



**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 2: Fixed infrastructure radar equipment**

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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 - NAF 742 C  
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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.6] 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 2 of a multi-part deliverable covering Short Range Devices; Transport and Traffic Telematics (TTT); Radar equipment operating in the 76 GHz to 77 GHz range, as identified below:

- Part 1: "Ground based vehicular radar";
- Part 2: "Fixed infrastructure radar equipment";**
- Part 3: "Railway/Road Crossings obstacle detection system applications".

The present document covers the essential requirements of article 3.2 of the Directive 2014/53/EU [i.2].

<b>Proposed national transposition dates</b>	
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.

# 1 Scope

The present document specifies technical characteristics and methods of measurements for radar equipment for fixed infrastructure Transport and Traffic Telematic (TTT) applications in the frequency range from 76 GHz to 77 GHz. 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 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.

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.

## 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 <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 (V1.1.1) (10-2016): "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] EC Decision 2013/752/EU: "Commission implementing Decision of 11 December 2013 amending Decision 2006/771/EC on harmonisation of the radio spectrum for use by short-range devices and repealing Decision 2005/928/EC".

- [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] Void.
- [i.6] 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.

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## 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:

**pulse radars:** EUTs, 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

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## 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 General requirements

In this clause all general considerations for the testing of radar equipment for applications in the frequency range from 76 GHz to 77 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 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 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:

- $f_H \leq 77$  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 clause 4.6 of ETSI EN 303 396 [1].

### 4.3.2 Mean Power

#### 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 6.2.5 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]**

	<b>EUTs others than pulsed radar</b>	<b>Pulsed radar</b>
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  $P_{\text{MEASURED}}$  as shown in table 3.

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

Illumination time t (see note 1)	<b>EUTs others than pulsed radar</b>		<b>Pulsed radar</b>	
	t ≤ 100 ms	t > 100 ms	t ≤ 100 ms	t > 100 ms
mean power (e.i.r.p.) (see note 2)	$P_{\text{MEASURED}} + 10 \log(D)$	$P_{\text{MEASURED}}$	$P_{\text{MEASURED}} + 10 \log(D)$	$P_{\text{MEASURED}}$
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 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.