

ETSI EN 303 413 V1.2.1 (2021-04)



**Satellite Earth Stations and Systems (SES);
Global Navigation Satellite System (GNSS) receivers;
Radio equipment operating in the 1 164 MHz to 1 300 MHz
and 1 559 MHz to 1 610 MHz frequency bands;
Harmonised Standard for access to radio spectrum**

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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).
ETSI EN 303 413 V1.2.1 (2021-04)
<https://standards.iteh.ai/catalog/standards/sist/c7b1772-9e68-470b-ad5f-21cf7b291c2c/etsi-en-303-413-v1-2-1-2021-04>

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.8] 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.

National transposition dates

Date of adoption of this EN:	12 April 2021
Date of latest announcement of this EN (doa):	31 July 2021
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2022
Date of withdrawal of any conflicting National Standard (dow):	31 January 2023

Modal verbs terminology

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Executive summary

The present document gives the technical requirements (clause 4) and test methodology (clause 5) for presumption of conformity of GNSS User Equipment with article 3.2 of Directive 2014/53/EU [i.1].

Introduction

The present document defines technical requirements to support the essential requirements of article 3.2 of Directive 2014/53/EU [i.1] which states "*Radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference*".

The present document does not contain any requirement, recommendation or information about the installation of the GNSS user equipment.

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1 Scope

The present document specifies technical characteristics and methods of measurements for Global Navigation Satellite System (GNSS) User Equipment (GUE).

Global Navigation Satellite System (GNSS) User Equipment (GUE) is capable of operating as part of one or more RadioNavigation-Satellite Service (RNSS) systems in the RNSS frequency bands given in table 1-1.

Table 1-1: RadioNavigation-Satellite Service (RNSS) frequency bands

RNSS frequency bands	Comments
1 164 MHz to 1 300 MHz	space-to-Earth
1 559 MHz to 1 610 MHz	space-to-Earth

A GUE receives radio signals from one or more GNSS constellation for the purpose of radiodetermination of the position, velocity and/or other characteristics of an object or the obtaining of information relating to those parameters, by means of the propagation properties of radio waves. RNSS is defined as "A radiodetermination-satellite service used for the purpose of radionavigation" (No. 1.43 of the ITU Radio Regulations [i.13]).

The present document applies to all GUE operating in the bands given in table 1-1 with the ability to receive any GNSS constellation (e.g. BeiDou (BDS), Galileo, Global Navigation Satellite System (GLONASS), Global Positioning System (GPS), Space Based Augmentation System (SBAS)).

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 (standards.iteh.ai)

2.1 Normative references

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 300 328 (V2.2.2): "Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum".

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] 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] Recommendation ITU-R M.1787: "Description of systems and networks in the radionavigation-satellite service (space-to-Earth and space-to-space) and technical characteristics of transmitting space stations operating in the bands 1 164-1 215 MHz, 1 215-1 300 MHz and 1 559-1 610 MHz".
- [i.4] Recommendation ITU-R M.1901: "Guidance on ITU-R Recommendations related to systems and networks in the radionavigation-satellite service operating in the frequency bands 1 164-1 215 MHz, 1 215-1 300 MHz, 1 559-1 610 MHz, 5 000-5 010 MHz and 5 010-5 030 MHz".
- [i.5] Recommendation ITU-R M.1902: "Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) operating in the band 1 215-1 300 MHz".
- [i.6] Recommendation ITU-R M.1903: "Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) and receivers in the aeronautical radionavigation service operating in the band 1 559-1 610 MHz".
- [i.7] Recommendation ITU-R M.1905: "Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) operating in the band 1 164-1 215 MHz".
- [i.8] 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.9] CISPR 16-1-4:2019: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements".
- [i.10] ETSI TR 102 273 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".
- [i.11] Void.
- [i.12] Void.
- [i.13] ITU Radio Regulations (edition of 2016).
- [i.14] EN IEC 55016-1-1: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus" (produced by CENELEC).
- [i.15] EN 55016-2-3: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurements of disturbances and immunity - Radiated disturbance measurements" (produced by CENELEC).
- [i.16] EN 55032: "Electromagnetic compatibility of multimedia equipment - Emission requirements" (produced by CENELEC).

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in Directive 2014/53/EU [i.1] and the following apply:

C/N_0 : carrier to noise-density ratio, expressed in dB-Hz

NOTE: The ratio of the received (GNSS) signal carrier power C , in dBW or dBm, to the noise power spectral density, in dBW/Hz or dBm/Hz, in the absence of interference.

$C/(N_0+I)$: carrier to noise-and-interference-density ratio, $C/(N_0+I)$, in dB-Hz

conducted measurements: measurements of the performance of the EUT made by direct wired connection to the antenna port

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

GNSS User Equipment (GUE): radiodetermination equipment capable of receiving signals from one or more GNSS constellation

NOTE: Such a receiver can acquire and then track GNSS signals to determine its location and/or velocity and/or time and/or other related parameters.

radiated measurements: measurements of the performance of the EUT made by placing the EUT in a suitable shielded container and radiating the required signals to the EUT

NOTE: I.e. without using a direct wired connection to the antenna port.

RadioNavigation-Satellite Service (RNSS): services used for the purpose of radionavigation, that is for the determination of the position, velocity, and/or other characteristics of an object

NOTE: Includes the use of GNSS and other RNSS systems.

RNSS frequency band: continuous ranges of frequencies detailed in table 1-1, allocated by the ITU Radio Regulations [i.13] to the RNSS

spurious emissions: any unintentional GUE emissions, whether inside or outside the receiver bandwidth

NOTE: Since a GNSS receiver is receive-only, any emission is unintentional.

3.2 Symbols

Void.

3.3 Abbreviations

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

AM(R)S	Aeronautical Mobile (Route) Service
ARNS	Aeronautical RadioNavigation Service
AWGN	Additive White Gaussian Noise
BDS	BeiDou Navigation Satellite System

NOTE: See Recommendation ITU-R M.1787 [i.3], annex 7.

CISPR	Comité International Spécial des Perturbations Radioélectriques
DDC	Digital Down Conversion
e.i.r.p.	effective isotropically radiated power
e.r.p.	effective radiated power

EC	European Commission
EFTA	European Free Trade Association
EGNOS	European Geostationary Navigation Overlay Service
EU	European Union
EUT	Equipment Under Test
GAGAN	GPS-Aided GEO Augmented Navigation System
GHz	Gigahertz
GLONASS	GLObalnaya NAvigatsionnaya Sputnikovaya Sistema

NOTE: Latin transliteration of the Cyrillic abbreviation ГЛОНАСС which stands for Глобальная навигационная спутниковая система translating to Global Navigation Satellite System (see Recommendation ITU-R M.1787 [i.3], annex 1).

GNSS	Global Navigation Satellite System
GPS	Global Positioning System

NOTE: See Recommendation ITU-R M.1787 [i.3], annex 2.

GUE	GNSS User Equipment
Hz	Hertz
IGSO	Inclined Geosynchronous Satellite Orbit
ITU	International Telecommunication Union
kHz	Kilohertz
LO	Local Oscillator
MEO	Medium Earth Orbit
MHz	Megahertz
MSAS	MTSAT Satellite Based Augmentation Navigation System
MSS	Mobile Satellite Service
OOBE	Out-Of-Band Emissions
RF	Radio Frequency
RMS	Root Mean Square
RNSS	RadioNavigation-Satellite Service

NOTE: See Recommendations ITU-R M.1901 [i.4], M.1902 [i.5], M.1903 [i.6] and M.1905 [i.7].

SBAS	Space Based Augmentation System
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NOTE: See Recommendation ITU-R M.1787 [i.3], annex 8.

WAAS	Wide Area Augmentation System
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4 Technical requirements specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the GUE, which shall be in accordance with its intended use. The GUE 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 specifications

4.2.1 Receiver blocking

4.2.1.1 Definition

Receiver blocking is a measure of the capability of the GUE to receive a wanted signal without exceeding a given degradation due to the presence of an unwanted input signal operating in accordance with the allocation table of the ITU Radio Regulations [i.13] in frequency bands adjacent or near-adjacent to the relevant RNSS band.

4.2.1.2 Specification

The C/N_0 metric reported by the GUE for all GNSS constellations and GNSS signals given in table 4-1 and supported by the GUE shall not degrade by more than the value given in equation (4-1) when a blocking signal is applied. The blocking signal is defined in table 4-4, with the frequencies and power levels defined in table 4-2 and/or in table 4-3 depending on the RNSS bands supported by the GUE.

Equation (4-1): Maximum degradation in C/N_0

$$\Delta C/N_0 \leq 1 \text{ dB} \quad (4-1)$$

Table 4-1: GNSS constellations, GNSS signals and RNSS frequency bands

GNSS Constellation	GNSS Signal Designations	RNSS Frequency Band (MHz)
BDS	B1I	1 559 to 1 610
	B1C	1 559 to 1 610
Galileo	E1	1 559 to 1 610
	E5a	1 164 to 1 215
	E5b	1 164 to 1 215
	E6	1 215 to 1 300
GLONASS	G1	1 559 to 1 610
	G2	1 215 to 1 300
GPS	L1 C/A	1 559 to 1 610
	L1C	1 559 to 1 610
	L2C	1 215 to 1 300
	L5	1 164 to 1 215
SBAS	L1	1 559 to 1 610
	L5	1 164 to 1 215

Table 4-2: Frequency bands, blocking signal test point centre frequencies and power levels for the 1 559 MHz to 1 610 MHz RNSS band

Frequency band (MHz)	Test point centre frequency (MHz)	Blocking signal power level (dBm)	Comments
1 518 to 1 525	1 524	-65	MSS (space-to-Earth) band
1 525 to 1 549	1 548	-95	MSS (space-to-Earth) band
1 549 to 1 559	1 554	-105	MSS (space-to-Earth) band
1 559 to 1 610	GUE RNSS band under test		
1 610 to 1 626	1 615	-105	MSS (Earth-to-space) band
1 626 to 1 640	1 627	-85	MSS (Earth-to-space) band

Table 4-3: Frequency bands, blocking signal test point centre frequencies and power levels for the 1 164 MHz to 1 300 MHz RNSS band

Frequency band (MHz)	Test point centre frequency (MHz)	Blocking signal power level (dBm)	Comments
960 to 1 164	1 154	-75	AM(R)S, ARNS band
1 164 to 1 215		GUE RNSS band under test	
1 215 to 1 260		GUE RNSS band under test	
1 260 to 1 300		GUE RNSS band under test	
1 300 to 1 350	1 310	-85	Radiolocation, ARNS, RNSS (Earth-to-space) band

Table 4-4: Blocking signal

Parameter	Value	Comments
Frequency	See table 4-2 and table 4-3	
Power level	See table 4-2 and table 4-3	
Bandwidth	1 MHz	See clause B.1 for details
Format	AWGN	

Annex B contains details of the blocking signal and the GNSS signals that shall be used in performing the conformance tests. Annex C contains a detailed explanation of the C/N_0 metric. Clause C.3 describes the calculation of the nominal bounding value for the blocking signal power level at the points closest to the operating band given in table 4-2.

4.2.1.3 Conformance

A GUE utilizing the RNSS band 1 559 MHz to 1 610 MHz shall be presumed to conform to this technical requirements specification if the C/N_0 , as reported by the GUE for each declared GNSS constellation and GNSS signal, does not degrade by more than the value given in equation (4-1) in the presence of the blocking signals in table 4-2.

A GUE also utilizing any of the RNSS band 1 164 MHz to 1 300 MHz shall be presumed to conform to this technical requirements specification if the C/N_0 , as reported by the GUE for each declared GNSS constellation and GNSS signal, also does not degrade by more than the value given in equation (4-1) in the presence of the blocking signals in table 4-3.

The testing for conformance with the technical requirements specifications is given in clause 5.4.

4.2.2 Receiver spurious emissions

4.2.2.1 Definition

Receiver spurious emissions are emissions at any frequency when the GUE is active.

4.2.2.2 Specification

The receiver spurious emissions of the GUE shall not exceed the values given in table 4-5.

In case of a GUE with an external antenna connector, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or for emissions radiated by a GUE with an integral antenna (without an antenna connector), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Table 4-5: Receiver spurious emission limits

Frequency range	Maximum power	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 8,3 GHz	-47 dBm	1 MHz