



**Short Range Devices;
Transport and Traffic Telematics (TTT);
Radar equipment operating in the 76 GHz to 77 GHz range;
Harmonised Standard covering the essential requirements
of article 3.2 of Directive 2014/53/EU;
Part 3: Railway/Road Crossings obstacle detection
system applications**

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Foreword

This final 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 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.5] 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 is part 3 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.6].

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
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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

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

1 Scope

The present document specifies technical characteristics and methods of measurements for the following types of equipment:

- radar equipment for obstacle detection applications in the frequency range from 76 GHz to 77 GHz at the road crossing of a railway track and references CEPT/ECC ERC Recommendation 70-03 [i.1] Annex 4;
- Short Range Devices (SRD) intended for the use at road crossing of a railway track.

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.

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.

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

Table 1: Permitted range of operation [i.1]

Permitted range of operation	
Transmit	76 GHz to 77 GHz
Receive	76 GHz to 77 GHz

The present document covers the essential requirements of article 3.2 of Directive 2014/53/EU [i.2] under the conditions identified in annex A.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version 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 303 396 (V1.1.1) (12-2016): " 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 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.6] ETSI EN 301 091-1: "Short Range Devices; Transport and Traffic Telematics (TTT); Radar equipment operating in the 76 GHz to 77 GHz range; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Part 1: Ground based vehicular radar".

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:

supervision area: intersection of the railway track(s) and road with an additional safety zone of 2 m

NOTE: The intersection is restricted by elements to halt/stop the road traffic (e.g. "signal, acoustic and/or barrier drive") and/or signs only to inform the traffic on the intersection.

3.2 Symbols

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

3.3 Abbreviations

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

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 which are identified as applicable in annex A 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 general considerations for the testing of radar applications at road crossing of railway track applications in the frequency range from 76 GHz to 77 GHz are given. The tests covers 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 clauses 4.2 and 4.3 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 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 shall apply 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:

- $f_H \leq 77$ GHz.
- $f_L \geq 76$ 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 ETSI EN 303 396 [1], clause 4.6.

4.3.2 Mean Power

4.3.2.1 Applicability

This requirement shall apply to all EUT.

4.3.2.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.5 applies.

4.3.2.3 Limits

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

Table 2: Mean power [i.1]

	EUTs others than pulsed radar	Pulsed radar
mean power (e.i.r.p.)	50 dBm	23,5 dBm
NOTE: For the purposes of this measurement, the averaging time shall be not greater than 100 ms. If the result varies through the EUT cycle time the maximum value shall be taken as the result.		

For constant pattern scanning antennas measured with the scanning inhibited (clause 4.3.5 of ETSI EN 303 396 [1]), the mean power shall be calculated from the measured result P_{MEASURED} as shown in table 3.

Table 3: Mean power calculation (constant pattern scanning antenna)

	EUTs others than pulsed radar		Pulsed radar	
	$t \leq 100$ ms	$t > 100$ ms	$t \leq 100$ ms	$t > 100$ ms
Illumination time t (see note 1)				
mean power (e.i.r.p.) (see note 2)	$P_{\text{MEASURED}} + 10 \log(D)$	P_{MEASURED}	$P_{\text{MEASURED}} + 10 \log(D)$	P_{MEASURED}
NOTE 1: t is the illumination time defined in ETSI EN 303 396 [1].				
NOTE 2: D is the antenna scan duty factor defined in ETSI EN 303 396 [1]. As D is smaller than 1 (i.e. 100 %), the $\log(D)$ value is negative and leads to a decrease in the result.				

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 ETSI EN 303 396 [1], clause 4.6.

4.3.3 Peak Power

4.3.3.1 Applicability

This requirement shall apply 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 ETSI EN 303 396 [1], clause 4.6.

4.3.4 Unwanted emissions in the out-of-band domain

4.3.4.1 Applicability

This requirement shall apply 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 4.

Table 4: Limits for out of band radiation [i.3]

Frequency [GHz]	RMS mean power spectral density [dBm/MHz]
$F_1 \leq f < f_L$	0
$f_H < f \leq F_2$	0

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 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 ETSI EN 303 396 [1], clause 4.6.

4.3.5 Unwanted emissions in the spurious domain

4.3.5.1 Applicability

This requirement shall apply to all EUT.

4.3.5.2 Description

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