



**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 covering the essential requirements
of article 3.2 of Directive 2014/53/EU**

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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
Association à but non lucratif enregistrée à la
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Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES), and is now submitted for the combined Public Enquiry and 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.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.

Proposed national transposition dates	
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
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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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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 the Radio Equipment Directive (2014/53/EU) [i.1].

Introduction

ETSI has designed a modular structure for the standards. Each standard is a module in the structure. The modular structure is shown in ETSI EG 203 336 [i.2].

The present document defines technical requirements to support the essential requirements of article 3.2 of the Radio Equipment Directive [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 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" (article 1.43 of ITU Radio Regulations [i.16]).

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

The present document applies to the GUE only. For other systems that include a GNSS receiver, the requirements of the most appropriate harmonised standard for that type of equipment apply.

The present document covers the essential requirements of article 3.2 of Directive 2014/53/EU [i.1] under the conditions identified in annex A.

As stated in the annex I of the Radio Equipment Directive [i.1] the present document does not cover:

- Marine equipment falling within the scope of Council Directive 96/98/EC [i.13].
- Airborne products, parts and appliances falling within the scope of Article 3 of Regulation (EC) No 216/2008 [i.14] of the European Parliament and of the Council.

NOTE: A new version of the Marine Equipment Directive has been published and the reference should be Directive 2014/90/EU [i.15]. However, this citation has not been updated in the RED.

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 300 328 (V2.1.1) (11-2016): "Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".

2.2 Informative references

Informative 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 (V1.1.1) (08-2015): "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.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 Ed.3.0 (2010): "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] ETSI TR 100 028-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [i.12] ETSI TR 100 028-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".
- [i.13] Council Directive 96/98/EC of 20 December 1996 on marine equipment.
- [i.14] Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC.

- [i.15] Directive 2014/90/EU of the European Parliament and of the Council of 23 July 2014 on marine equipment and repealing Council Directive 96/98/EC.
- [i.16] ITU Radio Regulations (edition of 2016).

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions 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

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): service(s) 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 systems.

RNSS frequency band: continuous ranges of frequencies detailed in table 1-1, allocated by the ITU Radio Regulations to the RNSS [i.16]

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 Abbreviations

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

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

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

e.i.r.p.	effective isotropically radiated power
e.r.p.	effective radiated power

GPS Global Positioning System

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

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
 GUE GNSS User Equipment
 ITU International Telecommunication Union
 MEO Medium Earth Orbit
 MSS Mobile Satellite Service
 OOBE Out-Of-Band Emissions
 RF Radio Frequency
 RNSS Radionavigation Satellite Service

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

RMS Root Mean Square
 SBAS Space Based Augmentation System

NOTE: See Recommendation ITU-R M.1787 [i.3], annex 8.

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 declared by the manufacturer. The GUE 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.

4.2 Conformance specifications

4.2.1 GUE adjacent frequency band selectivity performance

4.2.1.1 Definition

GUE adjacent frequency band selectivity is the ability of the GUE to achieve the specified performance in the presence of noise produced by signals operating in accordance with the allocation table of the ITU Radio Regulations [i.16] in frequency bands adjacent or near-adjacent to the relevant RNSS band.

4.2.1.2 Specifications

The C/N_0 metric reported by the GUE for all GNSS 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 an adjacent frequency signal is applied. The adjacent frequency 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, GNSS signals and RNSS frequency bands

GNSS	GNSS Signal Designations	RNSS Frequency Band (MHz)
BDS	B1I	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	1 559 to 1 610
	L2	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, adjacent frequency 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)	Adjacent frequency 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, adjacent frequency 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)	Adjacent frequency 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: Adjacent frequency 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 adjacent frequency 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 adjacent frequency 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 adjacent frequency signals in table 4-2.