

# ETSI EN 303 213-5-2 V1.1.1 (2022-04)



**Advanced Surface Movement Guidance and  
Control System (A-SMGCS);  
Part 5: Harmonised Standard for access to  
radio spectrum for Multilateration (MLAT) equipment;  
Sub-part 2: Reference and Vehicle Transmitters**

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**Reference**

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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 - APE 7112B  
Association à but non lucratif enregistrée à la  
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# Contents

Intellectual Property Rights .....	5
Foreword.....	5
Modal verbs terminology.....	6
Introduction .....	6
1 Scope .....	7
2 References .....	7
2.1 Normative references .....	7
2.2 Informative references.....	7
3 Definition of terms, symbols and abbreviations.....	8
3.1 Terms.....	8
3.2 Symbols.....	9
3.3 Abbreviations .....	9
4 Technical requirements specifications .....	10
4.1 Environmental profile.....	10
4.2 Conformance requirements .....	10
4.2.1 Equipment with and without integral antenna .....	10
4.2.2 Transmitter operating frequency and frequency error.....	10
4.2.2.1 Definition .....	10
4.2.2.2 Limits .....	10
4.2.2.3 Conformance.....	10
4.2.3 Spectrum mask.....	11
4.2.3.1 Definition .....	11
4.2.3.2 Limits .....	11
4.2.3.3 Conformance.....	12
4.2.4 Residual Power Output.....	12
4.2.4.1 Definition .....	12
4.2.4.2 Limits .....	12
4.2.4.3 Conformance.....	12
4.2.5 Spurious emissions of transmitter in active mode.....	12
4.2.5.1 Definition .....	12
4.2.5.2 Limits .....	12
4.2.5.3 Conformance.....	12
4.2.6 Transmitter Intermodulation attenuation .....	13
4.2.6.1 Definition .....	13
4.2.6.2 Limits .....	13
4.2.6.3 Conformance.....	13
4.2.7 Duty Cycle .....	13
4.2.7.1 Definition .....	13
4.2.7.2 Limits .....	13
4.2.7.3 Conformance.....	13
4.2.8 Peak Output Power .....	13
4.2.8.1 Definition .....	13
4.2.8.2 Limits .....	13
4.2.8.3 Conformance.....	14
5 Testing for compliance with technical requirements.....	14
5.1 Environmental conditions for testing .....	14
5.1.1 General requirements.....	14
5.1.2 Test conditions.....	14
5.1.2.1 Thermal Balance .....	14
5.1.2.2 Environmental Test Conditions.....	14
5.1.2.2.1 Temperature and humidity.....	14
5.1.2.2.2 Power supply .....	14
5.1.2.3 Environmental range tests .....	15

5.1.2.3.1	Temperature range.....	15
5.1.2.3.2	Extreme Power supply.....	15
5.2	Transmitter test signals.....	15
5.2.1	General Considerations.....	15
5.2.2	Test signal A.....	15
5.3	Transmitter tests.....	16
5.3.1	Operating frequency and frequency error.....	16
5.3.1.1	Description.....	16
5.3.1.2	Test conditions.....	16
5.3.1.3	Method of measurement.....	16
5.3.1.4	Measurement procedure.....	16
5.3.2	Peak Output Power.....	16
5.3.2.1	Description.....	16
5.3.2.2	Test conditions.....	16
5.3.2.3	Method of measurement.....	17
5.3.2.4	Measurement procedure.....	17
5.3.3	Spectrum mask.....	17
5.3.3.1	Description.....	17
5.3.3.2	Test conditions.....	17
5.3.3.3	Method of measurement.....	17
5.3.3.4	Measurement procedure.....	17
5.3.4	Residual Power Output.....	18
5.3.4.1	Description.....	18
5.3.4.2	Test conditions.....	18
5.3.4.3	Method of measurement.....	18
5.3.4.4	Measurement procedure.....	18
5.3.5	Spurious emissions of transmitter in active mode.....	18
5.3.5.1	Description.....	18
5.3.5.2	Test conditions.....	19
5.3.5.3	Method of measurement.....	19
5.3.5.4	Measurement Procedure.....	19
5.3.6	Transmitter Intermodulation attenuation.....	20
5.3.6.1	Description.....	20
5.3.6.2	Test Conditions.....	20
5.3.6.3	Method of Measurement.....	20
5.3.6.4	Measurement Procedure.....	20
5.3.7	Duty Cycle.....	21
5.3.7.1	Description.....	21
5.3.7.2	Test conditions.....	21
5.3.7.3	Method of measurement.....	21
5.3.7.4	Measurement procedure.....	21
<b>Annex A (informative):</b>	<b>Relationship between the present document and the essential requirements of Directive 2014/53/EU.....</b>	<b>22</b>
<b>Annex B (informative):</b>	<b>Maximum Measurement Uncertainty.....</b>	<b>24</b>
<b>Annex C (informative):</b>	<b>Checklist.....</b>	<b>25</b>
<b>Annex D (informative):</b>	<b>Bibliography.....</b>	<b>26</b>
History.....		27

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## Foreword

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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.3] 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 5, sub-part 2, of a multi-part deliverable covering Advanced Surface Movement Guidance and Control System (A-SMGCS), as identified below:

- Part 1: "Community Specification for A-SMGCS surveillance service including external interfaces";
- Part 2: "Community Specification for A-SMGCS airport safety support service";
- Part 3: "Community Specification for a deployed cooperative sensor including its interfaces";
- Part 4: "Community Specification for a deployed non-cooperative sensor including its interfaces";
- Part 5: "Harmonised Standard for access to radio spectrum for Multilateration (MLAT) equipment":**
  - Sub-part 1: "Receivers and Interrogators";
  - Sub-part 2: "Reference and Vehicle Transmitters";**
- Part 6: "Harmonised Standard for access to radio spectrum for deployed surface movement radar sensors";
- Part 7: "Community Specification for A-SMGCS routing service";

Part 8: "Community Specification for A-SMGCS guidance service".

<b>National transposition dates</b>	
Date of adoption of this EN:	26 April 2022
Date of latest announcement of this EN (doa):	31 July 2022
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2023
Date of withdrawal of any conflicting National Standard (dow):	31 January 2024

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## Modal verbs terminology

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"must" and "must not" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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## Introduction

A-SMGCS are systems providing routing, guidance, surveillance and control to aircraft and affected vehicles in order to maintain movement rate under all local weather conditions within the Aerodrome Visibility Operational Level (AVOL) whilst maintaining the required level of safety.

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# 1 Scope

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

- 1) devices transmitting in the 1 090 MHz band, used as ground-based reference transmitters in Mode S multilateration equipment in an Advanced Surface Movement Guidance and Control System (A-SMGCS);
- 2) devices transmitting in the 1 090 MHz band, used for ground vehicle tracking in an Advanced Surface Movement Guidance and Control System (A-SMGCS).

Antennas for this equipment are considered to be passive without an additional amplifier.

NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.1] is given in Annex A.

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## 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] EUROCAE ED-117A (September 2016): "Minimum operational performance specification for Mode S Multilateration Systems for Use in Advanced Surface Movement Guidance and Control Systems (A-SMGCS)".
- [2] ETSI EN 300 019-1-3 (V2.4.1) (04-2014): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weatherprotected locations".
- [3] ETSI EN 300 019-1-4 (V2.2.1) (04-2014): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weatherprotected locations".
- [4] ICAO Annex 10, Volume IV: "Surveillance Radar and Collision Avoidance systems", 5<sup>th</sup> edition, July 2014, including amendments up to amendment 90, November 2018.

### 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.

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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] ETSI EG 203 336 (V1.2.1): "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.3] 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.4] ERC Recommendation 74-01 (2019): "Unwanted emissions in spurious domain".
- [i.5] EUROCAE ED-102B (December 2020): "MOPS for 1090 MHz Extended Squitter ADS-B and TIS-B".
- [i.6] ICAO, Doc-9871: "Technical Provisions for Mode S Services and Extended Squitter", edition 2, 2012.
- [i.7] ITU Radio Regulations (2020).

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## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

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

**conducted measurements:** measurements which are made using a wired connection to the EUT

**environmental profile:** range of environmental conditions under which the EUT is declared by the manufacturer to comply with the provisions of the present document

**equipment under test:** system of constituents provided by the manufacturer for qualification under the present document

**ground based multilateration equipment or ground station:** aeronautical station equipment intended for use in an A-SMGCS multilateration component

NOTE: A ground station can include sensor, interrogator and/or transponder components. A ground station can be fixed or mobile.

**inactive state:** entire period between transmissions, less 100  $\mu$ s transition periods preceding and following the transmission

**integral antenna:** antenna which is integrated into the EUT without the use of an external connector, and which is considered to be part of the EUT

**interrogator:** aeronautical station equipment including at least one transmitter designed to produce aeronautical mobile service signals at 1 030 MHz

**Mode S:** particular type of transponder uplink or downlink message defined in ICAO Annex 10, Volume IV [4]

**multilateration:** surveillance technique which provides position derived from the Secondary Surveillance Radar (SSR) transponder signals (replies or squitters) primarily using Time Difference Of Arrival (TDOA) techniques

NOTE: Additional information, including identification, can be extracted from the received signals.

**observation bandwidth:** bandwidth in which the energy of an equipment is considered for the purposes of assessing transmission timings



**Operating Channel (OC):** frequency range in which the transmission from the EUT occurs, or in which the EUT is intended to receive transmissions

**operating frequency:** centre of the OC

**out of band emissions:** power transmitted at frequencies outside the OC but within the specified spectral mask

**probability of detection:** rate of correctly received and decoded squitter messages

**radiated measurements:** measurements which involve the measurement of a radiated field in the vicinity of the EUT

**receiver:** EUT which includes the capability to convert RF signals into binary content

**resolution bandwidth:** frequency span of the final filter that is applied to the input signal controlling the frequency resolution of the resulting spectrum

NOTE: Smaller resolution bandwidths provide finer frequency resolution and the ability to differentiate signals that have frequencies that are closer together.

**sensor:** aeronautical station equipment including at least one receiver designed to receive aeronautical mobile service signals at 1 030 MHz and/or 1 090 MHz

**spurious emissions:** power transmitted at frequencies below or above the Out of Band domain

NOTE: Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude Out of Band emissions.

**transmission:** radio emission consisting of one uplink or downlink Mode S message

**transmitter:** EUT which includes the capability to convert binary content into RF signals

**unwanted signal:** any signal other than the wanted signal or as described in a specific test case

**wanted signal:** in-band signal modulated according to the Mode S Specification

## 3.2 Symbols

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For the purposes of the present document, the following symbols apply:

dB	deciBel
dBc	power in dB relative to carrier
dBm	power in dB relative to 1 milliwatt
f	measurement frequency
μs	microsecond
Ω	Ohm

## 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AC	Alternating Current
ADS-B	Automatic Dependant Surveillance Broadcast
A-SMGCS	Advanced Surface Movement Guidance and Control System
AVOL	Aerodrome Visibility Operational Level
CL	Code Label
CW	Continuous Wave
DC	Direct Current
Doc	Document
ERC	European Radiocommunications Committee
EUROCAE	European Organization for Civil Aviation Equipment
EUT	Equipment Under Test
IC	Interrogator Code
ICAO	International Civil Aviation Organization

ITU	International Telecommunication Union
ITU-R	International Telecommunication Union - Radiocommunication
MOPS	Minimum Operational Performance Specification
NA	Not Applicable
OC	Operating Channel
OOB	Out Of Band
PEP	Peak Envelope Power
RBW <sub>ref</sub>	Reference BandWidth
RF	Radio Frequency
RMS	Root Mean Square
SSR	Secondary Surveillance Radar

## 4 Technical requirements specifications

### 4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be in accordance with its intended use but, as a minimum, shall be that specified in the test conditions contained in the present document. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the operational environmental profile defined by its intended use.

### 4.2 Conformance requirements

#### 4.2.1 Equipment with and without integral antenna

For the purposes of conducted measurements on an EUT a 50  $\Omega$  RF connection point shall be provided for test purposes.

For EUT with integral antenna the connection point shall correspond to the input of the integral antenna. The connection point may be a modification made for the purposes of testing and need not be a permanent part of the EUT when made available for sale.

The unit provided to the test lab may be fitted with a temporary antenna connector with the integral antenna disconnected.

#### 4.2.2 Transmitter operating frequency and frequency error

##### 4.2.2.1 Definition

The operating frequency is the nominal value of the carrier frequency.

The frequency error is the difference between the actual carrier frequency and its nominal value of 1 090 MHz.

##### 4.2.2.2 Limits

The nominal value of carrier frequency of the transmissions shall be 1 090 MHz.

The absolute value of the frequency error shall not exceed 100 kHz.

##### 4.2.2.3 Conformance

The conformance tests for this requirement shall be as defined in clause 5.3.1.

## 4.2.3 Spectrum mask

### 4.2.3.1 Definition

A spectrum mask is a set of limit lines applied to a plot of a transmitter spectrum. The purpose is to constrain emissions at frequencies in the Out of Band domain which lies immediately outside the intended Operating Channel.

For the purposes of the present document, the Out of Band domain extends to  $\pm 78$  MHz from the measured operating frequency (i.e.  $1\,090\text{ MHz} \pm \text{frequency error}$ ). The frequencies outside the Out of Band domain are defined as the spurious domain.

The definition of the spectrum mask is chosen as an alternative method to the specification of Out of Band domain emissions.

### 4.2.3.2 Limits

The measured spectrum shall be below the limit lines shown in Figure 1.

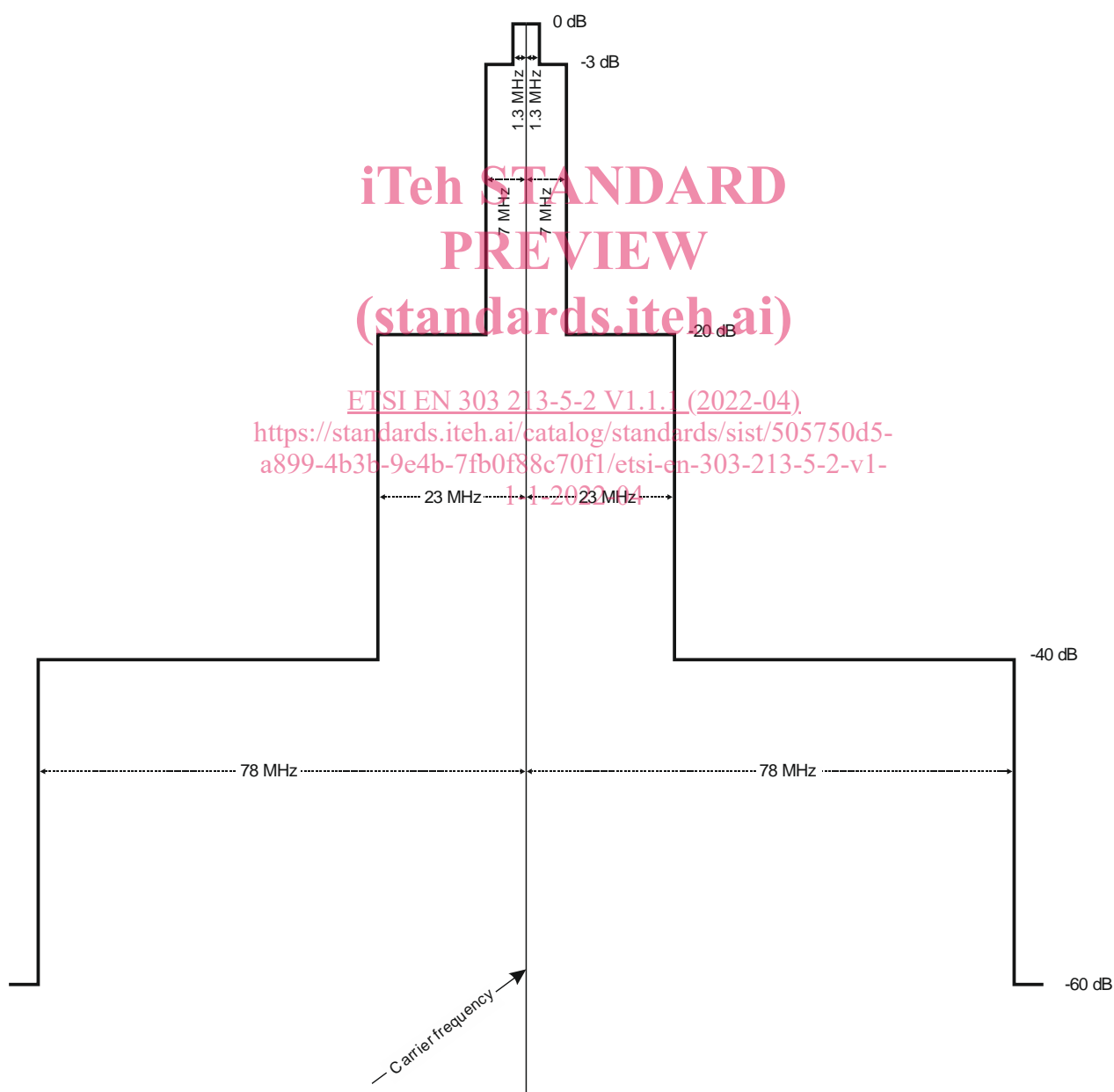


Figure 1: Spectrum mask