

ETSI EN 301 489-4 V3.3.1 (2021-02)



**ElectroMagnetic Compatibility (EMC)
standard for radio equipment and services;
Part 4: Specific conditions for fixed radio links
and ancillary equipment;
Harmonised Standard covering the essential requirements for
ElectroMagnetic Compatibility
of article 3.1(b) of Directive 2014/53/EU**

Reference

REN/ERM-EMC-403

Keywords

EMC, FWA, harmonised standard, point-to-point,
radio, regulation, RLL, WLL

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 prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

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/CommitteeSupportStaff.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.

© ETSI 2021.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M™ logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	5
Foreword.....	5
Modal verbs terminology	5
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references	7
3 Definition of terms, symbols and abbreviations.....	7
3.1 Terms	7
3.2 Symbols	8
3.3 Abbreviations.....	8
4 Test conditions	9
4.1 General.....	9
4.1.1 Introduction	9
4.1.2 Test conditions and configurations.....	9
4.1.3 Emission tests.....	10
4.1.4 Immunity tests.....	10
4.2 Arrangements for test signals.....	12
4.2.1 Arrangements for test signals at the input of the transmitter	12
4.2.2 Arrangements for test signals at the output of the transmitter.....	12
4.2.3 Arrangements for test signals at the input of the receiver	12
4.2.4 Arrangements for test signals at the output of the receiver	13
4.3 Exclusion bands	13
4.3.1 Exclusion bands for receivers.....	13
4.3.2 Exclusion bands for transmitters	13
5 Performance assessment.....	14
5.1 Equipment which can provide a communications link	14
5.2 Ancillary equipment	14
5.3 Equipment classification.....	14
6 Performance criteria	14
6.0 Introduction.....	14
6.1 Performance criterion for Continuous phenomena	14
6.2 Performance criterion for Transient phenomena.....	15
6.3 Specific performance criteria	15
6.3.1 Digital signal ports	15
6.3.1.0 General performance criteria	15
6.3.1.1 Performance criterion for continuous phenomena.....	15
6.3.1.2 Performance criterion for transient phenomena.....	15
6.3.2 Analogue voice frequency signal ports	15
6.3.2.1 Performance criterion for continuous phenomena	15
6.3.2.2 Performance criterion for transient phenomena.....	16
6.3.3 Ethernet and packet-data interfaces.....	16
6.3.3.0 Introduction	16
6.3.3.1 Performance criterion for continuous phenomena.....	16
6.3.3.2 Performance criterion for transient phenomena.....	16
6.3.4 Service and maintenance interfaces	16
6.3.5 Synchronization interfaces	16
6.3.5.0 Introduction	16
6.3.5.1 Performance criterion for continuous phenomena	16
6.3.5.2 Performance criteria for transient phenomena.....	17
6.3.6 Remote alarm interfaces.....	17
6.3.6.1 Performance criterion for continuous phenomena	17
6.3.6.2 Performance criterion for transient phenomena.....	17

6.4	Performance criteria for ancillary equipment tested on a stand alone basis.....	17
7	Applicability overview tables.....	17
7.1	Emission	17
7.1.1	General	17
7.1.2	Special conditions	18
7.2	Immunity	18
7.2.1	General	18
7.2.2	Special conditions	19
Annex A (informative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	20
Annex B (informative):	Change history	23
History		24

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables 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 server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

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.11] 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.1].

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 4 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

National transposition dates	
Date of adoption of this EN:	<u>8 February 2021</u>
Date of latest announcement of this EN (doa):	31 <u>May 2021</u>
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	<u>30 November 2021</u>
Date of withdrawal of any conflicting National Standard (dow):	<u>30 November 2022</u>

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 specifies technical characteristics and methods of measurement for Analogue and Digital Fixed Radio Links operating as fixed Point-to-Point, and Point-to-Multipoint systems as defined in ~~annex B~~ table 1, including the associated ancillary equipment, in respect of electromagnetic compatibility.

NOTE:—Technical specifications related to the antenna port of the radio 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, see table 1.

~~In case of differences (for instance concerning special conditions, definitions and abbreviations) between the present document and ETSI EN 301 489-1 [1], the provisions of the present document take precedence.~~ Table 1: Radio Technologies in scope of the present document

<u>Technology</u>	<u>ETSI Standard</u>
<u>Point-to-Point equipment; intended for operation in the frequency bands from 1,3 GHz to 86 GHz</u>	<u>ETSI EN 302 217-2 [i.5]</u>
<u>Point-to-Multipoint equipment; intended for operation in the frequency band below 1 GHz and in frequency bands from 1 GHz to 40 GHz</u>	<u>ETSI EN 302 326-2 [i.7]</u>

The processing and protection switch, (de)modulator, transmitter, receiver, RF filters, branching networks and feeders are covered by the present document. The multiplexing and/or de-multiplexing elements are covered if they form part of the transmitter, receiver and/or transceiver.

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

~~The present document covers the and essential requirements of article 3.1(b) of Directive 2014/53/EU [i.1] under the conditions identified is given in annex A.~~

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 <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] ETSI EN 301 489-1 (V2.2.0) ~~(03-20173) (11-2019)~~: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU".
- [2] EN 61000-3-3:2013/A1:2019: "Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection", (produced by CENELEC).

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] Void.
- [i.3] ~~Recommendation ITU R F.1191 1: "Bandwidths and unwanted emissions of digital radio relay systems".~~ Void.
- [i.4] ~~Recommendation ITU R F.746 3: "Radio frequency channel arrangements for radio relay systems".~~ Void.
- [i.5] ETSI EN 302 217-2: "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 2: Digital systems operating in frequency bands from 1 GHz to 86 GHz; Harmonised Standard for access to radio spectrum".
- [i.6] Void.
- [i.7] ~~ETSI EN 302 326-2: "Fixed Radio Systems; Multipoint Equipment and Antennas; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive for Digital Multipoint Radio Equipment 2: Harmonised Standard for access to radio spectrum".~~
- [i.8] Void.
- [i.9] Void.
- [i.10] Void.
- [i.11] 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.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 301 489-1 [1] and the following apply:

ancillary equipment: electrical or electronic equipment, that is intended to be used with a receiver or transmitter

NOTE 1: It is considered as an ancillary equipment if:

- the equipment is intended for use with a receiver or transmitter to provide additional operational and/or control features to the radio equipment (e.g. to extend control to another position or location);
- the ancillary equipment cannot be used without being connected to radio equipment to provide user functions independently of a receiver or transmitter; and

- the receiver or transmitter, to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

NOTE 2: An example of ancillary equipment would be a docking station for radio equipment whose interface is dedicated to a particular product or range of products.

Base Station (BS): alternative name for Central Station

Central Station (CS): ~~which can be subdivided into two units comprising of:~~

- the exchange unit, also called Central Controller Station (CCS) - (interface to the local switch); and
- the radio unit, also called Central Radio Station (CRS) - (central base band/radio transceiver).

NOTE: In some deployments the term Base Station is also used in place of Central Station. For the purposes of the present document either terms are assumed and are completely interchangeable.

~~**CHannel Separation (CHS):** CHannel Separation (CHS) is taken as $XS/2$ for alternated frequency channel arrangements according to Recommendation ITU-R F.1191-1 [i.3] and XS for co-channel and interleaved frequency channel arrangements as defined by Recommendation ITU-R F.746-3 [i.4], XS is the radio frequency separation between the centre frequencies of adjacent radio frequency channels on the same polarization and in the same direction of transmission~~

operating frequency range: range(s) of radio frequencies covered by the Equipment Under Test (EUT) without any change of units

Repeater Station (RS): radio repeater outstations with or without subscriber interfaces

Terminal station (TS): outstations with subscriber interfaces

vehicular equipment: radio equipment intended for installation and use in a vehicle, and powered by the main battery of the vehicle

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 301 489-1 [1] and the following apply:

BER	Bit Error Ratio
BS	Base Station
CCS	Central Controller Station
CHS	CHannel Separation
CR	Continuous phenomena applied to Receivers
CRS	Central Radio Station
CS	Central Station
CT	Continuous phenomena applied to Transmitters
RS	Repeater Station
TR	Transient phenomena applied to Receivers
TS	Terminal Station
TT	Transient phenomena applied to Transmitters

4 Test conditions

4.1 General

4.1.1 Introduction

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

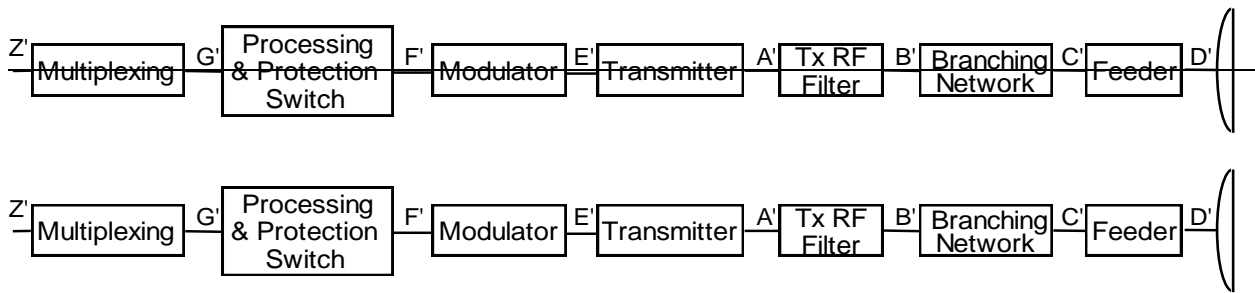
For emission and immunity tests the test modulation, test arrangements, etc., as specified in the present document, clauses 4.1.2 to 4.3.2 shall apply.

The test configuration and mode of operation shall represent the intended use and shall be recorded in the test report.

4.1.2 Test conditions and configurations

This clause defines the test conditions and configurations for the emission and immunity tests as follows:

- a transmitter shall, as a minimum, comprise the element between E' and A' of figure 1. Additionally the transmitter may comprise any of the other elements from the transmitter chain shown in figure 1. If these additional elements are part of the transmitter or system they shall also meet the requirements of the present document;

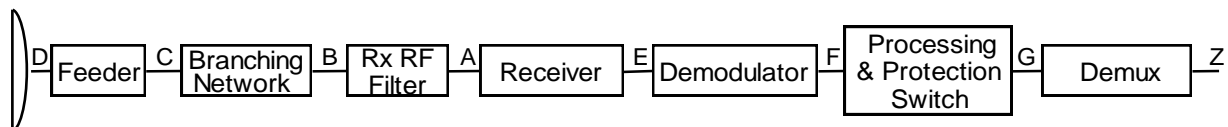


NOTE 1: For the purposes of defining the reference points, the branching network (B' to C') does not include a hybrid.

NOTE 2: Points B' and C' may coincide, dependent on the equipment configuration.

Figure 1: Elements of a transmitter

- a receiver shall, as a minimum, comprise the element between A and E of figure 2. Additionally the receiver may comprise any of the other elements from the receiver chain shown in figure 2. If these additional elements are part of the receiver or system they shall also meet the requirements of the present document;



NOTE 1: For the purposes of defining the reference points, the branching network (B to C) does not include a hybrid.

NOTE 2: Points B and C may coincide, dependent on the equipment configuration.

Figure 2: Elements of a receiver

- a transceiver shall comprise as a minimum the elements E' to A' and A to E shown in figures 1 and 2, and additionally it may comprise any combinations of the other elements. If these additional elements are part of the transceiver they shall also meet the requirements of the present document;

- the equipment shall be tested under conditions which are within the manufacturer's declared range of humidity, temperature and supply voltage;
- the test configuration shall be as close to normal intended use as possible;
- if the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment while connected to the minimum configuration of ancillary equipment necessary to exercise the ports;
- ports which in normal operation are connected to ancillary or other equipment shall be either connected to such equipment, or to a representative termination to simulate the input/output characteristics of the ancillary or other equipment. Radio Frequency (RF) input/output ports shall be correctly terminated;
- if the equipment has a large number of ports, then a sufficient number shall be selected to simulate actual operation conditions and to ensure that all the different types of termination are tested;
- ports which are not connected to cables during normal intended operation, e.g. service connectors, programming connectors, temporary connectors, etc. shall not be connected to any cables for the purpose of ElectroMagnetic Compatibility (EMC) testing. Where cables have to be connected to these ports, or interconnecting cables have to be extended in length in order to exercise the EUT, precautions shall be taken to ensure that the evaluation of the EUT is not affected by the addition or extension of these cables;
- the test conditions, test configuration and mode of operation shall be recorded in the test report.

4.1.3 Emission tests

~~The provisions ETSI EN 301 489 1 [1], clause 8 shall apply with the following modification:-~~

For Point-to-Multipoint systems a communications link shall be established, which shall comprise of the Central Station and a minimum of one Terminal Station. These stations are tested separately.

4.1.4 Immunity tests

~~The provisions of ETSI EN 301 489 1 [1], clause 9.1 shall apply with the following modifications:~~

The test configuration shall for transmitters be in accordance with the principle of figure 3, and for receivers it shall be in accordance with the principle of figure 4, and for transceiver shall be in accordance with the principle of figure 5.

The ~~measuring~~monitoring equipment shall be located outside the test environment. Adequate measures shall be taken to avoid any effects of the ~~unwanted~~test signals on the ~~measuring~~monitoring equipment.

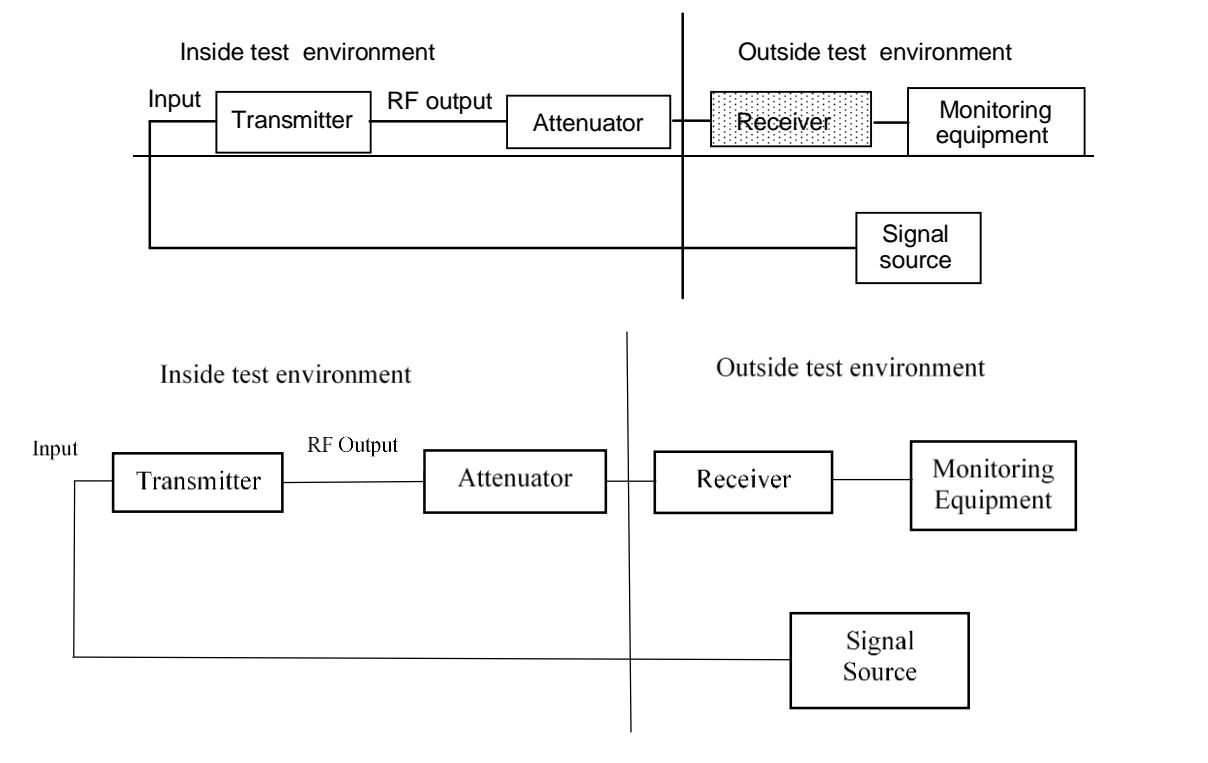


Figure 3: Test configuration for transmitters

During immunity tests the transmitter shall be operated at its rated output power. The input to the transmitter shall be in accordance with clause 4.2.1 (see figure 3). A communication link shall be established at the start of the test and be maintained during the test.

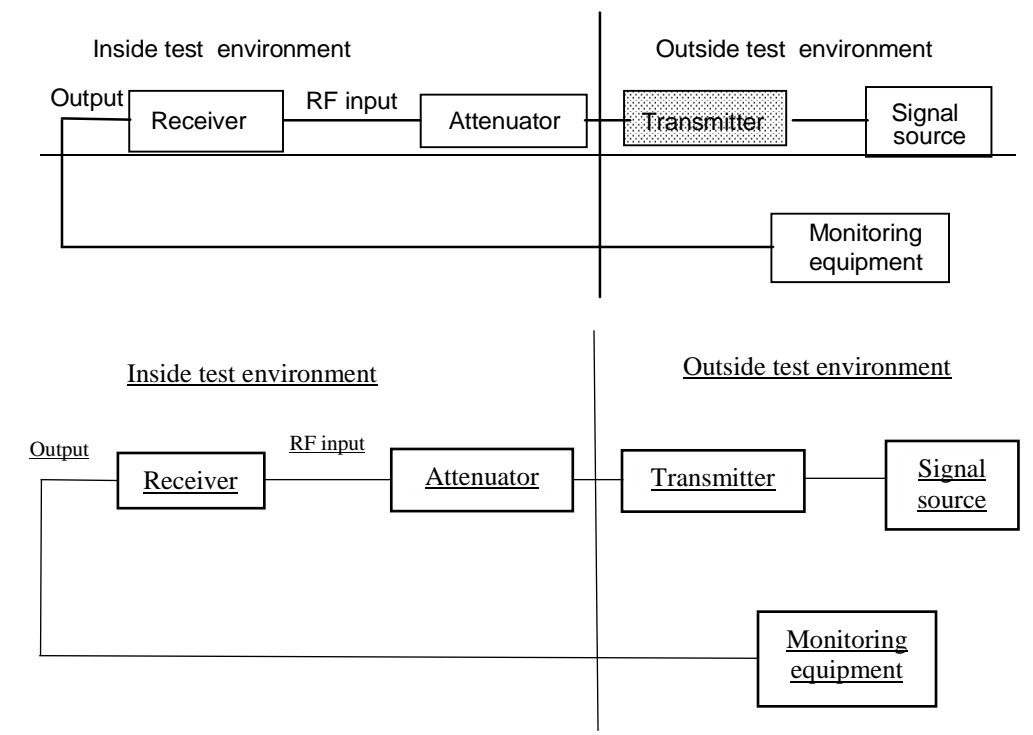


Figure 4: Test configuration for receivers

During immunity tests for receivers, the wanted RF input signal, coupled to the receiver, shall be in accordance with clause 4.2.3 (see figure 4). A communication link shall be established at the start of the test and be maintained during the test.

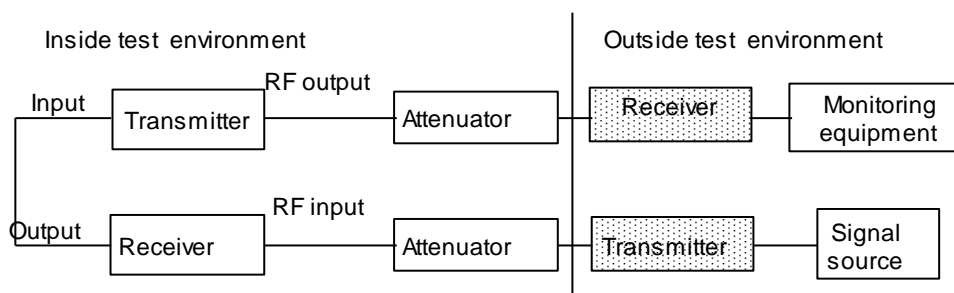


Figure 5: Test configuration of transceivers

In the case of duplex transceivers where the transmitter and receiver cannot operate at the same radio frequency, the wanted input signal, coupled to the receiver, shall be in accordance with clause 4.2.3. The transmitter shall be operated at its rated output power, and with its input coupled to the output of the receiver (repeater mode) (see figure 5).

The same test configuration also applies where the transmitters and receivers operate at the same radio frequency.

The measurement shall be made in the mode of operation as required in this clause.

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

For the immunity tests of ancillary equipment without a separate pass/fail criteria, the receiver, transmitter or transceiver coupled to the ancillary equipment, shall be used to judge whether the ancillary equipment passes or fails.

For Point-to-Multipoint systems the minimum configuration shall comprise of one Central Station and one terminal station, unless more terminal stations are required to establish a representative test configuration.

A communication link shall be established at the start of the test and maintained during the test, between the Central Station and ~~at the~~ Terminal Station(s).

These stations are tested separately.

4.2 Arrangements for test signals

4.2.1 Arrangements for test signals at the input of the transmitter

The provisions of ETSI EN 301 489-1 [1], clause 4.2.1 shall apply with the following modifications:

- The input of the transmitter shall be coupled via the normal input connector to the signal source shown in figures 3 and 5.
- The wanted signal(s) shall be (a) representative baseband input signal(s) ~~corresponding to normal operation~~.

4.2.2 Arrangements for test signals at the output of the transmitter

The provisions of ETSI EN 301 489-1 [1], clause 4.2.2 shall apply with the following modifications:

- To establish a communication link the wanted output signal shall be delivered from the transmitter RF output via suitable attenuation through a coaxial cable or waveguide. Adequate measures shall be taken to minimize the effects of unwanted currents on the external conductor of the coaxial cable or waveguide at the point of entry to the EUT. Mismatch errors may be avoided by placing the attenuators close to the EUT.
- If the transmitter RF output cannot be recovered via connection another antenna of the same type may be used to retrieve the wanted output signal from the transmitter.

4.2.3 Arrangements for test signals at the input of the receiver

The provisions of ETSI EN 301 489-1 [1], clause 4.2.3 shall apply with the following modifications:

- The wanted signal shall be a representative modulated RF input signal corresponding to normal operation.

- To establish a communication link the wanted input signal shall be applied to the RF input of the receiver via a coaxial cable or waveguide. Adequate measures shall be taken to minimize the effects of unwanted currents on the external conductor of the coaxial cable or waveguide at the point of entry to the EUT. Mismatch errors may be avoided by placing the attenuators close to the EUT.
- If the receiver RF input cannot be applied via connection another antenna of the same type may be used to apply the wanted input signal to the receiver. The source of the wanted input signal shall be located outside of the test environment.
- For digital equipment, including Point-to-Multipoint equipment, the input signal level shall be at a nominal value of 15 dB above the receiver input level for a Bit Error Ratio (BER) of 1×10^{-5} .
- ~~The input signal level for analogue equipment shall be set to 15 dB above the input signal level that produces the reference signal to noise ratio. If the reference signal to noise ratio is not specified in the appropriate product standard, the level specified by the manufacturer shall be used.~~
- These levels are close to normal operation and sufficient to avoid the broadband noise from the power amplifiers, which generate the disturbing EM phenomena, from influencing the measurement.

4.2.4 Arrangements for test signals at the output of the receiver

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

4.3 Exclusion bands

4.3.0 ~~General~~

~~The provisions of ETSI EN 301 489-1 [1], clause 4.3 shall apply as detailed below.~~

4.3.1 Exclusion bands for receivers

For the lower edge for the exclusion band:

$$EXband(lower) = Band_{RX}(lower) - nChW_{RX}$$

and for the upper edge of the exclusion band:

$$EXband(upper) = Band_{RX}(upper) + nChW_{RX}$$

~~Where~~ For equipment within the scope of the present document $n=1$ and ChW_{RX} is the widest channel size supported by as specified in ETSI EN 302 217-2 [i.5] for the intended frequency band of the EUT.

For EUT that operate above 6 GHz there is no exclusion band specified as test ranges stop at 6 GHz.

4.3.2 Exclusion bands for transmitters

The provisions of ETSI EN 301 489-1 [1], clause 4.3.2 shall apply.

5 Performance assessment

5.1 ~~General~~

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

5.2 Equipment which can provide a communications link

The test arrangement and signals given in clause 4.2 apply to radio equipment or a combination of a radio equipment and ancillary equipment which permits the establishment of a communications link.

5.3 ~~Equipment which does not provide a communications link~~

~~If the equipment is of a specialized nature (see clause 6) which does not permit a communications link to be established, such as protection switching equipment, or ancillary equipment tested in isolation, (i.e. not connected to radio equipment), the manufacturer shall define the method of test to determine the acceptable level of performance or degradation of performance during and/or after the test. The manufacturer shall provide the method of observing the degradation of performance of the equipment.~~

~~The performance assessment carried out shall be simple, but at the same time give adequate proof that the primary functions of the equipment are operational.~~

5.45.2 Ancillary equipment

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

5.53 Equipment classification

Radio link equipment covered by the present document is only intended for fixed use and powered either by AC mains or DC power supply.

~~Therefore, for emission and immunity tests only the requirements for radio and ancillary equipment for fixed use shall apply (see ETSI EN 301 489-1 [1], clauses 7.1 and 7.2, table 1 and table 2 respectively).~~

6 Performance criteria

6.0 Introduction

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

6.1 Performance criterion for Continuous phenomena ~~applied to Transmitters (CT) and Receivers (CR)~~

The provision of ETSI EN 301 489-1 [1], clause 6.1 shall apply with the following ~~modifications~~ additions:

- The communication link shall be maintained during and after the test.
- The specific performance criteria of clause 6.3, for continuous phenomena, shall additionally apply.

6.2 Performance criterion for Transient phenomena ~~applied to Transmitters (TT) and Receivers (TR)~~

The provision of ETSI EN 301 489-1 [1], clause 6.2 shall apply with the following ~~modifications~~ additions:

- The communication link shall be maintained after the test.
- The specific performance criteria of clause 6.3, for transient phenomena, shall additionally apply.

6.3 Specific performance criteria

6.3.1 Digital signal ports

6.3.1.0 ~~Introduction~~ General performance criteria

The performance of the equipment shall be verified for digital signal ports:

- by measuring the number of induced bit errors on the main signal port during ~~all exposures~~ the application of the continuous immunity phenomena;
- ~~by testing the functionality of the main signal port and the other signal ports after the exposure;~~
- ~~by verifying that corruption~~ application of software and data held in memory has not occurred the immunity phenomena.

NOTE: To allow for background errors which may occur at any time, the test can be repeated up to three times to determine any correlation between eventual errors and the EMC phenomena.

6.3.1.1 Performance criterion for continuous phenomena

The number of bit errors at each individual exposure shall not exceed the maximum permissible number of errors ~~stated by the manufacturer~~ for its intended operation.

The number of errors is calculated as:

$$(\text{the maximum } \underline{\text{permissible}} \text{ bit error ratio } \text{---} \text{specified by the manufacturer}) \times (\text{bit rate}) \times (\text{test time}).$$

The test time is taken to be the dwell time at each frequency of the exposure.

6.3.1.2 Performance criterion for transient phenomena

Loss of frame alignment or loss of synchronization is not allowed during each individual exposure. No alarms shall be generated as a result of the electromagnetic stress.

The above does not apply to surge testing where some loss of frame alignment may be expected. For this test, the EUT shall operate as intended following the cessation of the exposure.

6.3.2 Analogue voice frequency signal ports

6.3.2.1 Performance criterion for continuous phenomena

~~6.3.2.0~~ ~~Introduction~~

The performance of the equipment shall be verified for analogue voice frequency signal ports:

by measuring the audio signal break-through (demodulated 1-kHz) on the signal port during application of the continuous exposures immunity phenomena in both signal path directions covering both analogue to digital conversion and digital to analogue conversion;

- ~~by testing the functionality of the main signal port and the other signal ports after the transient exposures;~~
- ~~by verifying that corruption of software and data held in memory has not occurred.~~

~~6.3.2.1 Performance criterion for continuous phenomena~~

The noise signal level received from the EUT measured in an impedance of 600 Ω shall not be greater than -40 dBm.

6.3.2.2 Performance criterion for transient phenomena

The performance of the equipment shall be verified for analogue voice frequency signal ports by testing the functionality of the main signal port and the other signal ports after the application of the transient immunity phenomena.

6.3.3 Ethernet and packet-data interfaces

6.3.3.0 Introduction

To interfaces operating in packet mode the criteria below apply.

6.3.3.1 Performance criterion for continuous phenomena

For interfaces which are intended for the transmission of third party data traffic, a selected port shall be connected to test equipment (e.g. a data communications analyser) as a single Point-to-Point data link. This will avoid excessive failed transmission attempts caused by data collisions and bus contention problems.

The interface shall be suitably exercised and monitored throughout the test period for errored frames.

No more than 5 % additional errored frames above the quiescent level shall be permitted during the exposure.

6.3.3.2 Performance criterion for transient phenomena

The data link connection shall be maintained.

6.3.4 Service and maintenance interfaces

These type of ports are not intended to be permanently connected, and therefore is not subjected to immunity tests. After the conclusion of all immunity tests it shall be verified that ~~the performance of these ports meets the manufacturer's specifications~~continue to operate as intended.

6.3.5 Synchronization interfaces

6.3.5.0 Introduction

The performance of slave clock ports shall be checked with the equipment synchronized with an external source.

6.3.5.1 Performance criterion for continuous phenomena

During the exposure, synchronization shall not be lost.

6.3.5.2 Performance criteria for transient phenomena

No alarm indications shall persist after the exposure.

~~The functional performance according to the manufacturer's specification shall be verified following cessation of the exposure.~~

6.3.6 Remote alarm interfaces

6.3.6.0 Introduction

~~These interfaces are defined by the manufacturer.~~

6.3.6.1 Performance criterion for continuous phenomena

No false alarms shall occur during continuous exposures.

6.3.6.2 Performance criterion for transient phenomena

No false alarm indications shall persist after the exposure.

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

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

7 Applicability overview tables

7.1 Emission

7.1.1 General

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

~~For fixed radio link equipment, only the part of table 1 which specifies the requirements for radio and ancillary equipment for fixed use shall apply.~~

Table 2: Emission requirements

Phenomenon	Port	Applicability	Reference clause
radiated emission	enclosure	applicable	7.1.2
conducted emission	DC power input/output port	applicable	ETSI EN 301 489-1 [1], clause 8.3
conducted emission	AC mains input/output port	applicable	ETSI EN 301 489-1 [1], clause 8.4
harmonic current emissions	AC mains input port	applicable	ETSI EN 301 489-1 [1], clause 8.5
voltage fluctuations and flicker	AC mains input port	applicable	7.1.2
conducted emission	wired network port	applicable	ETSI EN 301 489-1 [1], clause 8.7

7.1.2 Special conditions

The following special conditions set out in table 43 relate to the EMC emission measurements and limits used in ETSI EN 301 489-1 [1], clause 8.

Table 43: Special conditions for EMC emission tests

Reference to clauses in ETSI EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in ETSI EN 301 489-1 [1], clause 8
8.2.3:— Limits; Enclosure of ancillary equipment measured on a stand alone basis	NOTE 1:—The radiated emissions from the enclosure of the radio equipment shall meet the same requirements as stated for the enclosure of ancillary equipment in ETSI EN 301 489-1 [1], clause 8.2.
8.3.3:— Limits; DC power input/output ports 8.6: Voltage fluctuations and flicker	NOTE 2:—The emission limits for DC power ports given in table 6 requirements of ETSI EN 301 489-1 [1], clause 8.6 shall apply, with the exception of the first paragraph of clause 6.1 of EN 61000-3-3 [2].

7.2 Immunity

7.2.1 General

Table 2 in ETSI EN 301 489-1 [1], Table 4 contains the applicability of EMC immunity measurements to the relevant ports of radio and/or associated ancillary equipment.

For fixed radio link equipment, only the part of table 2 of ETSI EN 301 489-1 [1] which specifies the requirements for radio and ancillary equipment for fixed use shall apply.

Table 4: Immunity requirements

Phenomenon	Port	Applicability	Reference clause	Performance Criteria clause
RF electromagnetic field (80 MHz to 6 000 MHz)	enclosure port	applicable	7.2.2	6.1
electrostatic discharge	enclosure	applicable	ETSI EN 301 489-1 [1], clauses 9.3.1 and 9.3.2	6.2
fast transients common mode	signal, wired network and control ports	applicable	ETSI EN 301 489-1 [1], clauses 9.4.1 and 9.4.2	6.2
	DC power ports	applicable	ETSI EN 301 489-1 [1], clauses 9.4.1 and 9.4.2	6.2
	AC power ports	applicable	ETSI EN 301 489-1 [1], clauses 9.4.1 and 9.4.2	6.2
RF common mode 0,15 MHz to 80 MHz	signal, wired network and control ports	applicable	ETSI EN 301 489-1 [1], clauses 9.5.1 and 9.5.2	6.1
	DC power ports	applicable	ETSI EN 301 489-1 [1], clauses 9.5.1 and 9.5.2	6.1
	AC power ports	applicable	ETSI EN 301 489-1 [1], clauses 9.5.1 and 9.5.2	6.1
transients and surges	DC power input ports	not applicable	None	not applicable
voltage dips and interruptions	AC mains power input ports	applicable	7.2.2	6.2
surges, line to line and line to ground	AC mains power input ports	applicable	ETSI EN 301 489-1 [1], clauses 9.8.1 and 9.8.2	6.2
	wired network ports	applicable	ETSI EN 301 489-1 [1], clauses 9.8.1 and 9.8.2	6.2

7.2.2 Special conditions

The following special conditions set out in table 25 relate to the immunity test methods and performance criteria used in ETSI_EN 301 489-1 [1], clause 9.

Table 25: Special conditions for EMC immunity tests

Reference to clauses in ETSI EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in ETSI EN 301 489-1 [1], clause 9
9.2.2: Test method; Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	Test level: For the frequency range 80 MHz to 690 MHz, test level shall be 3 V/m. For the frequency range 690 MHz to 6 000 MHz test level shall be 10 V/m.
9.7.3: Performance criteria; Voltage dips and interruptions	Voltage interruptions: For voltage interruptions, temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

Annex A (informative): 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.11] 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.1].

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 301 489-4					
Requirement				Requirement Conditionality	
No	Description	<u>Essential requirements of Directive</u>	<u>Reference: Clause No(s) of the present document</u>	U/C	Condition
1	Emissions: Enclosure port	<u>3.1(b)</u>	<u>7.1.2</u>	U	
2	Emissions: DC power input/output ports	<u>3.1(b)</u> 8.3 of ETSI EN 301 489-4 [1]	<u>7.1</u>	C	Only where equipment has DC power input and/or output ports with a cable length greater than 3 m or from a vehicle power supply
3	Emissions: AC mains power input/output ports	8.4 of ETSI EN 301 489-4 [1] <u>3.1(b)</u>	<u>7.1</u>	C	Only where equipment has AC mains power input and/or output ports
4	Emissions: Harmonic current emission (AC mains input port)	8.5 of ETSI EN 301 489-4 [1] <u>3.1(b)</u>	<u>7.1</u>	C	Only where equipment has AC mains power input ports
5	Emissions: Voltage fluctuations and flicker (AC mains input ports)	8.6 of ETSI EN 301 489-4 [1] <u>3.1(b)</u>	<u>7.1.2</u>	C	Only where equipment has AC mains power input ports
6	Emissions: Wired network ports	<u>3.1(b)</u>	8.7 of ETSI EN 301 489-4 [1] <u>7.1</u>	C	Only where equipment has wired network ports
7	Immunity: Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	<u>3.1(b)</u>	<u>7.2.2</u>	U	
8	Immunity: Electrostatic discharge	9.3 of ETSI EN 301 489-4 [1] <u>3.1(b)</u>	<u>7.2</u>	U	
9	Immunity: Fast transients common mode	9.4 of ETSI EN 301 489-4 [1] <u>3.1(b)</u>	<u>7.2</u>	U	
10	Immunity: Radio frequency common mode	9.5 of ETSI EN 301 489-4 [1] <u>3.1(b)</u>	<u>7.2</u>	U	
11	Immunity: Transients and surges in the vehicular environment	9.6 of ETSI EN 301 489-4 [1] <u>3.1(b)</u>	<u>7.2</u>	C	Only where equipment is <u>intended to be fitted to a vehicle power supply</u>
12	Immunity: Voltage dips and interruptions	<u>3.1(b)</u>	<u>7.2.2</u>	C	Only where equipment has AC mains power input ports
13	Immunity: Surges, line to line and line to ground	9.8 of ETSI EN 301 489-4 [1] <u>3.1(b)</u>	<u>7.2</u>	C	Only where equipment has AC mains power input ports and/or wired network ports

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.

Essential requirements of Directive

_____ Identification of article(s) defining the requirement in the Directive.

Clause Number(s) of the present document

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 is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement is or is not 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.

~~Annex B (informative):
Examples of Fixed Radio Link equipment within the scope of
the present document~~

~~B.1 Fixed Radio Systems; Point-to-Point equipment;
intended for operation in the frequency bands from
1,3 GHz to 86 GHz~~

~~The present document applies to Fixed radio link. Definitions of such Fixed Radio Link equipment and associated ancillary equipment are found in the following functional radio standard:~~

- ~~• ETSI EN 302 217 2 [i.5].~~

~~B.2 Fixed Radio Systems; Point-to-Multipoint equipment;
intended for operation in the frequency band
below 1 GHz and in frequency bands from 1 GHz to
40 GHz~~

~~The present document applies to Fixed radio link. Definitions of such Fixed Radio Link equipment and associated ancillary equipment are found in the following functional radio standard:~~

- ~~• ETSI EN 302 326 2 [i.7].~~

~~Annex C~~ Annex B (informative): Change history

Version	Information about changes
3.1.1	<ul style="list-style-type: none"><li data-bbox="421 371 1315 450">• Radiated immunity testing to a continuous sweep between 690 MHz and 6 000 MHz at 10 V/m, as opposed to the previous frequency range of 80 MHz to 1 000 MHz and 1 400 MHz to 2 700 MHz in earlier editions.<li data-bbox="421 454 1315 506">• New derivations of exclusion bands more closely linked to the operational characteristics of the radio link(s) in the EUT.
3.3.1	<ul style="list-style-type: none"><li data-bbox="421 510 1315 537">• Alignment with ETSI EN 301 489-1 (V2.2.3) and feedback from EC.

History

Document history		
V1.2.1	August 2000	Publication
V1.3.1	August 2002	Publication
V1.4.1	May 2009	Publication
V2.1.1	November 2012	Publication
V2.2.1	May 2015	Publication
V3.1.1	February 2017	Publication
V3.2.0	March 2017	EN Approval Procedure AP 20170606: 2017-03-08 to 2017-06-06
V3.2.1	April 2019	Publication
<u>V3.3.0</u>	<u>March 2020</u>	<u>EN Approval Procedure AP 20200628: 2020-03-30 to 2020-06-29</u>
<u>V3.3.1</u>	<u>December 2020</u>	<u>Vote V 20210206: 2020-12-08 to 2021-02-08</u>
<u>V3.3.1</u>	<u>February 2021</u>	<u>Publication</u>