



**ElectroMagnetic Compatibility (EMC)
standard for radio equipment and services;
Part 51: Specific conditions for Automotive, Ground based
Vehicles and Surveillance Radar Devices using
24,05 GHz to 24,25 GHz, 24,05 GHz to 24,5 GHz,
76 GHz to 77 GHz and 77 GHz to 81 GHz;
Harmonised Standard covering the essential requirements
of article 3.1(b) of Directive 2014/53/EU**

Reference

REN/ERM-EMC-382

Keywords

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Contents

Intellectual Property Rights	4
Foreword.....	4
Modal verbs terminology.....	4
1 Scope	5
2 References	5
2.1 Normative references	5
2.2 Informative references.....	6
3 Definitions and abbreviations.....	6
3.1 Definitions.....	6
3.2 Abbreviations	6
4 Test conditions	6
4.1 General	6
4.2 Arrangements for test signals	6
4.2.1 General.....	6
4.2.2 Arrangements for test signals at the input of transmitters.....	6
4.2.3 Arrangements for test signals at the output of transmitters.....	7
4.2.4 Arrangements for test signals at the input of receivers	7
4.2.5 Arrangements for test signals at the output of receivers	7
4.2.6 Arrangements for testing transmitter and receiver together (as a system)	7
4.3 Exclusion bands.....	7
4.4 Narrow band responses of receivers.....	7
4.5 Normal test modulation	7
5 Performance assessment.....	7
5.1 General	7
6 Performance criteria	8
6.0 Introduction	8
6.1 Performance criteria	8
7 Applicability overview	8
7.1 Emission.....	8
7.2 Immunity	8
Annex A (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU	9
Annex B (informative): Change history	11
History	12

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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.2] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

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

The present document is part 51 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

National transposition dates

Date of adoption of this EN:	6 June 2017
Date of latest announcement of this EN (doa):	31 July 2019
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2020
Date of withdrawal of any conflicting National Standard (dow):	31 January 2021

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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1 Scope

The present document, together with ETSI EN 301 489-1 [1], covers the assessment of automotive, ground based vehicles and surveillance radar devices using 24,05 GHz to 24,25 GHz, 24,05 GHz to 24,5 GHz, 76 GHz to 77 GHz and 77 GHz to 81 GHz in respect of ElectroMagnetic Compatibility (EMC).

Technical specifications related to the antenna port and emissions from the enclosure port of radar equipment are not included in the present document. Such technical specifications are found in the relevant product standards for the effective use of the radio spectrum.

The present document specifies the applicable test conditions, performance assessment and performance criteria for automotive and surveillance radar devices and associated ancillary equipment.

Automotive and surveillance radar equipments are low power millimetre wave devices that are able to detect and characterize targets in their environment.

The following use cases are included (but are not limited to):

- automotive Advanced Driver Assistance Systems (ADAS) applications, such as Adaptive Cruise Control (ACC), Blind Spot Detection (BSD), parking aid, backup aid, autonomous braking and pre-crash systems (PCS);
- surveillance radars for other kind of ground based vehicles, such as trains, trams, aircrafts while taxiing;
- fixed infrastructure radars for traffic monitoring;
- railway/road crossings obstacle detection radars;
- helicopter obstacle detection radars.

Examples of automotive and surveillance radar devices are given in the related harmonised standards.

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

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

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 301 489-1 (V2.2.0) (03-2017): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU".

2.2 Informative references

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

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

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Directive 2014/53/EU of the European Parliament and of the council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.
- [i.2] 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 and abbreviations

3.1 Definitions

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

3.2 Abbreviations

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

4 Test conditions

4.1 General

For the purposes of the present document, the test conditions of ETSI EN 301 489-1 [1], clause 4 shall apply as appropriate except as varied herein.

For emission and immunity tests the test modulation, test arrangements, etc., as specified in the present document, clauses 4.2 to 4.5 shall apply.

4.2 Arrangements for test signals

4.2.1 General

The provisions of ETSI EN 301 489-1 [1], clause 4.2 shall apply.

4.2.2 Arrangements for test signals at the input of transmitters

The provisions of ETSI EN 301 489-1 [1], clause 4.2.1 shall apply.

4.2.3 Arrangements for test signals at the output of transmitters

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

The transmitter shall be operated at its maximum rated RF output power, modulated with normal test modulation (see clause 4.5). Measurement equipment is not required. The signal shall be directed to a dummy target or a target simulator.

4.2.4 Arrangements for test signals at the input of receivers

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

The return signal shall be generated by either a dummy target or a target simulator.

4.2.5 Arrangements for test signals at the output of receivers

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

4.2.6 Arrangements for testing transmitter and receiver together (as a system)

The provisions of ETSI EN 301 489-1 [1], clause 4.2.5 shall not apply.

For the purpose of testing radar equipment the receiver and transmitter shall be tested as a system.

4.3 Exclusion bands

No exclusion bands are applicable.

4.4 Narrow band responses of receivers

The provisions of ETSI EN 301 489-1 [1], clause 4.4 shall apply.

4.5 Normal test modulation

The equipment shall be operated in a transmission mode representative of normal operation.

5 Performance assessment

5.1 General

The provision of ETSI EN 301 489-1 [1], clause 5 shall apply except as varied herein.

The provision of ETSI EN 301 489-1 [1], clause 5.2 shall not apply.

The manufacturer shall supply a list of operation modes of the EUT.

6 Performance criteria

6.0 Introduction

For the purposes of the present document the provisions of ETSI EN 301 489-1 [1], clause 6, shall not apply.

The performance criteria are used to make an assessment whether a radar equipment passes or fails immunity tests.

6.1 Performance criteria

In table 1 below:

- Performance criterion A applies for immunity tests with phenomena of a continuous nature.
- Performance criterion B applies for immunity tests with phenomena of a transient nature.

Table 1: Performance Requirements

Criterion	During test	After test
A	Operate as intended No loss of function No unintentional responses	Operate as intended No loss of function No degradation of performance
B	No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance

Where "operate as intended" or "no loss of function" is specified, the EUT shall demonstrate correct functioning as described in clause 5.

Where the EUT has more than one mode of operation (including stand-by) an unplanned transition from one mode to another is an unintentional response. The EUT shall be tested in sufficient modes to confirm there are no such unintentional responses.

7 Applicability overview

7.1 Emission

Table 1 in ETSI EN 301 489-1 [1] contains the applicability of EMC emission measurements to the relevant ports of radio and/or associated ancillary equipment. Details on the test conditions are specified in clause 4 of the present document.

7.2 Immunity

Table 2 of ETSI EN 301 489-1 [1] contains the applicability of EMC immunity measurements to the relevant ports of radio and/or associated ancillary equipment. Details on the test conditions are specified in clause 4 of the present document.

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.2] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

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

Harmonised Standard ETSI EN 301 489-51				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Emissions: Enclosure of ancillary equipment measured on a stand alone basis	ETSI EN 301 489-1 [1], clause 8.2	C	Only applicable to ancillary equipment not incorporated in the radio equipment and intended to be measured on a stand-alone basis
2	Emissions: DC power input/output ports	ETSI EN 301 489-1 [1], clause 8.3	C	Only where equipment has DC power input and/or output ports with a cable length greater than 3 m or from a vehicle power supply
3	Emissions: AC mains power input/output ports	ETSI EN 301 489-1 [1], clause 8.4	C	Only where equipment has AC mains power input and/or output ports
4	Emissions: Harmonic current emission (AC mains input port)	ETSI EN 301 489-1 [1], clause 8.5	C	Only where equipment has AC mains power input ports
5	Emissions: Voltage fluctuations and flicker (AC mains input ports)	ETSI EN 301 489-1 [1], clause 8.6	C	Only where equipment has AC mains power input ports
6	Emissions: Wired network ports	ETSI EN 301 489-1 [1], clause 8.7	C	Only where equipment has wired network ports
7	Immunity: Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	ETSI EN 301 489-1 [1], clause 9.2	U	
8	Immunity: Electrostatic discharge	ETSI EN 301 489-1 [1], clause 9.3	U	
9	Immunity: Fast transients common mode	ETSI EN 301 489-1 [1], clause 9.4	U	
10	Immunity: Radio frequency common mode	ETSI EN 301 489-1 [1], clause 9.5	U	
11	Immunity: Transients and surges in the vehicular environment	ETSI EN 301 489-1 [1], clause 9.6	C	Only where equipment is connected to vehicle power supply
12	Immunity: Voltage dips and interruptions	ETSI EN 301 489-1 [1], clause 9.7	C	Only where equipment has AC mains power input ports
13	Immunity: Surges, line to line and line to ground	ETSI EN 301 489-1 [1], clause 9.8	C	Only where equipment has AC mains power input ports and/or wired network ports