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Short Range Devices (SRD) operating in 1 GHz to 40 GHz;
Harmonised Standard for access to radio spectrum;
Part 2: Radiodetermination equipment for location tracking applications operating in the frequency range 2,4 GHz to 2,4835 GHz

Reference
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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 - APE 7112B
Association à but non lucratif enregistrée à la
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Contents

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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 Standardisation Request deliverable Approval Procedure (SRdAP).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.4] 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.3].

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 Short Range Devices (SRD) operating in 1 GHz to 40 GHz; Harmonised Standard for access to radio spectrum, as identified below:

Part 1: "Radiocommunication equipment in the frequency ranges 2,4 GHz to 2,4835 GHz and 5,725 GHz to 5,875 GHz";

Part 2: "Radiodetermination equipment for location tracking applications operating in the frequency range 2,4 GHz to 2,4835 GHz";

Part 3: "Intrusion radiodetermination equipment operating in the frequency range 1 GHz to 40 GHz".

NOTE: The list above shows the planned multi-part deliverable, at the time, when the present document was published.

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.

Introduction

Attention is drawn to new clauses 4.1 and 5.1 which ensure that requirements and tests apply at all operating conditions within the environmental profile given by the equipment's intended use. The intended use is provided in equipment documentation according to article 10 of the Radio Equipment Directive 2014/53/EU [i.3].

1 Scope

The present document specifies technical requirements, limits, and test methods for radiodetermination equipment for location tracking applications operating in the frequency range 2,4 GHz to 2,4835 GHz.

Further details of the covered equipment can be found in clause 4.2 of the present document.

NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.3] 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 in the ETSI docbox.

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 303 883-1 (V2.1.1) (08-2024): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Part 1: Measurement techniques for transmitter requirements".

[2] ETSI EN 303 883-2 (V2.1.1) (08-2024): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Part 2: Measurement techniques for receiver requirements".

[3] ETSI TS 103 941 (V1.1.1) (01-2024): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Measurement setups and specifications for testing under full environmental profile (normal and extreme environmental conditions)".

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 may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

[i.1] Void.

[i.2] Commission Implementing Decision (EU) 2025/105 of 22 January 2025 amending Decision 2006/771/EC updating harmonised technical conditions in the area of radio spectrum use for short-range devices and repealing Implementing Decision 2014/641/EU on harmonised technical conditions of radio spectrum use by wireless audio programme making and special events equipment in the Union.

[i.3] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.

[i.4] 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.5] ETSI EG 203 336 (V1.2.1): "Guide for the selection of technical parameters for the production of Harmonised Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".

[i.6] ETSI TS 103 567 (V1.1.1): "Requirements on signal interferer handling".

[i.7] ERC/REC 74-01: "Unwanted emissions in the spurious domain", latest amendment on 23 May 2022.

[i.8] ETSI TR 102 273-2 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 2: Anechoic chamber".

[i.9] ETSI TS 102 321 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Normalized Site Attenuation (NSA) and validation of a fully lined anechoic chamber up to 40 GHz".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 303 883-1 [1], ETSI EN 303 883-2 [2], ETSI TS 103 941 [3] and the following apply:

Angle of Arrival (AOA): method used to determine the direction of a radio-frequency wave that hits an antenna array. It is calculated by measuring the difference in path length between the different elements of the array

NOTE: The location of a transmitter may be found by determining the intersection of multiple paths.

Receiver Baseline Resilience (RBR): capability to maintain a pre-determined minimum acceptable level of performance in the presence of unwanted signals over the frequency band of operation, applicable adjacent and remote frequency bands

Receiver Baseline Sensitivity (RBS): capability to receive a wanted signal at application related defined input signal levels while providing a pre-determined minimum acceptable level of technical performance

Received Signal Strength Indication (RSSI): measurement of the power of a received radio signal

NOTE: The location of a transmitter can be determined by comparing the strength of the signal received at multiple known locations.

Time Difference Of Arrival (TDOA): method to compare the moment of reception of a single transmission at multiple synchronized receivers

NOTE: It can be used to compute the location of a transmitter by comparing the difference of arrival time of the multiple receivers at known locations.

3.2 Symbols

For the purposes of the present document, the symbols given in ETSI EN 303 883-1 [1], ETSI EN 303 883-2 [2], ETSI TS 103 941 [3] and the following apply.

f_L lowest frequency of the operating frequency range
f_{LS} lowest frequency of the operating frequency range start spurious domain below f_C
f_H highest frequency of the operating frequency range
f_{LS} start spurious domain above f_C
f_C centre frequency of the operating frequency range

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 303 883-1 [1], ETSI EN 303 883-2 [2], ETSI TS 103 941 [3] and the following apply:

AOA	Angle Of Arrival
RSSI	Received Signal Strength Indication
TDOA	Time Difference Of Arrival

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 in accordance with its intended use, 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 operational environmental profile defined by its intended use.

4.2 Equipment categories

There are two equipment categories in the scope of the present document (see Table 1).

Table 1: Equipment categories

Equipment Category	Equipment type	Frequency Band	Band number in EC Decision 2025/105/EU [i.2]
TX1	TX only	2,4 - 2,4835 GHz	57b
RX1	RX only	2,4 - 2,4835 GHz	57b

The TX1 equipment category transmits its identification and alerts to have its location determined by a set of RX1. The TX1 equipment category has an integral antenna.

The second category is a receive only equipment (RX1) that provides the location determination through TDOA or other location determining means such as RSSI or AOA. Equipment in the RX1 category has an external dedicated antenna and a connector.

Table 2 provides an overview of the requirements of all categories specified in the present document.

Table 2: Equipment categories and applicability of requirements

Category	TX requirements		RX-requirements	
	requirement	clause	requirement	clause
TX1	OFR	4.3.2	Not applicable	Not applicable
	RF Output Power	4.3.3		
	TXUE	4.3.5		
	TX-behaviour	4.3.6		
RX1	Not applicable	Not applicable	RX-spurious	4.4.3
			RBS	4.4.4
			RBR	4.4.5

4.3 Transmitter requirements

4.3.1 General

The transmitter requirements apply to TX1 equipment in the TX1 category.

4.3.2 Operating Frequency Range (OFR)

4.3.2.1 Applicability

Operating Frequency Range (OFR) requirement applies to equipment in the TX1 category, see clause 4.2, Table 1 of the present document.

4.3.2.2 Description Operating Frequency Range

For the description of the Operating Frequency Range (OFR), see ETSI EN 303 883-1 [1], clause 5.2.1. The OFR is the difference between f_H and f_L. As required in ETSI EN 303 883-1 [1], clause 5.2.1 the required limit for the parameter X is 23 dB.

4.3.2.3 Limits for Operating Frequency Range

The OFR derived from f_L and f_H of the Equipment shall be within the permitted frequency ranges specified in Table 3.

Table 3: Permitted frequency range

Equipment category	Frequency Range
TX1	2,4 - 2,4835 GHz

4.3.2.4 Conformance

The conformance test for OFR is defined in clause 5.3.1 of the present document.

4.3.3 RF output power

4.3.3.1 Applicability

RF output power requirement applies to equipment in the TX1 category, see clause 4.2, Table 1.

4.3.3.2 Description RF output power

The RF output power is defined as the mean equivalent isotropic radiated power (Mean e.i.r.p.). For the description of the Mean e.i.r.p., see ETSI EN 303 883-1 [1], clause 5.3.1.1

4.3.3.3 Limits for RF output power

The limit for the RF output power requirement within the OFR, shall be as specified in Table 4 below.

Table 4: RF output power for radiodetermination equipment

Equipment category	Frequency Range	RF output power
TX1	2,4 - 2,4835 GHz	25 mW

4.3.3.4 Conformance

The conformance test for RF Power Output is defined in clause 5.3.2 of the present document.

4.3.4 TX unwanted emissions (TXUE)

4.3.4.1 Applicability

TX unwanted emissions requirement applies to equipment in the TX1 category, see clause 4.2, Table 1.

4.3.4.2 Description TX unwanted emissions

The description of TX unwanted emissions is given in ETSI EN 303 883-1 [1], clause 5.5.1.

4.3.4.3 Limits for TX unwanted emissions

The limits in Table 5 shall apply to any unwanted emission in the OOB domain. The OOB limit is to be derived from limits for output power (see clause 4.3.3.3 of the present document) equation (1).

$$OOB\ limit\ [dBm/MHz] = 14_{dBm} - 23\ dB - 10 \times log_{10}\left(\frac{OFR_{EUT}\ [MHz]}{\text{RBW}\ [MHz]}\right) \quad (1)$$

where:

- 14 dBm is the output power limit from clause 4.3.3.3.
- OFR_{EUT} is measurement result from clause 5.3.1.
- RBW [MHz] is the Resolution Bandwidth (RBW) used for the OFR conformance testing, 1 MHz.

Table 5: emission limit in the OOB domain

category	Frequency Range (GHz)	OOB limit (dBm)
TX1	$f_{LS} < f < f_L$	calculated from equation (1)
	$f_H < f < f_{HS}$	calculated from equation (1)

The maximum power limits of TX1 category for the unwanted emissions in the spurious domain shall be as in Table 6 below. Lower (F_{LOWER}) and upper frequency (F_{UPPER}) for the spurious emissions tests are based on the equipment OFR (see clause 4.3.2 of the present document) and are in line with ERC/REC 74-01 [i.7].

Table 6: Spurious TX unwanted emission limits in the spurious domain

Frequency range	Limit values for TXUE	Measurement bandwidth (RBW)
87,5 MHz ≤ f ≤ 118 MHz	-54 dBm	100 kHz
174 MHz ≤ f ≤ 230 MHz	-54 dBm	100 kHz
470 MHz ≤ f ≤ 694 MHz	-54 dBm	100 kHz
otherwise in band 30 MHz ≤ f < 1 000 MHz	-36 dBm	100 kHz
1 000 MHz ≤ f ≤ 13 GHz	-30 dBm	1 MHz
NOTE: The limits apply for the ranges $f < f_{LS}$ and $f_{HS} < f$.		

NOTE: The spurious TX unwanted emission limits in the spurious domain are in accordance with ERC/REC 74-01 [i.7], Annex 2, Table 6, reference number 2.1.2.

4.3.4.4 Conformance

The conformance test for TX unwanted emissions is defined in clause 5.3.3 of the present document.

4.3.5 TX behaviour

4.3.5.1 Applicability

TX behaviour requirement applies to equipment in the TX1 category, see clause 4.2, Table 1 of the present document.

4.3.5.2 Description

The TX behaviour verifies the conformance of the RF Output Power and the OFR within the permitted range over the environmental profile as specified in clause 5.1.3 of the present document.

For the description of the TX behaviour, see ETSI TS 103 941 [3], clause 4.3.1.

4.3.5.3 Limits

The TX behaviour is obtained by measuring the RF Output Power across the complete environmental profile (see clause 5.1.3 of the present document) and assessing the variation with respect to an adjusted Regulated Limit (RL).

The procedure to adjust the regulated limit is described in ETSI TS 103 941 [3], clause 6.3.

TX1 category: the limits of RF Output Power from clause 4.3.3 are applied indirectly over the full environmental profile (as specified in clause 5.1.3 of the present document) with a relative measurement. The difference between each environmental profile relative measurement point (P_{step}) and the relative reference value REF_{power} at normal condition, both expressed in decibels, shall be smaller than the difference between the individual regulated RF Output Power limit (see clause 4.3.3, Table 4 of the present document) and the maximum measured value obtained in an absolute measurement according to clause 4.3.3 of the present document.

4.3.5.4 Conformance

The conformance test for TX behaviour is defined in clause 5.3.4 of the present document.

4.4 Receiver requirements

4.4.1 General

The receiver requirements apply for RX1 category as specified in clause 4.2, Table 1 of the present document.

4.4.2 Wanted Technical Performance Criteria

The wanted technical performance criteria for RX1 category is used for the RBS (see clause 4.4.4 of the present document) and RBR (see clause 4.4.5 of the present document) requirement.

The equipment shall fulfil a Message Success Ratio better than 80 %.

For the RBR test the equipment shall meet this requirement also during interferer present, as shown in Figure 1.

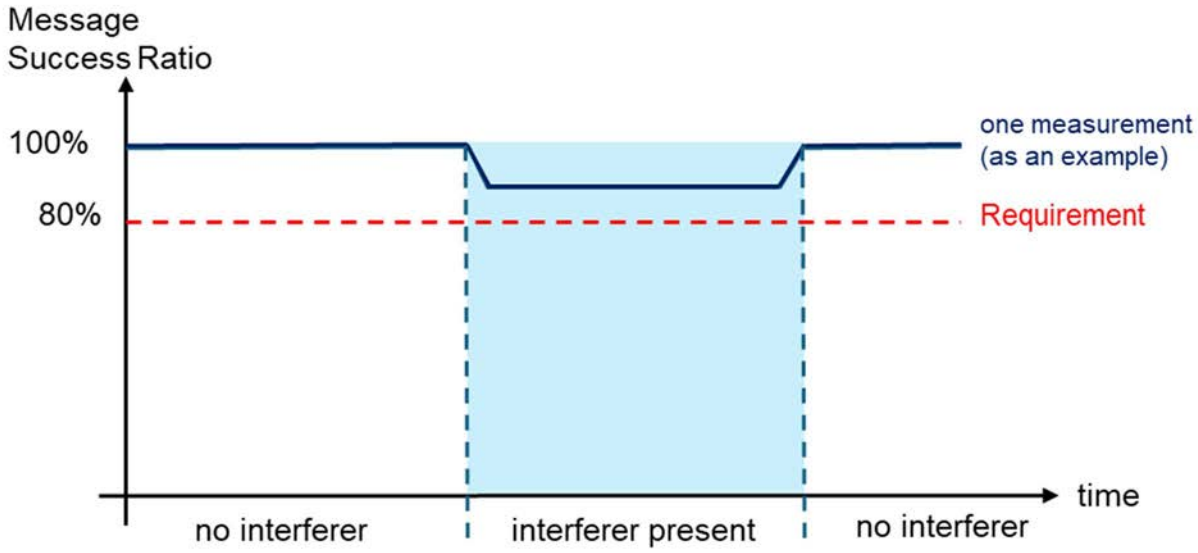

Figure 1: Wanted technical performance criteria for RBS and RBR test

The equipment shall support the determination of the MSR for the test setup in the present document.

The MSR shall be determined with at least 20 messages (e.g. 16 successful message detections out of 20).

NOTE 1: The equipment covered by the present document uses a packet-based exchange for distance bounding and/or location tracking and/or data transfer. This exchange is referred to as "message". The performance requirement is based on the successful detection of messages by the equipment. An adequate Message Success Ratio (MSR), as specified in the present document, is, therefore, an appropriate wanted technical performance criterion.

NOTE 2: For the general case of proprietary protocols, supporting an MSR measurement will require that the manufacturer provides an appropriate companion equipment or signal generator configuration to generate a "wanted signal", as well as tools to read out successful message detection from the equipment and calculate MSR.

4.4.3 Receiver spurious emissions

4.4.3.1 Applicability

Receiver spurious emissions requirement applies for RX1 category, see clause 4.2, Table 1 of the present document.

4.4.3.2 Description

For the description of the Receiver spurious emissions, see ETSI EN 303 883-2 [2], clause 5.2.1.

4.4.3.3 Limits

For RX spurious emissions the limits in Table 7 shall apply.

Table 7: Receiver spurious emission limits

Frequency range	Limit values
30 MHz ≤ f ≤ 1 000 MHz	- 57 dBm
1 GHz < f ≤ 13 GHz	-47 dBm
NOTE 1: The limits of the receiver spurious emission limits are in accordance with ERC/REC 74-01 [i.7], Annex 2, Table 6, reference number 2.1.4. NOTE 2: 13 GHz corresponds to the fifth harmonic as defined in ERC/REC 74-01 [i.7], Table 1 plus a margin.	

4.4.3.4 Conformance

The conformance test for Receiver spurious emissions is defined in clause 5.4.1 of the present document.

4.4.4 Receiver Baseline Sensitivity (RBS)

4.4.4.1 Applicability

RBS requirement applies to RX1 category, see clause 4.2, Table 1 of the present document.

4.4.4.2 Description for the RBS requirements

For the description of the RBS requirement, see ETSI EN 303 883-2 [2], clause 5.4.1.

4.4.4.3 Limits

The Receiver Baseline Sensitivity (RBS) is defined as the "received power at the equipment" (according to ETSI EN 303 883-2 [2], clause 5.4.3.3) and shall be at least 104 dB below the maximum Mean e.i.r.p. (see clause 4.3.3 of the present document) level of 14 dBm:

- Receiver Baseline Sensitivity: $P_{@equipment} \leq$ -90 dBm

NOTE 1: Received power at the equipment includes the dedicated equipment antenna gain.

NOTE 2: Baseline sensitivity is defined with the same unit as RF Output Power, and therefore the measurement methods for RF Output Power can be reused for quantifying the received power at the equipment.

The wanted technical performance criteria for RX1 category for the RBS test shall be the criteria, as defined in clause 4.4.2 of the present document.

4.4.4.4 Conformance

The conformance test for RBS is defined in clause 5.4.3 of the present document.

4.4.5 Receiver Baseline Resilience (RBR)

4.4.5.1 Applicability

RBR requirement applies to RX1 category, see clause 4.2, Table 1 of the present document.

4.4.5.2 Description for the RBR requirement

For the description of the RBR requirement, see ETSI EN 303 883-2 [2], clause 5.5.1.

4.4.5.3 Limits

The present document considers one interference scenario. In this scenario the Wanted Technical Performance Criteria (clause 4.4.2 of the present document) shall be fulfilled.

The wanted signal level for all RBR tests shall be 10 dB above the RX Baseline Sensitivity (see clause 4.4.4.3 of the present document):

- Sensitivity degradation d_g = 10 dB

Limits for the interferer within OFR shall be as given as in Table 8.

In the presence of an interference signal as in Table 8, the sensitivity limit defined in clause 4.4.4.3 shall not be decreased by more than 10 dB.

Table 8: RBR limits within OFR

Category	TX (companion equipment TX1)	Power level at equipment of the interfering signal	Wanted technical performance criterion	Interferer test frequencies	Modulation of test signals
RX1	normal operation	-85 dBm	See clause 4.4.2	Fc (note)	CW
NOTE: Centre frequency of TX1 OFR, see clause 4.3.2 of the present document.					

Limits for the interferer outside OFR shall be as given in Table 9.

Table 9: RBR limits outside OFR

Category	TX (companion equipment TX1)	Power level at equipment of the interfering signal	Wanted technical performance criterion	Test frequencies	Modulation of test signals
RX1	normal operation	-34 dBm	See clause 4.4.2	f_c - 2,5 × OFR f_c - 0,8 × OFR f_c + 0,8 × OFR f_c + 2,5 × OFR	CW

4.4.5.4 Conformance

The conformance test for RBR is defined in clause 5.4.4 of the present document.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

5.1.1 General

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

Where 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.

5.1.2 Normal test conditions

Normal test conditions shall be as defined in clause 4.5.3.1 of ETSI TS 103 941 [3].

5.1.3 Complete environmental profile test conditions

Normal test conditions are defined in clause 5.1.2 of the present document.

Extreme test conditions shall be as defined in clause 4.5.3.2 of ETSI TS 103 941 [3] with a temperature range varying between -30 °C to +55 °C; the primary supply voltage varies from 90 % to 110 % of the nominal value.

NOTE: The nominal value of the supply voltage is usually provided by the user manual of the EUT.

5.2 Conformance test suites and general conditions for testing

General guidance on testing TX and RX measurements are given respectively in ETSI EN 303 883-1 [1], clause 5.1.1 for the TX requirements and ETSI EN 303 883-2 [2], clause 5.1 for the RX requirements.

ETSI EN 303 883-1 [1], Annex A provides complementary information on general conditions for testing, e.g. test environment and test conditions, and interpretation of the measurement results. An overview is provided in ETSI EN 303 883-1 [1], clause A.1.

Information about measurement uncertainty is provided in ETSI EN 303 883-1 [1], clause A.8.

ETSI EN 303 883-1 [1], Annex B provides complementary information on test setups for testing, e.g. radiated and conducted measurements. An overview for radiated measurements is provided in ETSI EN 303 883-1 [1], clause B.2.1.

General information's on test set-up for measurements under environmental profile are given respectively in ETSI TS 103 941 [3], clause 5.1. More detailed test solutions are provided in:

- ETSI TS 103 941 [3], clause 5.2 with the usage of a temperature chamber; and
- ETSI TS 103 941 [3], clause 5.3 with the usage of a climate dome and anechoic chamber.

5.3 Conformance methods of measurement for TX requirements

5.3.1 Operating Frequency Range (OFR)

The conformance test shall be done under normal conditions as defined in clause 5.1.2 of the present document.

The test shall be done in 3 m distance inside an FAR, see ETSI EN 303 883-1 [1], clause B.2.2.2 and the test setup shall be based on the test method as described in ETSI EN 303 883-1 [1], clause B.4. Further information on FAR is available in ETSI TR 102 273-2 [i.8] and ETSI TS 102 321 [i.9].

OFR measurement should be done with the same setup of clause 5.3.2 below using the conformance test in ETSI EN 303 883-1 [1], clause 5.3.2.5.

The measured results of the OFR [MHz], f_L [MHz], f_H [MHz] and the highest emission (Pmax) [dBm/MHz] within the OFR shall be recorded.

For the purpose of Tx behaviour measurements in clause 5.3.4, the difference $DELTA_{fL}$ and $DELTA_{fH}$ between the OFR boarders to the edges of the permitted frequency range shall be calculated, see ETSI TS 103 941 [3], clause 6.3.1.2, Action 2.

5.3.2 RF output power

The conformance test shall be done under normal conditions as defined in clause 5.1.2 of the present document.

The RF output power conformance test shall be performed in 3m distance inside an FAR, see ETSI EN 303 883-1 [1], clause B.2.2.2 and the test setup shall be based on the test method as described in ETSI EN 303 883-1 [1], clause B.4. Further information on FAR is available in ETSI TR 102 273-2 [i.8] and ETSI TS 102 321 [i.9].

The conformance test procedure as specified in ETSI EN 303 883-1 [1], clause 5.3.1.3 shall be used.

For the purpose of Tx behaviour measurements in clause 5.3.4, the difference $DELTA_{power}$ between the RF output power limit (RL) in Table 4 and the maximum of the measured results for the RF output power. ($NORM_{abs}$), shall be calculated for each measurement direction around the equipment (see ETSI TS 103 941 [3], clause 6.3.1.2, Action 1).

The direction of the maximum RF output power (that gives the smallest difference $DELTA_{power}$), the measured results of the RF output power ($NORM_{abs}$) as well as the value of $DELTA_{power}$ shall be recorded.

5.3.3 TX unwanted emissions

5.3.3.1 General

The conformance test shall be done under normal conditions as defined in clause 5.1.2 of the present document.

Conformance for the TX unwanted emission of the TXUE OOB domain shall be tested according to clause 5.3.3.2.

Conformance for the TX unwanted emission of the TXUE spurious domain shall be tested according to clause 5.3.3.3.

5.3.3.2 TXUE OOB Domain

The TXUE OOB domain conformance test shall be performed in 3 m distance inside an FAR, as specified in ETSI EN 303 883-1 [1], clause B.2.2.2 and the test setup shall be based on the test method as described in ETSI EN 303 883-1 [1], clause B.4. Further information on FAR is available in ETSI TR 102 273-2 [i.8] and ETSI TS 102 321 [i.9].

For the OOB domain the measurement shall be according to ETSI EN 303 883-1 [1], clause 5.5.3.2.2. The specifications for the measurement are:

- Resolution bandwidth (RBW): 1 MHz
- Video bandwidth: VBW equal or greater than the RBW
- Detector mode: RMS
- Display mode: Max. Hold
- Average Time: Equal or larger than signal repetition time
- Number of measurement points: At least equal to frequency span divided by RBW
- Sweep Time: Time for spectrum analyser sweep (over one Frequency Span).

  Appropriate settings shall be calculated with the following equation (2):

  $$\text{Sweep Time (SWT)} \geq \text{signal repetition time} \times Number\ of\ measurement\ points \quad (2)$$

- Signal repetition time: See annex C of ETSI EN 303 883-1 [1].

5.3.3.3 TXUE Spurious domain

The TXUE spurious domain conformance test shall be performed in 3 m distance inside an FAR as specified in ETSI EN 303 883-1 [1], clause B.2.2.2 and the test setup shall be based on the test method as described in ETSI EN 303 883-1 [1], clause B.4. Further information on FAR is available in ETSI TR 102 273-2 [i.8] and ETSI TS 102 321 [i.9].

For the TXUE Spurious domain, the measurement shall be according to ETSI EN 303 883-1 [1], clause 5.5.3.1.1, step 1. In this step 1 a fast pre-scan using a peak detector is conducted in order to determine the spatial direction and the frequencies where EUT produces emissions above the limit. For all measurement results out of step 1 which are above the limit of clause 4.3.4.3, Table 6 of the present document, the assessment shall proceed with step 2a in ETSI EN 303 883-1 [1], clause 5.5.3.1.3.

The Duty Cycle measurement procedures in ETSI EN 303 883-1 [1], clause 5.11.2 can be used to assess T_{on} time.

5.3.4 TX behaviour

The conformance test shall be done under the complete environmental profile conditions as defined in clause 5.1.3 of the present document.

A test set-up shall be selected based on clause 4.3.1 and Figure 1 in ETSI TS 103 941 [3].

The procedure according to ETSI TS 103 941 [3], clause 6.3 shall be used.

For the TX1 category the reference requirements to be assessed over the environmental profile is the Operating Frequency Range (OFR) from clause 5.3.1 of the present document and RF Output Power from clause 5.3.2 of the present document. The measurement of OFR and RF Output Power shall be used as the basis for the assessment.

Based on clause 5.1.3 of the present document and ETSI TS 103 941 [3], clause 4.5.4, Figure 6, the parameters for the assessment are specified as follows:

- t_{low}: see clause 5.1.3, set to -30 °C
- t_{high}: see clause 5.1.3, set to +55 °C
- t_{steps}: 20 °C
- supply voltage: see clause 5.1.3 of the present document, the nominal value of the supply voltage is provided by the user manual of the EUT.

5.4 Conformance methods of measurement for receiver

5.4.1 Receiver spurious emissions

The conformance test shall be done under normal conditions as defined in clause 5.1.2 of the present document.

The receiver spurious emissions test shall be performed inside an FAR, as specified in ETSI EN 303 883-1 [1], clause B.2.2.2 and the test setup shall be based on the test method as described in ETSI EN 303 883-1 [1], clause B.4. Further information on FAR is available in ETSI TR 102 273-2 [i.8] and ETSI TS 102 321 [i.9].

Conformance shall be tested according to ETSI EN 303 883-2 [2], clause 5.2.3.

5.4.2 General for RBS and RBR conformance tests

The conformance test shall be done under normal conditions as defined in clause 5.1.2 of the present document.

The test shall be done inside an FAR, as specified in ETSI EN 303 883-1 [1], clause B.2.2.2. Further information on FAR is available in ETSI TR 102 273-2 [i.8] and ETSI TS 102 321 [i.9].

5.4.3 RBS

The conformance test shall be done under normal conditions as defined in clause 5.1.2 of the present document.

Conformity of RX Baseline Sensitivity shall be a radiated test according to ETSI EN 303 883-2 [2], clause 5.4.3.3 ("Radiated measurements for radio communication devices with power limit").

All signal levels ($P_{@EUT}$) shall be determined with reference to the RF Output Power of TX1 EUT and therefore documented with the unit "dBm ".

The wanted technical performance criteria for the test are provided in clause 4.4.2 of the present document and see Figure 2 for the arrangement.

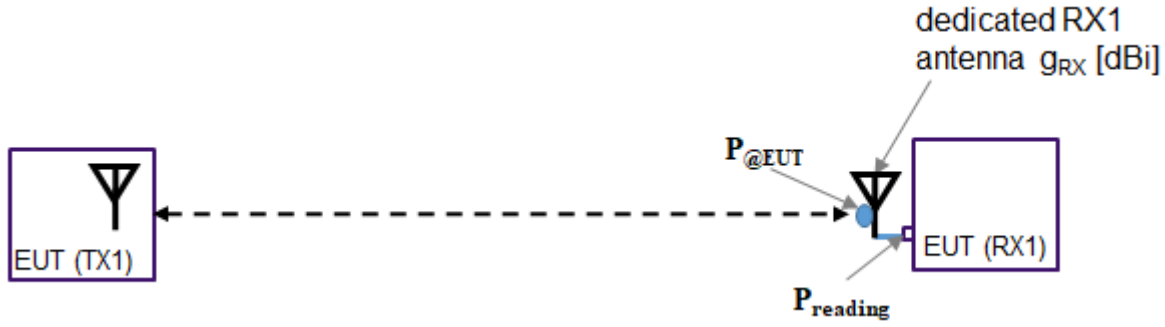

Figure 2: Radiated RBS test set-up for radiodetermination location tracking use-cases

For a practical measurement distance within a FAR (has to be shorter than the distances under normal operation) within the test set-up an additional attenuator between the RX1 EUT antenna and RX1 antenna port has to be added, see Figure 3.

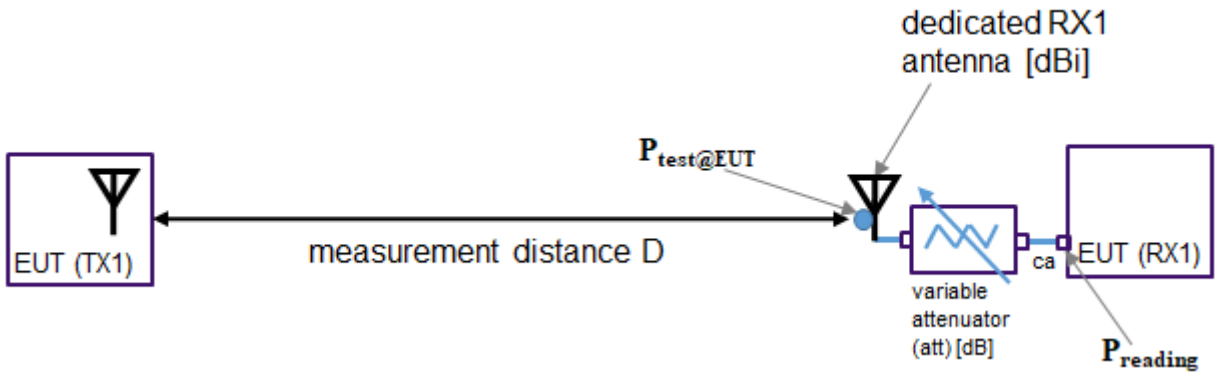

Figure 3: Radiated RBS test set-up for radiodetermination location tracking use-cases with attenuator for measurements within a FAR

The variable attenuator is to compensate the lower attenuation over the measurement distance compared to the wanted technical performance criteria specified in clause 4.4.2 of the present document.

To determine the amount to adjust the necessary attenuation of the variable attenuator (see Figure 3) the received power shall be subtracted from the antenna gain. The basis is given in equation (3).

$$P_{reading} = P_{@EUT} - g_{RX} \quad (3)$$

where:

- $P_{reading}$ received power at the RX1 EUT connector [dBm]
- $P_{@EUT}$ received power at the RX EUT antenna [dBm]
- g_{RX} antenna gain of the dedicated RX1 antenna [dB]

NOTE: If the dedicated RX1 antenna gain is not known, then one of the test set-ups as provided in ETSI EN 303 883-1 [1], clause 5.12 can be used to measure the antenna gain.

Based on equation (3), the power at the EUT RX1 connector shall be assessed allowing for all the affecting values as shown below: (see equation (4)):

$$P_{reading} = P_{test@EUT} - g_{RX} - ca - att \quad (4)$$

where:

- $P_{reading}$ received power at the RX1 EUT connector [dBm]
- $P_{test@EUT}$ received power at the RX1 EUT antenna (shorter measurement distance)
- att: variable attenuator attenuation [dB]
- ca cable attenuation [dB]
- g_{RX} antenna gain of the dedicated RX1 antenna [dB]

To measure the $P_{test@EUT}$ in the relation to the used measurement distance the same set-up as specified in clause 5.3.2 of ETSI EN 303 883-2 [2] shall be used. The arrangement is shown in Figure 4.

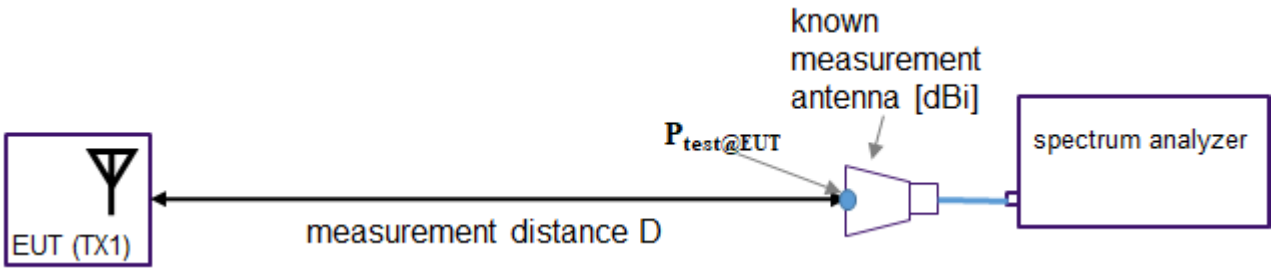

Figure 4: Test set-up for radiodetermination location tracking use-cases

To justify, if the attenuator adjustment is correct, the power at the RX1 EUT connector could be checked as shown in Figure 5. For the spectrum analyser the same setting as in clause 5.3.2 of ETSI EN 303 883-2 [2] shall be used.

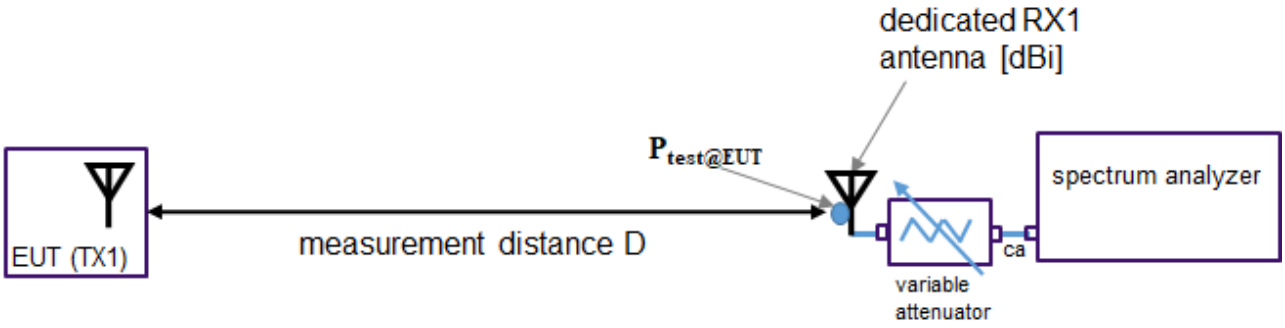

Figure 5: Test set-up for radiodetermination location tracking use-cases with attenuator for measurements within a FAR

5.4.4 RBR

The conformance test shall be done under normal conditions as defined in clause 5.1.2 of the present document.

Conformity of Receiver Baseline Resilience shall be tested according to ETSI EN 303 883-2 [2], clause 5.5.3.3 ("Radiated Measurements for Radio Communication Devices with Power Limit") with the following parameters:

- The wanted technical performance criteria for the test are provided in clauses 4.3.2. and the RBR limits as specified in clause 4.4.5.3 of the present document.
- The degradation of the sensitivity can be realized by reducing the variable attenuator attenuation by 10 dB.
- The adding of the interfering signal source and interfering transmit antenna as descripted in ETSI EN 303 883-2 [2], clause 5.5.3.3.2 the test set-up is shown in Figure 6.
- To adjust the interfering signal power level, see ETSI EN 303 883-2 [2], clause A.3.1.

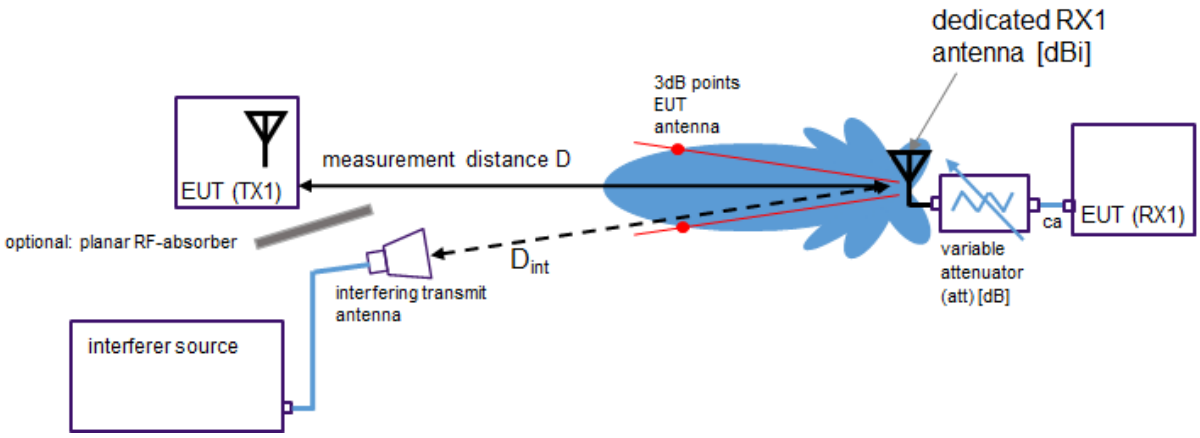

Figure 6: Radiated RBR test set up for radiodetermination reception

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.3] 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.4].

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 300 440-2					
Requirement				Requirement Conditionality	
No	Description	Essential requirements of Directive	Clause(s) of the present document	U/C	Condition
1	Operating Frequency Range	3.2	4.3.2	C	Only Category TX1
2	TX RF output power	3.2	4.3.3	C	Only Category TX1
3	TX Unwanted Emissions (TXUE)	3.2	4.3.4	C	Only Category TX1
4	TX behaviour	3.2	4.3.5	C	Only Category TX1
5	RX Wanted Technical Performance Criteria	3.2	4.4.2	C	Only Category RX1
6	Receiver spurious emissions	3.2	4.4.3	C	Only Category RX1
7	Receiver Baseline Sensitivity (RBS)	3.2	4.4.4	C	Only Category RX1
8	Receiver Baseline Resilience (RBR)	3.2	4.4.5	C	Only Category RX1

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(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): Requirement mapping

ETSI EG 203 336 [i.5], clause 5 lists the technical parameters applicable to transmitters and receivers that should be considered when producing Harmonised Standards that are intended to cover the essential requirements in article 3.2 of Directive 2014/53/EU [i.3]. Essential requirements are high level objectives described in European Directives. The purpose of the Harmonised Standard is to translate those high-level objectives into detailed technical specifications. Table B.1 contains the parameters listed in ETSI EG 203 336 [i.5], clause 5 for transmitter and receiver, and cross references these to the clauses within the present document in which the requirements for measurement of such parameters are satisfied or justified.

Table B.1: Cross reference of clauses in the present document to technical parameters for transmitter and receiver listed in ETSI EG 203 336 [i.5]

ETSI EG 203 336 [i.5]		Present document		Justification
Clause	**Parameter**	**Clause**	**Parameter**	
5.2.2	Transmitter power limits	4.3.3	RF output power	As specified in the related ECC/EC regulation, here Decision (EU) 2025/105 [i.2] Band 57b.
5.2.3	Transmitter power accuracy	-	-	From the latest version of ETSI EG 203 336 [i.5], "When regulatory limits imply only a maximum emission limit (e.g. products that operate under a general licence regime), this parameter need not be considered for inclusion in an HS."
5.2.4	Transmitter spectrum mask	4.3.2	Operating Frequency Range	As specified in related ECC/EC regulation, see Decision (EU) 2025/105 [i.2] Band 57b
5.2.5	Transmitter frequency stability	4.3.5	Tx behaviour	There is no TX frequency stability requirement specified. The related requirement is for the emissions to remain within the permitted frequency range of the complete environmental profile. This requirement will be assessed in the TX behaviour requirement, see ETSI TS 103 941 [3].
5.2.6	Transmitter intermodulation attenuation	-	-	From latest version of ETSI EG 203 336 [i.5], this parameter is required only "where high levels of quality services are required". This is not relevant for generic short range devices which are operating under licence except regime without any kind of regulatory protection. SRDs have to accept interferences.
5.2.7.2	Transmitter unwanted emissions in the out of band domain	4.3.4	TX Unwanted emissions	
5.2.7.3	Transmitter unwanted emissions in the spurious domain	4.3.4	TX Unwanted emissions	
5.2.8	Transmitter time domain characteristics	-	-	Not applicable. No requirement in ECC nor EC regulation.
5.2.9	Transmitter transients	-	-	Not applicable.
	Other mitigation, spectrum access requirements not specified in the ETSI Guide but specified in related ECC/EC framework	-	-	Not applicable. No requirement in ECC nor EC regulation.

ETSI EG 203 336 [i.5]		Present document		Justification
Clause	**Parameter**	**Clause**	**Parameter**	
5.3.2	Receiver sensitivity	4.4.4	Not specified, superseded by RBS test	See justification in ETSI EN 303 883-2 [2], Annex C and the explanation of the interferer signal handling concept, see ETSI TS 103 567 [i.6].
5.3.2.3	Desensitization	4.4.5	Not specified, superseded by RBR test	See justification in ETSI EN 303 883-2 [2], Annex C and the explanation of the interferer signal handling concept, see ETSI TS 103 567 [i.6].
5.3.3	Receiver co-channel rejection	4.4.5	Not specified, superseded by RBR test	See justification in ETSI EN 303 883-2 [2], Annex C and the explanation of the interferer signal handling concept, see ETSI TS 103 567 [i.6]
5.3.4.2.1	Receiver adjacent channel selectivity	4.4.5	Not specified, superseded by RBR test	See justification in ETSI EN 303 883-2 [2], Annex C and the explanation of the interferer signal handling concept, see ETSI TS 103 567 [i.6].
5.3.4.2.2	Receiver adjacent band selectivity	4.4.5	Not specified, superseded by RBR test	See justification in ETSI EN 303 883-2 [2], Annex C and the explanation of the interferer signal handling concept, see ETSI TS 103 567 [i.6].
5.3.4.3	Receiver blocking	4.4.5	Not specified, superseded by RBR test	See justification in ETSI EN 303 883-2 [2], Annex C and the explanation of the interferer signal handling concept, see ETSI TS 103 567 [i.6].
5.3.4.4	Receiver spurious response rejection	4.4.5	Not specified, superseded by RBR test	See justification in ETSI EN 303 883-2 [2], Annex C and the explanation of the interferer signal handling concept, see ETSI TS 103 567 [i.6].
5.3.4.5	Receiver radio-frequency intermodulation	4.4.5	Not specified, superseded by RBR test	See justification in ETSI EN 303 883-2 [2], Annex C and the explanation of the interferer signal handling concept, see ETSI TS 103 567 [i.6].
5.3.5	Receiver unwanted emissions in the spurious domain	4.4.3	Receiver spurious domain	If the equipment covered by the EN has "receive only" modes.
5.3.6.1	Receiver dynamic range	4.4.4	Receiver dynamic range or partly by RBS	Or EN has specific dynamic range test, if not see ETSI EN 303 883-2 [2], Table C.1.2.
5.3.6.2	Reciprocal mixing	4.4.4	Not specified, superseded by RBR test	See justification in ETSI EN 303 883-2 [2], Annex C and the explanation of the interferer signal handling concept, see ETSI TS 103 567 [i.6].
5.3.1	Signal interferer handling	4.4.4 4.4.5	Receiver Baseline Sensitivity (RBS) Receiver Baseline Resilience (RBR)	Interferer signal handling (ETSI TS 103 567 [i.6], clause 5.3.1) is an alternative method for specifying receiver parameters intended for use for receivers such as UWB and certain types of radiodetermination equipment.

Annex C (informative): Change history

Version	Information about changes
V2.1.1	This work included merging of previous versions of part 1 and 2. Revision of standard parts to cover the essential requirements of article 3.2 of the RE-D. Clarifications in the measurement procedure.
V2.2.1	• Additional Rx-requirement for category 3 receivers: "blocking or desensitization". • Clarification harmonized and non-harmonized frequency ranges covered by the present document. Clarification text: "General performance criteria".
V3.1.1	• 2,4 GHz RFID, GBSAR removed sent to TG 34 (RFID), and TGUWB (UWB) respectively. • ETSI EN 300 440 split into 3 application specific parts: Communication, Radiodetermination location tracking, Intrusion radiodetermination. • Testing methodology standardized to use ETSI EN 303 883-1 and -2 for transmitter and receiver.

History

Document history		
Edition 1	December 1995	Publication as ETSI I-ETS 300 440
Corrigendum 1	April 1996	Corrigendum 1 to 1st Edition of ETSI I-ETS 300 440
V1.3.1/V1.1.1	September 2001	Publication as ETSI EN 300 440 parts 1 and 2
V1.1.2	July 2004	Publication as ETSI EN 300 440 part 2
V1.4.1/V1.2.1	May 2008	Publication as ETSI EN 300 440 parts 1 and 2
V1.5.1/V1.3.1	March 2009	Publication as ETSI EN 300 440 parts 1 and 2
V1.6.1/V1.4.1	August 2010	Publication as ETSI EN 300 440 parts 1 and 2
V2.1.1	March 2017	Publication as ETSI EN 300 440
V2.2.1	July 2018	Publication as ETSI EN 300 440
V3.1.0	June 2025	SRdAP process EV 20250917: 2025-06-19 to 2025-09-17