



**ElectroMagnetic Compatibility (EMC)
standard for radio equipment and services;
Part 55: Specific conditions for ground based equipment
for air navigation operating
in the frequency range 960 MHz to 1 215 MHz;
Harmonised Standard for ElectroMagnetic Compatibility**

Reference

DEN/ERM-EMC-408

Keywords

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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 55 of a multi-part deliverable covering ElectroMagnetic Compatibility (EMC) standard for radio equipment and services. Full details of the entire series can be found in part 1 [1].

National transposition dates	
Date of adoption of this EN:	22 October 2025
Date of latest announcement of this EN (doa):	31 January 2026
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Date of withdrawal of any conflicting National Standard (dow):	31 July 2027

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 specifies technical characteristics and methods of measurement in respect of ElectroMagnetic Compatibility (EMC) for the following equipment:

- Secondary Surveillance Radar (SSR) interrogator;
- SSR Far Field Monitor (FFM);
- Multilateration (MLAT);
- Wide Area Multilateration (WAM);
- Distance Measurement Equipment (DME) land station transponder;
- Extended Squitter (ES) / Non Transponder (NT).

operating in the frequency range 960 MHz to 1 215 MHz.

The above mentioned radio equipment can be intended for use at a fixed location or mobile use.

The standard covers equipment consisting of one or more enclosures that contain at least one of the following functionalities: transmitter, receiver, signal processing. Other parts which are not part of the navigation functionality e.g. local UPS, air conditioning equipment, dehumidifying equipment, communication network equipment, etc., are not in the scope of the present document, unless these parts are implemented inside the system enclosure(s).

NOTE 1: The relationship between the present document and essential requirements of article 3.1(b) of Directive 2014/53/EU [i.1] is given in annex A.

Technical specifications related to conducted emission EMC requirements below 9 kHz on the AC mains port of radio equipment are not included in the present document.

NOTE 2: Such technical specifications are normally found in the relevant product family standards for AC mains powered equipment (e.g. EN 61000-3-2 [i.3] and EN 61000-3-3 [i.4]).

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.

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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 \(V2.2.3\) \(11-2019\)](#): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility".
- [2] [EN 61000-6-4:2019](#): "Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments", produced by CENELEC.
- [3] [EN 55032:2015](#): "Electromagnetic compatibility of multimedia equipment - Emission requirements", produced by CENELEC.

- [4] [EN 61000-4-2:2025](#): "Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test", produced by CENELEC.

2.2 Informative references

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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] [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.
- [i.3] EN 61000-3-2 (2018) + A1 (2020) + A2 (2024): "Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)", produced by CENELEC.
- [i.4] EN 61000-3-3 (2013) + A1 (2017) + A2 (2021): "Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection", produced by CENELEC.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document the following terms apply:

ancillary equipment: electrical or electronic equipment, that is intended to be used with a receiver or transmitter

NOTE 1: It is considered as an ancillary equipment if:

- the equipment is intended for use with a receiver or transmitter to provide additional operational and/or control features to the radio equipment (e.g. to extend control to another position or location);
- the ancillary equipment cannot be used without being connected to radio equipment to provide user functions independently of a receiver or transmitter; and
- the receiver or transmitter, to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

NOTE 2: An example of ancillary equipment would be a docking station for radio equipment whose interface is dedicated to a particular product or range of products.

critical stored data: data that is essential for an EUT to perform a primary function in accordance with that EUT's specification

NOTE: This can include data previously stored by the user.

enclosure port: physical boundary of the equipment through which electromagnetic fields may radiate or impinge

NOTE: Also known as cabinet radiation.

Equipment Under Test (EUT): equipment subject to the performance requirements of the present document

mode of operation: operational status of the radar system, for example but not limited to standby or operating mode

operating mode: mode of operation which produces the authorized emission

port: interfaces of the equipment with the external environment and other equipment

standby mode: mode of operation where the transmitter is available for operation but is not in the operating mode

3.2 Symbols

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

3.3 Abbreviations

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

AC	Alternating Current
dB	deciBel
DC	Direct Current
DME	Distance Measurement Equipment
EM	ElectroMagnetic
EMC	ElectroMagnetic Compatibility
ES	Extended Squitter
EUT	Equipment Under Test
FFM	Far Field Monitor
MLAT	MultiLATeration
NT	Non Transponder
RF	Radio Frequency
SSR	Secondary Surveillance Radar
WAM	Wide Area Multilateration

4 Test conditions

4.1 General requirements

For the purpose of the present document, the provisions of ETSI EN 301 489-1 [1], clause 4 shall apply with the following additions from clauses 4.2.2 to 4.2.5 of the present document.

The EUT shall be tested in all the operating mode(s) supported including idle mode to confirm there are no unintentional responses. Every tested operating mode shall be listed in the test report.

Where radio equipment is provided with an integral antenna, it shall be tested with the antenna fitted in a manner representative of intended use.

The test report shall list all intentional modes of operation available and all modes tested.

4.2 Arrangements for test signals

4.2.1 General

The provisions of ETSI EN 301 489-1 [1], clause 4.2.0 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.

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 of the fourth paragraph and note:

The level of the wanted signal at the input of the receiver or the enclosure port of the EUT, shall be 40 dB above the P_{min} for the EUT.

NOTE: A simple method to establish the required communication link is to establish a link, reduce power to the point of link failure then increase by 40 dB.

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, paragraphs 1, 2, 3 and 5 shall apply.

4.3 RF exclusion band for radio equipment

4.3.1 General requirements

The transmitter and receiver exclusion bands as defined in clauses 4.3.2 and 4.3.3 shall apply.

Whenever an exclusion band is applied, the specific frequency range(s) excluded from assessment shall be detailed in the technical documentation.

4.3.2 Exclusion band for transmitters or the transmitter part of transceivers

Exclusion bands shall not be applied when measuring transmitters in standby mode. When the transmitter is in operating mode the exclusion bands, as indicated in Table 1, shall be used.

Table 1: Transmitter exclusion bands

Type of equipment	Exclusion band
MLAT, WAM, SSR interrogator (1 030 MHz transmitter)	905 MHz - 1 155 MHz
FFM, MLAT (see note), WAM (see note), ES/NT (1 090 MHz transmitter)	1 012 MHz - 1 168 MHz
DME	960 MHz - 1 215 MHz
NOTE: In case the EUT contains a reference/test transmission function.	

For equipment capable of simultaneous multi-frequency operation, each exclusion band shall be applied.

4.3.3 Exclusion band for receivers or the receiver part of the transceivers

The exclusion bands, as indicated in Table 2, shall be used.

Table 2: Receiver exclusion bands

Type of equipment	Exclusion band
FFM (1 030 MHz receiver)	905 MHz - 1 155 MHz
MLAT, WAM, SSR interrogator (1 090 MHz receiver)	1 012 MHz - 1 168 MHz
DME	960 MHz - 1 215 MHz

For equipment capable of simultaneous multi-frequency operation, each exclusion band shall be applied.

Exclusion bands are not applied when testing emissions of receivers or the receiver part of transceivers.

5 Ancillary equipment

If cabling between the ancillary equipment and radio equipment allows for the radio equipment to be moved outside of the test volume, then:

- Ancillary equipment shall be tested and assessed by applying the provisions of the present document with the radio equipment outside of the measurement area but still connected to the ancillary equipment.
- No exclusion bands shall be applied to the ancillary equipment.

If the cabling does not allow the ancillary equipment to be separated from the radio equipment such that the radio equipment is moved outside of the test volume, then:

- Ancillary equipment shall be tested and assessed by applying the provisions of the present document to the combination of ancillary and radio equipment, both within the measurement area.
- Exclusion bands shall be applied.

6 Performance criteria

6.1 General requirements

The performance criteria A, B and C, as indicated in Table 3, shall be used in the following manner:

- Performance criteria A for immunity tests with phenomena of a continuous nature.
- Performance criteria B for immunity tests with phenomena of a transient nature.
- Performance criteria C for immunity tests with voltage interruptions.

Table 3: Performance criteria

Criteria	During test	After test
A	Operate as intended (see note 1 and note 2). No unintended RF transmission. No unintended antenna motion. No Degradation of performance (see note 3).	Operate as intended (see note 1 and note 2). No change of critical stored data or user programmable functions. No degradation of performance (see note 3).
B	Loss of function is allowed. No change of operating mode shall occur. No unintended RF transmission. No unintended antenna motion.	Operate as intended (see note 1 and note 2). No change of critical stored data or user programmable functions. No degradation of performance (see note 3).
C	Loss of function is allowed. Change of operating mode may occur. No unintended antenna motion. No unintended RF transmission shall occur.	Operation as intended shall be recoverable either automatically or by operational user intervention. No change of critical stored data or user programmable functions. No degradation of performance (see note 3). No unintentional operation. No unwanted activation or deactivation of the transmitter. No unintended antenna motion.
NOTE 1: For receiving EUT operate as intended means that a received message is successfully decoded. For transmitting EUT operate as intended means that a response is triggered.		
NOTE 2: Where the EUT has more than one mode of operation (including standby mode and operating mode) no unplanned transition from one mode to another is allowed.		
NOTE 3: No degradation of performance means the performance of the EUT remains within the specified limits as stated in the documentation of the EUT without any new warnings or errors.		

7 Applicability tables

7.1 EMC Emission

7.1.1 General requirements

Apply the class A limits as this equipment is not used in a residential environment. The following emission requirements set out in Table 4 shall apply.

Table 4: Emission Requirements

Phenomenon	Port	Applicability		Reference clause
		Fixed equipment	Vehicular equipment	
Radiated emission	Enclosure	applicable	applicable	7.1.2
Conducted emission	DC power	applicable	applicable	7.1.2
Conducted emission	AC mains	applicable	not applicable	7.1.2
Conducted emission	Wired network	applicable	not applicable	7.1.2

7.1.2 Special Conditions

The following special conditions set out in Table 5 shall apply.

NOTE: Not all article 3.2 of the RED [i.1] standards for equipment under the scope of the present document cover unwanted radiated emission testing on the enclosure.

Table 5: Special conditions for EMC emission measurements

Reference to clauses in ETSI EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in ETSI EN 301 489-1 [1], clause 8
8.2: Enclosure port	The radiated emissions from the enclosure of the radio equipment shall meet the same requirements as stated for the enclosure of ancillary equipment in ETSI EN 301 489-1 [1], clause 8.2. The relevant exclusion band(s) specified in clause 4.3 shall apply. Equipment with a diameter smaller than or equal to 1,5 m and a maximum height of 1,5 m shall be tested at 3 m distance.
8.3: DC power input/output ports	The limits given in EN 61000-6-4 [2], annex A, table A.1 shall apply. This test shall be performed on all cables.
8.4: AC mains power input/output ports	The limits given in EN 55032 [3], annex A, table A.9 shall apply.
8.7: Wired network ports	The test shall be performed on all cables excluding cables connecting to the antenna ports (see note).
NOTE: Technical specifications related to the antenna port of the radio 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.	

7.2 Immunity

7.2.1 General requirements

The following immunity requirements set out in Table 6 shall apply.

In case of multiple mains power input lines, fast transients, common mode, RF common mode, voltage dips and interruptions and surge tests shall be separately applied to each mains power input ports.

Table 6: Immunity Requirements and applicability

Phenomenon	Port	Applicability		Reference clause	Performance Criteria
		Fixed equipment	Vehicular equipment		
RF electromagnetic field (80 MHz to 6 000 MHz)	Enclosure	applicable	applicable	7.2.2	A
Electrostatic discharge	Enclosure	applicable	applicable	7.2.2	B
Fast transients common mode	Signal, wired network and control	applicable	not applicable	ETSI EN 301 489-1 [1], 9.4.2	B
	DC power	applicable	not applicable (see note 1)		
	AC power	applicable	not applicable		
RF common mode 0,15 MHz to 80 MHz	Signal, wired network and control	applicable	applicable	7.2.2	A
	DC power	applicable	applicable	ETSI EN 301 489-1 [1], 9.5.2	
	AC power	applicable	not applicable		

Phenomenon	Port	Applicability		Reference clause	Performance Criteria
		Fixed equipment	Vehicular equipment		
Transients and surges in the vehicular environment	DC power input	not applicable	applicable	7.2.2	B
Voltage dips and interruptions	AC mains power input	applicable	not applicable	ETSI EN 301 489-1 [1], 9.7.2	C
Surges	AC mains power input	applicable	not applicable	ETSI EN 301 489-1 [1], 9.8.2.0 and 9.8.2.3	B
	Wired network	applicable	not applicable (see note 1)	ETSI EN 301 489-1 [1], 9.8.2.0, 9.8.2.1 and 9.8.2.2	See note 2
NOTE 1: This requirement is covered by the transients and surges test on DC power input ports.					
NOTE 2: Performance criteria C applies when applying the 10/700 μ s waveform surge test. In all other surge tests performance criteria B applies.					

7.2.2 Special Conditions

The following special conditions set out in Table 7 shall apply.

Table 7: Special conditions for EM immunity tests

Reference to clauses in ETSI EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in ETSI EN 301 489-1 [1], clause 9
9.2.1 and 9.2.2: RF electromagnetic field (80 MHz to 6 000 MHz)	Level of the immunity RF test signal over the frequency range 80 MHz to 6 000 MHz shall be 10 V/m (measured unmodulated).
9.3.1 Electrostatic discharge	Test shall not be done in situ. The test method shall be in accordance with EN 61000-4-2 [4], clauses 6, 7 and 8. The test severity level for contact discharge shall be ± 4 kV. For air discharge testing, the test shall be applied at all test levels ± 2 kV, ± 4 kV and ± 8 kV. The escalation strategy in EN 61000-4-2 [4], Annex H shall not be applied.
9.5.1 and 9.5.2: RF common mode 0,15 MHz to 80 MHz	The conducted RF immunity test described in ETSI EN 301 489-1 [1], clause 9.5 shall be used with the test level set to 10 V. This test shall be performed on all cables.
9.6.2: Transients and surges in the vehicular environment	These tests shall be performed on nominal 12 V and 24 V DC supply voltage input ports of mobile radio and ancillary equipment, which are also intended for mobile use in vehicles.

8 EUT test configuration

8.1 Test configuration for emissions

This clause defines the requirements for test configurations:

- if the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment while connected to the minimum representative configuration of ancillary equipment necessary to exercise the ports;
- ports shall be connected to either a piece of equipment representative of intended use or to a representative piece of cable terminated to simulate the impedance of the connected equipment.

8.2 Test configuration for immunity

This clause defines the requirements for test configurations:

- the tests shall be carried out within the specified environmental range and at the rated supply voltage for the equipment;
- if the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment connected to the minimum representative configuration of ancillary equipment necessary to exercise the ports;
- for the immunity tests of ancillary equipment, without a separate pass/fail criteria, the receiver or transmitter coupled to the ancillary equipment, shall be used to judge whether the ancillary equipment passes or fails;
- ports shall be connected to either a piece equipment representative of intended use or to a representative piece of cable terminated to simulate the impedance of the connected equipment.

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].

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 301 489-55					
Requirement				Requirement Conditionality	
No	Description	Essential requirements of Directive	Clause(s) of the present document	U/C	Condition
1	Emissions: Enclosure port	3.1(b)	7.1	U	
2	Emissions: DC power input/output ports	3.1(b)	7.1	C	Only where equipment has DC power input/output ports
3	Emissions: AC mains power input/output ports	3.1(b)	7.1	C	Only applies to fixed equipment
4	Emissions: Wired network ports	3.1(b)	7.1	C	Only applies to fixed equipment
5	Immunity: Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	3.1(b)	7.2	U	
6	Immunity: Electrostatic discharge	3.1(b)	7.2	U	
7	Immunity: Fast transients common mode	3.1(b)	7.2	C	Only applies to fixed equipment
8	Immunity: Radio frequency common mode on signal, wired network and control ports	3.1(b)	7.2	U	
9	Immunity: Radio frequency common mode on DC power ports	3.1(b)	7.2	U	
10	Immunity: Radio frequency common mode on AC power ports	3.1(b)	7.2	C	Only applies to fixed equipment
11	Immunity: Transients and surges in the vehicular environment	3.1(b)	7.2	C	Only where equipment is fitted to a vehicle power supply
12	Immunity: Voltage dips and interruptions	3.1(b)	7.2	C	Only applies to fixed equipment
13	Immunity: Surges	3.1(b)	7.2	C	Only applies to fixed equipment

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): Bibliography

ETSI EN 303 363-2 (V1.1.1): "Air Traffic Control Surveillance Radar Sensors; Secondary Surveillance Radar (SSR); Harmonised Standard for access to radio spectrum; Part 2: Far Field Monitor (FFM)".

ETSI EN 303 213-5-1 (V2.1.1): "Advanced Surface Movement Guidance and Control System (A-SMGCS); Part 5: Harmonised Standard for access to radio spectrum for Multilateration (MLAT) equipment; Sub-part 1: Receivers and Interrogators".

Draft ETSI EN 303 489 (V0.0.18): "Air Traffic Control Surveillance; Wide Area Multilateration (WAM) systems; Harmonised Standard for access to radio spectrum".

ETSI EN 303 363-1 (V1.1.1): "Air Traffic Control Surveillance Radar Sensors; Secondary Surveillance Radar (SSR); Harmonised Standard for access to radio spectrum; Part 1: SSR Interrogator".

Draft FAA: "Performance specification distance measuring equipment (DME) transponder system" (July 22, 2021).

History

Document history		
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