



**Short Range Devices;
Transport and Traffic Telematics (TTT);
Short Range Radar equipment operating in
the 77 GHz to 81 GHz band;
Harmonised Standard covering the essential requirements
of article 3.2 of the Directive 2014/53/EU**

Reference

REN/ERM-TGSRR-76

Keywords

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Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.7] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.2].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

The present document covers short range radar equipment operating in the 77 GHz to 81 GHz range.

The present document covers the essential requirements of article 3.2 of the RE-D [i.2].

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).

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Introduction

The present document, together with ETSI EN 303 396 [1], covers the assessment of certain types of equipment as defined herein.

In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present document and ETSI EN 303 396 [1], the provisions of the present document take precedence.

1 Scope

The present document specifies the technical requirements and methods of measurement for Short Range Devices (SRD) working as broadband devices with at least 50 MHz occupied bandwidth in the 77 GHz to 81 GHz frequency range, hereinafter referred to as the 79 GHz band, intended for Transport and Traffic Telematics (TTT) applications. Applications include but are not limited to e.g. Short Range Radar (SRR) for obstacle detection, stop&go, blind spot detection, parking aid, backup aid and precrash.

The present document covers transmitters intended to operate in the frequency range as defined in the EC Decision 2004/545/EC [i.5] and the ECC Decision ECC/DEC/(04)03 [i.6].

The present document applies to:

- a) transmitters in the 79 GHz range operating as broadband devices;
- b) receivers operating in the 79 GHz range;
- c) integrated transceivers in the 79 GHz range.

The present document:

- a) contains the technical characteristics and test methods for short range radar equipment fitted with integral antennas operating in the 79 GHz range;
- b) covers short range radar vehicle applications in the 79 GHz range. It covers integrated transceivers and separate transmit/receive modules.

The present document does not necessarily include all the characteristics which may be required by a user, nor does it necessarily represent the optimum performance achievable.

These radio equipment types are capable of operating in all or part of the frequency bands given in table 1.

Table 1: Permitted ranges of operation

Permitted ranges of operation	
Transmit	77 GHz to 81 GHz
Receive	77 GHz to 81 GHz

The present document contains requirements to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 303 396 (V1.1.0) (04-2016): "Short Range Devices; Measurement Techniques for automotive and surveillance radar equipment" . .

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] CEPT/ERC Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".
- [i.2] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.
- [i.3] CEPT/ERC/REC 74-01: "Unwanted emissions in the spurious domain".
- [i.4] ETSI EG 203 336: "Electromagnetic compatibility and Radio spectrum Matters (ERM); 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.5] Commission Decision 2004/545/EC on the harmonisation of radio spectrum in the 79 GHz range for the use of automotive short-range radar equipment in the Community.
- [i.6] ECC Decision (04)/03: "The frequency band 77-81 GHz to be designated for the use of Automotive Short Range Radars".
- [i.7] 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 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI EN 303 396 [1] and the following apply:

ground based vehicles: vehicles using wheels or rails for movement

EXAMPLE: Includes but is not limited to passenger cars, busses, trucks, rail engines, trams, ships, constriction vehicle and aircraft while taxiing

NOTE: For details see CEPT/ERC Recommendation 70-03 [i.1].

Pulse radars: radar system providing information on the distance of a target

NOTE: Which determine distance (range) by the time-of-flight of short radar pulses, which are not frequency modulated.

3.2 Symbols

For the purposes of the present document, the symbols given in ETSI EN 303 396 [1] and the following apply:

D antenna scan duty factor

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 303 396 [1] and the following apply:

e.r.p. equivalent radiated power

4 Technical requirements specifications

4.1 Environmental conditions

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile. The normal and extreme test conditions are defined in clauses 4.4.3 and 4.4.4 of ETSI EN 303 396 [1].

4.2 General

4.2.1 Background information

In this clause all general considerations for the testing of radar applications for automotive vehicular applications in the frequency range from 77 GHz to 81 GHz are given. The tests cover integrated transceivers and separate transmit/receive modules.

All operating bandwidths of the equipment (see clause 4.3.1) shall be declared by the equipment manufacturer (see clause 4.2 of ETSI EN 303 396 [1]).

Where equipment has more than one operating bandwidths, sufficient number of operating bandwidths shall be chosen for testing so as to encompass the lower and higher limits of the operating frequency and the minimum and maximum bandwidth.

The EUT modulation during testing should be representative of normal use of the equipment. The manufacturer shall employ the mode of operation of the equipment which results in the highest transmitter activity consistent with the requirement to measure the highest power transmission which would be available in operation, and should ensure that:

- transmissions occur regularly in time;
- sequences of transmissions can be repeated accurately.

For transmitters that have multi-modulation schemes incorporated, it may be necessary to test each scheme.

The meaning of EUT with scanning/steerable antenna is that the EUT TX antenna pattern is electronically or mechanically adjustable.

4.2.2 Wanted performance criteria

The wanted performance criterion is that the EUT shall indicate the properties of a given target at a given distance. Since EUT considered here typically are tailored to specific applications, no single wanted performance criterion can be defined here.

Therefore:

- The relevant properties (e.g. presence, range, relative speed, azimuth angle) shall be declared by the manufacturer.
- The type and RCS of the target and the distance shall be declared by the manufacturer.

4.2.3 Fixed and scanning antennas

The provisions of ETSI EN 303 396 [1], clause 4.3.5 apply.

4.3 Transmitter Conformance Requirements

4.3.1 Operating Frequency Range

4.3.1.1 Applicability

This requirement applies to all EUT.

4.3.1.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.2 applies.

4.3.1.3 Limits

The upper and lower limits of the operating frequency range shall meet the following conditions:

- $f_H \leq 81$ GHz.
- $f_L \geq 77$ GHz.

4.3.1.4 Conformance

The conformance test suite for operating frequency range shall be as defined in clause 6.3.2 of ETSI EN 303 396 [1].

Conformance shall be established under normal and extreme test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.3.2 Mean Power spectral density

4.3.2.1 Applicability

This requirement applies to all EUT.

4.3.2.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.6 applies.

4.3.2.3 Limits

The mean power shall not be greater than the limits in table 2.

Table 2: Mean power spectral density, CEPT/ERC Recommendation 70-03 [i.1]

Frequency in GHz	77 GHz to 81 GHz
Maximum radiated average power spectral density (e.i.r.p.) [dBm/MHz] of the EUT	-3 dBm/MHz

4.3.2.4 Conformance

The conformance test suite for mean power shall be as defined in clause 6.3.4 of ETSI EN 303 396 [1].

Conformance shall be established under normal and extreme test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.3.3 Peak Power

4.3.3.1 Applicability

This requirement applies to all EUT.

4.3.3.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.4 applies.

4.3.3.3 Limits

The peak power for EUT with fixed beam or scanning antenna shall not be greater than 55 dBm.

4.3.3.4 Conformance

The conformance test suite for peak power shall be as defined in clause 6.3.3 of ETSI EN 303 396 [1].

Conformance shall be established under normal and extreme test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.3.4 Unwanted emissions in the out-of-band domain

4.3.4.1 Applicability

This requirement applies to all EUT.

4.3.4.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.11 applies.

4.3.4.3 Limits

The RMS mean power spectral density radiated in the calculated out-of-band domain (between F_1 to f_L and f_H to F_2 band) shall not be greater than the values given in table 3.

Table 3: Limits for out of band radiation, CEPT/ERC/REC 74-01 [i.3]

Frequency [GHz]	RMS mean power spectral density [dBm/MHz]
$F_1 \leq f < f_L$	-30
$f_H < f \leq F_2$	-30

The values f_L and f_H are the results of the operating frequency range conformance test, see clause 4.3.1.4.

The values F_1 and F_2 are calculated as in ETSI EN 303 396 [1], clause 6.2.11.

Note that the out-of-band domain may be larger or smaller than the maximum permitted range of operation.

4.3.4.4 Conformance

The conformance test suite for unwanted emissions in the out of band domain shall be as defined in clause 6.3.10 of ETSI EN 303 396 [1].

Conformance shall be established under normal test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.3.5 Unwanted emissions in the spurious domain

4.3.5.1 Applicability

This requirement applies to all EUT.

4.3.5.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.11 applies.

4.3.5.3 Limits

The effective radiated power of any radiated spurious emission shall be not greater than the values given in table 4.

Table 4: Limits of radiated spurious emissions [i.3]

Frequency range (MHz)	Limit values for spurious radiation	Detector type
47 to 74	-54 dBm e.r.p.	Quasi-Peak
87,5 to 118	-54 dBm e.r.p.	Quasi-Peak
174 to 230	-54 dBm e.r.p.	Quasi-Peak
470 to 790	-54 dBm e.r.p.	Quasi-Peak
otherwise in band 30 to 1 000	-36 dBm e.r.p.	Quasi-Peak
f > 1 000 to 300 000 (see note)	-30 dBm e.i.r.p.	mean
NOTE: According to CEPT/ERC/REC 74-01 [i.3], spurious emission is measured up to the 2 nd harmonic of the fundamental frequency.		

4.3.5.4 Conformance

The conformance test suite for unwanted emissions in the spurious domain shall be as defined in clause 6.3.10 of ETSI EN 303 396 [1].

Conformance shall be established under normal test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.4 Receiver Conformance Requirements

4.4.1 Introduction

ETSI EG 203 336 [i.4] lists candidate technical parameters to be included in a Harmonised Standard aimed at providing a presumption of conformity of radio equipment with the essential requirements in articles 3.1(b) and 3.2 of the Radio Equipment Directive 2014/53/EU [i.2].

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.

The present document applies to radar systems for which the "classical" receiver parameters are not necessarily relevant. Where applicable, suitable alternative technical requirements are included, see clause 4.4.3.

4.4.2 Receiver spurious emissions

4.4.2.1 Applicability

Receiver spurious emission testing shall apply for any mode other than transmit mode.

NOTE: Otherwise receiver spurious emissions are measured as part of the transmitter spurious emissions, see clause 4.3.5.

4.4.2.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.12 applies.

4.4.2.3 Limits

The effective radiated power of any narrowband receiver spurious emission shall be not greater than the values given in table 5.

Table 5: Narrowband spurious emission limits for receivers [i.3]

Frequency range	Limit
30 MHz to 1 GHz	-57 dBm (e.r.p.)
above 1 GHz to 300 GHz	-47 dBm (e.i.r.p.)
NOTE: According to CEPT/ERC/REC 74-01 [i.3], spurious emission is measured up to the 2 nd harmonic of the fundamental frequency.	

Wideband receiver spurious emissions shall be not greater than the values given in table 6.

Table 6: Wideband spurious emission limits for receivers [i.3]

Frequency range	Limit
30 MHz to 1 GHz	-47 dBm/MHz (e.r.p.)
above 1 GHz to 300 GHz	-37 dBm/MHz (e.i.r.p.)
NOTE: According to CEPT/ERC/REC 74-01 [i.3], spurious emission is measured up to the 2 nd harmonic of the fundamental frequency.	

4.4.2.4 Conformance

The conformance test suite for unwanted receiver spurious emissions shall be as defined in clause 6.3.11 of ETSI EN 303 396 [1].

Conformance shall be established under normal test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.4.3 Receiver in-band, out-of-band and remote-band signals handling

4.4.3.1 Applicability

This requirement applies to all devices under test.

4.4.3.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.13 applies.

4.4.3.3 Limits

The EUT shall achieve the wanted performance criterion, see clause 4.2.2, in the presence of unwanted signals defined in ETSI EN 303 396 [1], clause 6.3.12.4.

If the wanted performance criterion is not achieved then the EUT shall issue a respective blindness message.

4.4.3.4 Conformance

The conformance test suite for receiver in-band, out-of-band and remote-band signals handling shall be as defined in clause 6.3.12 of ETSI EN 303 396 [1].

Conformance shall be established under normal test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.4.4 Receiver sensitivity

Receiver sensitivity is not specified in the present document in order to allow manufacturers the freedom to tailor equipment to specific circumstances.

For instance, equipment covered by the present document may be intended to detect a target at maximum range or may be intended to discriminate features such as size, shape or velocity at shorter range. The level of minimum usable signal would be different in each case.

4.5 Other requirements and mitigation techniques

4.5.1 Installation requirements

4.5.1.1 Applicability

This requirement shall apply to all EUT.

4.5.1.2 Description

ECC/DEC(04)/03 [i.6] describes the maximum mean power spectral density outside a vehicle based on the max value for a standalone device and a given bumper/fascia loss,

4.5.1.3 Limits

The following installation requirements shall be fulfilled:

- a) 79 GHz SRR are required to be installed at a permanent fixed position on a vehicle.
- b) The maximum mean power spectral density outside a vehicle resulting from the operation of one short-range radar shall not exceed:
 - -9 dBm/MHz e.i.r.p.

4.5.1.4 Conformance

Conformance shall be conditional on the correct installation described above.

The installation/mounting instructions shall be made available by the device manufacturer.

5 General considerations for performing the tests

The provisions of ETSI EN 303 396 [1], clause 4 shall apply except as varied herein.

6 Test setup and procedures

The provisions of ETSI EN 303 396 [1], clause 5 shall apply except as varied herein.

7 Conformance methods of measurement for transmitter and receiver

The provisions of ETSI EN 303 396 [1], clause 6 shall apply except as varied herein.

All measurement results shall be recorded in a test report, see clause 4.7 in ETSI EN 303 396 [1].

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

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.7] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.2].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

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

Harmonised Standard ETSI EN 302 264 The following requirements are relevant to the presumption of conformity under the article 3.2 of Directive 2014/53/EU [i.2]				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Operating Frequency Range	4.3.1	U	
2	Mean Power spectral density	4.3.2	U	
3	Peak Power	4.3.3	U	
4	Unwanted emissions in the out-of-band domain	4.3.4	U	
5	Unwanted emissions in the spurious domain	4.3.5	U	
6	Receiver spurious emissions	4.4.2	C	It applies for any mode other than transmit mode
7	Receiver in-band, out-of-band and remote-band signal handling	4.4.3	U	
8	Installation requirement	4.5.1	U	

Key to columns:

Requirement:

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

Description A textual reference to the requirement.

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

Requirement Conditionality:

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

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

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

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

Annex B (informative): Bibliography

Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

Annex C (informative): Change History

Date	Version	Information about changes
January 2016	2.1.1_0.0.1	Initial version for TG SRR#23
January 2016	2.1.1_0.0.2	Draft version during TG SRR#23
March 2016	0.0.3	Revision to align with the structure of the standards that were approved for ENAP in TG SRR#23
April 2016	2.1.1_0.0.4	TGSRR#24
May 2016	2.1.1_2.0.0	Version for TG SRR amendment for ENAP (via RC)

History

Document history		
V1.1.1	June 2009	Publication as ETSI EN 302 264 part 1 and part 2
V2.1.0	July 2016	EN Approval Procedure AP 20161011: 2016-07-13 to 2016-10-11