.2 of Directive 2014/53/EU [i.1]				
Requirement			**Requirement Conditionality**	
No	**Description**	**Reference: Clause No**	**U/C**	**Condition**
1	Frequency error	4.2.1.1	C	This requirement applies to transmitter equipment
2	Carrier power	4.2.1.2	C	This requirement applies to transmitter equipment
3	Adjacent channel power	4.2.1.3	C	This requirement applies to transmitter equipment
4	Spurious emissions (TX)	4.2.1.4	C	This requirement applies to transmitter equipment
5	Intermodulation attenuation	4.2.1.5	C	This requirement applies to transmitter equipment. This requirement does not apply to ground mobile and hand held radio.
6	Keying transient behaviour	4.2.1.6	C	This requirement applies to transmitter equipment. This requirement does not apply to ground mobile and hand held radio.
7	Cabinet Radiation	4.2.1.7	C	This requirement applies to transmitter equipment
8	Sensitivity	4.2.2.1	C	This requirement applies to receiver equipment
9	Adjacent channel rejection	4.2.2.2	C	This requirement applies to receiver equipment
10	Spurious response rejection	4.2.2.3	C	This requirement applies to receiver equipment
11	Intermodulation response rejection	4.2.2.4	C	This requirement applies to receiver equipment
12	Blocking or desensitization	4.2.2.5	C	This requirement applies to receiver equipment
13	Conducted spurious emissions	4.2.2.6	C	This requirement applies to receiver equipment
14	Cross modulation rejection	4.2.2.7	C	This requirement applies to receiver equipment
15	Cabinet Radiation	4.2.2.8	C	This requirement applies to receiver equipment

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement shall be unconditionally applicable (U) or is conditional upon the manufacturers claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement shall or shall not be applicable for a requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

History

Document history		
Edition 1	March 1997	Publication as ETSI ETS 300 676
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