

ETSI EN 301 842-5 V2.1.1 (2016-09)



**VHF air-ground Digital Link (VDL) Mode 4 radio equipment;
Technical characteristics and methods of measurement
for ground-based equipment;
Part 5: Harmonised Standard covering the essential
requirements of article 3.2 of the Directive 2014/53/EU**

Reference

REN/ERM-TGAERO-33

Keywords

aeronautical, digital, harmonised standard, radio,
testing, VHF

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:
<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2016.
All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.
3GPP™ and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.
GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	5
Foreword.....	5
Modal verbs terminology.....	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	9
4 Technical requirements specifications	10
4.1 Environmental profile.....	10
4.2 Conformance requirements	10
4.2.1 Receiver requirements	10
4.2.1.1 General: Reference Signal.....	10
4.2.1.2 Sensitivity	10
4.2.1.3 Adjacent Channel Rejection.....	10
4.2.1.4 Spurious response rejection of signals within the VHF aeronautical band	11
4.2.1.4.1 Definition.....	11
4.2.1.4.2 Limits	11
4.2.1.4.3 Conformance	11
4.2.1.5 Spurious response rejection of signals outside the VHF aeronautical band	11
4.2.1.5.1 Definition.....	11
4.2.1.5.2 Limits	11
4.2.1.5.3 Conformance	11
4.2.1.6 Co-channel interference	11
4.2.1.7 Receiver Conducted spurious emission.....	12
4.2.1.7.1 Definition.....	12
4.2.1.7.2 Limits	12
4.2.1.8 In-band Intermodulation.....	12
4.2.1.8.1 Definition.....	12
4.2.1.8.2 Limits	12
4.2.1.9 Receiver Cabinet radiation	12
4.2.1.9.1 Definition.....	12
4.2.1.9.2 Limits	12
4.2.2 Transmitter requirements	12
4.2.2.1 Manufacturer's declared output power	12
4.2.2.1.1 Definition.....	12
4.2.2.1.2 Limits	12
4.2.2.2 RF power rise time	13
4.2.2.2.1 Definition.....	13
4.2.2.2.2 Limits	13
4.2.2.3 RF power release time.....	13
4.2.2.3.1 Definition.....	13
4.2.2.3.2 Limits	13
4.2.2.4 Transmitter Conducted Spurious emissions	13
4.2.2.4.1 Definition.....	13
4.2.2.5 Adjacent channel power	13
4.2.2.5.1 Definition.....	13
4.2.2.5.2 Limits	14
4.2.2.6 Wide-band noise	14
4.2.2.6.1 Definition.....	14
4.2.2.6.2 Limits	14
4.2.2.7 Frequency Error	14

4.2.2.7.1	Definition.....	14
4.2.2.7.2	Limits	14
4.2.2.8	Load VSWR capability	14
4.2.2.8.1	Definition.....	14
4.2.2.8.2	Limits	14
4.2.2.9	Transmitter Cabinet radiation.....	15
4.2.2.9.1	Definition.....	15
4.2.2.9.2	Limits	15
4.2.3	Transceiver requirements.....	15
4.2.3.1	Receiver to transmitter turnaround time.....	15
4.2.3.1.1	Definition.....	15
4.2.3.1.2	Limits	15
4.2.3.2	Transmitter to receiver turnaround time.....	15
4.2.3.2.1	Definition.....	15
4.2.3.2.2	Limits	15
5	Testing for compliance with technical requirements.....	15
5.1	Environmental conditions for testing	15
5.2	Interpretation of the measurement results	16
Annex A (normative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	17
History		19

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web radiserver) which are, or may be, or may become, essential to the present document.

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.1] 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.2].

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 provides the technical procedures and limits for compliance with article 3.2 of the Directive 2014/53/EU [i.2] for the ground equipment only.

The present document is part 5 of a multi-part deliverable covering the VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment, as identified below:

- Part 1: "EN for ground equipment";
- Part 2: "General description and data link layer";
- Part 3: "Additional broadcast aspects";
- Part 4: "Point-to-point functions";
- Part 5: "Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU".**

National transposition dates	
Date of adoption of this EN:	7 September 2016
Date of latest announcement of this EN (doa):	31 December 2016
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2017
Date of withdrawal of any conflicting National Standard (dow):	30 June 2018

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.

1 Scope

The present document applies to Very High Frequency (VHF) Digital Link (VDL) Mode 4 ground-based radio transmitters and receivers for air-ground communications operating in the VHF band, using Gaussian-filtered Frequency Shift Keying (GFSK) Modulation with 25 kHz channel spacing and capable of tuning to any of the 25 kHz channels from 112,000 MHz to 136,975 MHz as defined in ICAO VHF Digital Link (VDL) Standards and Recommended Practices (SARPs) [i.5].

Manufacturers should note that in future the tuning range for the ground transceivers may also cover any 25 kHz channel from 108,000 MHz to 111,975 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.2].

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 Directive 2014/53/EU [i.2] as well as essential requirements under the Single European Sky Interoperability Regulation 552/2004 [i.10] and related implementing rules and/or essential requirements under the EASA basic regulation No 216/2008 [i.3] as amended by Regulation No 1108/2009 [i.4] 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 301 842-1 (V1.4.1) (04-2015): "VHF air-ground Digital Link (VDL) Mode 4 radio equipment; Technical characteristics and methods of measurement for ground-based equipment; Part 1: EN for ground equipment".
- [2] ETSI EN 300 113-1 (V1.7.1) (11-2011): "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] 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.2] 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.3] Regulation (EC) No 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.
- [i.4] Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulation (EC) No 216/2008 in the field of aerodromes, air traffic management and air navigation services and repealing Directive 2006/23/EC.
- [i.5] ICAO Annex 10 to the Convention on International Civil Aviation: "Aeronautical Telecommunications, Volume III: Communication Systems, Part I: Digital Data Communication Systems, Chapter 6", inc. Amendment 88-A (applicable from 14/11/2013).
- [i.6] ISO/IEC 7498-1 (1994): "Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model".
- [i.7] ISO/IEC 10731 (1994): "Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services".
- [i.8] ETSI TR 100 028-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [i.9] 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.10] EC Regulation 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.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the Radio Equipment Directive [i.2], ISO/IEC 7498-1 [i.6], ISO/IEC 10731 [i.7] and the following apply:

adjacent channel power: amount of the modulated RF signal power which falls within a given adjacent channel

NOTE: Adjacent channel power includes discrete spurious, signal sidebands, and noise density (including phase noise) at the transmitter output.

Bit Error Rate (BER): ratio between the number of erroneous bits received and the total number of bits received

data rate: maximum amount of data that can be transmitted in a specified amount of time, typically expressed as bits per second

NOTE: The nominal data rate for VDL Mode 4 is 19 200 bits/s.

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

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 is provided for test purposes.

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

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

reference signal level: signal level used in the receiver performance specifications except otherwise stated

spurious emissions: conducted RF emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information

NOTE: Spurious emissions include parasitic emissions, intermodulation products and frequency conversion products.

station: VDL Mode 4 Specific Services (VSS)-capable entity

NOTE: A station may be either a mobile station or a ground station. A station is a physical entity that transmits and receives bursts over the RF interface (either A/G or A/A) and comprises, at a minimum: a physical layer, media access control sublayer, and a unique VSS address. A station which is also a DLS station has the same address.

VDL Mode 4: VHF data link using a Gaussian Filtered Frequency Shift Keying modulation scheme and self-organizing time division multiple access

VDL Mode 4 station: physical entity that transmits and receives VDL Mode 4 bursts over the RF interface (either A/G or A/A) and comprises, as a minimum: a physical layer, Media Access Control sublayer and a VSS sublayer

NOTE: A VDL Mode 4 station may either be a mobile VDL Mode 4 station or a ground VDL Mode 4 station.

VDL Station: VDL-capable entity that transmits and receives VDL bursts over the RF interface (either A/G or A/A) and comprises, as a minimum: a physical layer, Media Access Control sublayer and a VSS sublayer

NOTE: A station may either be a mobile station or a ground station. A station is a physical entity that transmits and receives frames over the air/ground (A/G) interface and comprises, at a minimum: a physical layer, media access control sublayer, and a unique DLS address. The particular initiating process (i.e. DLE or LME) in the station cannot be determined by the source DLS address. The particular destination process cannot be determined by the destination DLS address. These can be determined only by the context of these frames as well as the current operational state of the DLEs.

VDL System: VDL-capable entity comprising one or more stations and the associated VDL management entity

NOTE: A system may either be a mobile system or a ground system.

3.2 Abbreviations

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

A/A	Air-to-Air
A/G	Air/Ground
BER	Bit Error Rate
DLE	Data Link Entity
DLS	Data Link Service
EASA	European Aviation Safety Agency
EN	European Norm
GFSK	Gaussian Filtered Frequency Shift Keying
ICAO	International Civil Aviation Organization

IPR	Intellectual Property Rights
ISO	International Organization for Standardization
LME	Link Management Entity
RF	Radio Frequency
SARPs	Standards And Recommended Practices
VDL	VHF Digital Link
VHF	Very High Frequency
VSS	VDL Mode 4 Specific Services
VSWR	Voltage Standing Wave Ratio

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 manufacturer. 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 Receiver requirements

4.2.1.1 General: Reference Signal

The reference signal level applied at the receiver input for all the receiver requirements below described, unless otherwise stated, shall be as specified in clause 6.1.3 of ETSI EN 301 842-1 [1].

4.2.1.2 Sensitivity

4.2.1.2.1 Definition

The radio receiver sensitivity is defined as the power level at the receiver input at which the Bit Error Ratio (BER) is as specified in clause 6.1.2 of ETSI EN 301 842-1 [1].

4.2.1.2.2 Limits

The sensitivity shall be as specified in ETSI EN 301 842-1 [1], clause 6.1.4.

4.2.1.2.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.1.2.

4.2.1.3 Adjacent Channel Rejection

4.2.1.3.1 Definition

The adjacent channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal which differs in frequency from the wanted signal by an amount equal to the adjacent channel separation for which the equipment is intended.

4.2.1.3.2 Limits

The adjacent channel rejection shall be as specified in ETSI EN 301 842-1 [1], clause 6.1.5.

4.2.1.3.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.1.3.

4.2.1.4 Spurious response rejection of signals within the VHF aeronautical band

4.2.1.4.1 Definition

Within the context of the present document, this can be defined as the ability of the equipment to achieve a given BER requirement in the presence of an unwanted signal within the VHF aeronautical band.

4.2.1.4.2 Limits

The BER requirement as defined in clause 6.1.2 of ETSI EN 301 842-1 [1] shall be achieved when the wanted signal, set at the reference level, is combined with an unmodulated interfering signal as specified in clause 6.1.6 of ETSI EN 301 842-1 [1].

4.2.1.4.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.1.4.

4.2.1.5 Spurious response rejection of signals outside the VHF aeronautical band

4.2.1.5.1 Definition

Within the context of the present document, this can be defined as the ability of the equipment to achieve a given BER requirement in the presence of an unwanted signal outside the VHF aeronautical band.

4.2.1.5.2 Limits

The BER requirement as defined in clause 6.1.2 of ETSI EN 301 842-1 [1] shall be achieved when the wanted signal, set at the reference level, is combined with an unmodulated interfering signal as specified in clause 6.1.7 of ETSI EN 301 842-1 [1].

4.2.1.5.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.1.5.

4.2.1.6 Co-channel interference

4.2.1.6.1 Definition

The level of co-channel interference is a measure of the capability of the receiver to receive a wanted signal without exceeding a given degradation due to the presence of an unwanted modulated signal at the same carrier frequency.

4.2.1.6.2 Limits

The co-channel interference level shall be as specified in ETSI EN 301 842-1 [1], clause 6.1.11.

4.2.1.6.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.1.9.

4.2.1.7 Receiver Conducted spurious emission

4.2.1.7.1 Definition

Conducted spurious emissions from the receiver are signals at any frequency, emitted from the antenna port.

4.2.1.7.2 Limits

The conducted spurious emission - measured by its power level at the antenna connector - shall be as specified in ETSI EN 301 842-1 [1], clause 6.1.12.

4.2.1.7.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.1.10.

4.2.1.8 In-band Intermodulation

4.2.1.8.1 Definition

In-band intermodulation refers to the BER performance which needs to be achieved in the presence of two interfering signals, displaced in frequency, from the desired signal.

4.2.1.8.2 Limits

The in-band intermodulation shall be as specified in ETSI EN 301 842-1 [1], clause 6.1.14.

4.2.1.8.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.1.11.

4.2.1.9 Receiver Cabinet radiation

4.2.1.9.1 Definition

The receiver cabinet radiation is the effective radiated power when radiated by the cabinet and structure of the receiver.

4.2.1.9.2 Limits

The receiver cabinet radiation limits shall be as specified in clause 6.1.15 of ETSI EN 301 842-1 [1].

4.2.1.9.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 300 113-1 [2], clauses 8.10.1 b) and c), and 8.10.3.

4.2.2 Transmitter requirements

4.2.2.1 Manufacturer's declared output power

4.2.2.1.1 Definition

The manufacturer's declared output power of the transmitter is the mean output power of the transmitter.

4.2.2.1.2 Limits

The manufacturer's declared output power shall be as specified in clause 6.2.4 of ETSI EN 301 842-1 [1].

4.2.2.1.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.2.2.

4.2.2.2 RF power rise time

4.2.2.2.1 Definition

The RF power rise time is the time taken for the transmitter power level to reach no less than 90 % of the mean output power level measured during signal transmission.

4.2.2.2.2 Limits

The RF power rise time shall be as specified in clause 6.2.5 of ETSI EN 301 842-1 [1].

4.2.2.2.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.2.3.

4.2.2.3 RF power release time

4.2.2.3.1 Definition

The RF power release time is the time taken for the transmitted power level to decay by a given value below the manufacturer declared output power level.

4.2.2.3.2 Limits

The RF power release time shall be as specified in clause 6.2.6 of ETSI EN 301 842-1 [1].

4.2.2.3.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.2.4.

4.2.2.4 Transmitter Conducted Spurious emissions

4.2.2.4.1 Definition

Conducted spurious emissions from the transmitter are signals at any frequency emitted from the antenna port.

4.2.2.4.2 Limits

The conducted spurious emissions is measured by their power levels at the antenna connector and their limits shall be as specified in clause 6.2.7 of ETSI EN 301 842-1 [1].

4.2.2.4.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.2.5.

4.2.2.5 Adjacent channel power

4.2.2.5.1 Definition

The adjacent channel power is the RF power measured over the channel bandwidth of adjacent channels.

4.2.2.5.2 Limits

The adjacent channel power shall be as specified in clause 6.2.8 of ETSI EN 301 842-1 [1].

4.2.2.5.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.2.6.

4.2.2.6 Wide-band noise

4.2.2.6.1 Definition

The wide-band noise is the RF power measured over the 25 kHz channel bandwidth for channels other than the adjacent channels.

4.2.2.6.2 Limits

The adjacent channel power shall be as specified in clause 6.2.9 of ETSI EN 301 842-1 [1].

4.2.2.6.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.2.7.

4.2.2.7 Frequency Error

4.2.2.7.1 Definition

The frequency error is the difference between the measured carrier frequency and its nominal value.

4.2.2.7.2 Limits

The frequency error shall be as specified in clause 6.2.10 of ETSI EN 301 842-1 [1].

NOTE: In ETSI EN 301 842-1 [1], this is referred to as 'Frequency Tolerance'.

4.2.2.7.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.2.8.

4.2.2.8 Load VSWR capability

4.2.2.8.1 Definition

The load VSWR capability is the ability of the transmitter to maintain the limits of wide-band noise and adjacent channel power when a 2:1 mismatch to the transmitter output terminals is applied by a length of feeder, which is varied in electrical length by up to half a wavelength.

4.2.2.8.2 Limits

Limits shall be as specified in clause 6.2.11 of ETSI EN 301 842-1 [1].

4.2.2.8.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.2.9.

4.2.2.9 Transmitter Cabinet radiation

4.2.2.9.1 Definition

The transmitter cabinet radiation is the effective radiated power when radiated by the cabinet and structure of the transmitter.

4.2.2.9.2 Limits

The transmitter cabinet radiation shall be as specified in clause 6.2.12 of ETSI EN 301 842-1 [1].

4.2.2.9.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 300 113-1 [2], clauses 7.5.1 b) and c), and 7.5.3.

4.2.3 Transceiver requirements

4.2.3.1 Receiver to transmitter turnaround time

4.2.3.1.1 Definition

This is the time between the termination of the receiver function, and the capability to begin transmission of the transmitter power stabilization sequence.

4.2.3.1.2 Limits

The receiver to transmitter turnaround time shall be as specified in clause 6.3.3 of ETSI EN 301 842-1 [1].

4.2.3.1.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.3.1.

4.2.3.2 Transmitter to receiver turnaround time

4.2.3.2.1 Definition

This is the time between the completion of a transmission, and the capability of receiving and demodulating with nominal performance an incoming signal.

4.2.3.2.2 Limits

The transmitter to receiver turnaround time shall be as specified in clause 6.3.4 of ETSI EN 301 842-1 [1].

4.2.3.2.3 Conformance

To demonstrate conformance, the equipment shall pass the test procedure described in ETSI EN 301 842-1 [1], clause 9.3.2.

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.

Where technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions (within the boundary limits of the declared operational environmental profile) to give confidence of compliance for the affected technical requirements.

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 an 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 the tables 1, 2 and 3.

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.8] and [i.9], in particular in annex D of the ETSI TR 100 028-2 [i.9].

Tables 1, 2 and 3 are based on such expansion factors.

Table 1: Transmitter measurement uncertainty: maximum values

Measurement uncertainties	Maximum values
Manufacturer's declared output power (normal and extreme test conditions)	$\pm 0,75$ dB
RF power rise and release time	± 20 % of the limits values
Conducted spurious emissions: below 1 GHz	± 3 dB
between 1 GHz and 4 GHz	± 6 dB
Adjacent channel power	$\pm 2,5$ dB
Wide band noise	$\pm 2,5$ dB
Frequency error	$\pm 1 \times 10^{-9}$
Cabinet radiation	± 6 dB

Table 2: Receiver measurement uncertainty: maximum values

Measurement uncertainties	Maximum values
Sensitivity	± 3 dB
Adjacent channel rejection	± 4 dB
Spurious response rejection	± 4 dB
Co-channel interference	± 3 dB
Conducted spurious emissions: below 1 GHz	± 3 dB
between 1 GHz and 4 GHz	± 6 dB
in-band intermodulation	± 3 dB
Cabinet radiation	± 6 dB

Table 3: Transceiver measurement uncertainty: maximum values

Measurement uncertainties	Maximum values
Receiver to transmitter turn-around time	± 20 % of the limits values
Transmitter to receiver turn-around time	± 20 % of the limits values

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

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.1] 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.2].

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

Harmonised Standard ETSI EN 301 842-5				
The following requirements are relevant to the presumption of conformity under the article 3.2 of Directive 2014/53/EU [i.2]				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Sensitivity	4.2.1.2	U	
2	Adjacent Channel Rejection	4.2.1.3	U	
3	Spurious Response rejection	4.2.1.4 4.2.1.5	U	
4	Co-channel interference	4.2.1.6	U	
5	Receiver Conducted spurious emission	4.2.1.7	U	
6	In-band Intermodulation	4.2.1.8	U	
7	Receiver Cabinet radiation	4.2.1.9	U	
8	Manufacturer's declared power output	4.2.2.1	U	
9	RF power rise time	4.2.2.2	U	
10	RF power release time	4.2.2.3	U	
11	Transmitter Conducted spurious emissions	4.2.2.4	U	
12	Adjacent channel power	4.2.2.5	U	
13	Wide-band noise	4.2.2.6	U	
14	Frequency error	4.2.2.7	U	
15	Load VSWR capability	4.2.2.8	U	
16	Transmitter Cabinet radiation	4.2.2.9	U	
17	Receiver to transmitter turnaround time	4.2.3.1	U	
18	Transmitter to receiver turnaround time	4.2.3.2	U	

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 manufacturer's 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		
V1.1.1	July 2015	Publication
V2.1.0	June 2016	EN Approval Procedure AP 20160907: 2016-06-09 to 2016-09-07
V2.1.1	September 2016	Publication