SLOVENSKI STANDARD
oSIST prEN 303 661 V1.1.0:2023

01-april-2023

Naprave kratkega dosega (SRD) - Talni sintetično odprtinski radar (GBSAR) v frekvenčnem območju od 17,1 GHz do 17,3 GHz in talni sintetično odprtinski radar visoke ločljivosti (HD-GBSAR) v frekvenčnem območju od 76 GHz do 77 GHz - Harmonizirani standard za dostop do radijskega spektra

Short Range Devices (SRD) - Ground Based Synthetic Aperture Radar (GBSAR) in the frequency range 17,1 GHz to 17,3 GHz and High Definition Ground Based Synthetic Aperture Radar (HD-GBSAR) in the frequency range 76 GHz to 77 GHz - Harmonised Standard for access to radio spectrum

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Short Range Devices (SRD);
Ground Based Synthetic Aperture Radar (GBSAR) in the frequency range 17,1 GHz to 17,3 GHz and High Definition Ground Based Synthetic Aperture Radar (HD-GBSAR) in the frequency range 76 GHz to 77 GHz;
Harmonised Standard for access to radio spectrum

Reference
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Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), 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.7] 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).

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

Introduction

The present document is developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the Directive 2014/53/EU [i.1].

It specifically aims at providing requirements for Ground Based Synthetic Aperture Radar (GBSAR) and High Definition Ground Based Synthetic Aperture Radar (HD-GBSAR). GBSAR and HD-GBSAR are Short Range Devices used for radiodetermination application. The GBSAR and HD-GBSAR applications are intended exclusively for detection of movement related to structures potentially effecting the protection of workers and the general public.

For the GBSAR case of the present document, the applicable harmonised standard has been ETSI EN 300 440 [i.6], for Radio equipment to be used in the 1 GHz to 40 GHz frequency range; this was published in the OJEU on 14 July 2017 with a restriction for receiver categories 2 and 3 as defined in table 5 of that standard.

1 Scope

The present document specifies technical characteristics and methods of measurements for Ground Based Synthetic Aperture Radar (GBSAR) and High Definition Ground Based Synthetic Aperture Radar (HD-GBSAR).

GBSAR devices within the scope of the present document are covered by SRD regulations:

- ERC/REC 70-03 [i.2], annex 6 (17,1 GHz to 17,3 GHz); and
- Commission Implementing Decision (EU) 2022/180 [i.3] for SRD, band no. 65.

GBSAR within the scope of the present document provide:

- an output logic test signal indicating when the intended operation command of GBSAR is started and stopped respectively;
- an output logic signal indicating when the DAA is active/not active.

HD-GBSAR devices within the scope of the present document are covered by ECC Decision:

- ECC/DEC/(21)02 [i.10].

HD-GBSAR within the scope of the present document also provide:

- an output logic signal indicating when the DAA is active/not active.

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.

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.

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 303 883-1 (V1.2.1) (02-2021): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Part 1: Measurement techniques for transmitter requirements".

[2] ETSI EN 303 883-2 (V1.2.1) (02-2021): "Short Range Devices (SRD) and Ultra Wide Band (UWB); Part 2: Measurement techniques for receiver requirements".

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 (RE-Directive).

[i.2] CEPT/ERC Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".

[i.3] Commission Implementing Decision (EU) 2022/180 of 8 February 2022 amending Decision 2006/771/EC as regards the update of harmonised technical conditions in the area of radio spectrum use for short-range devices (notified under document C(2022) 644).

[i.4] ETSI TS 103 361 (V1.1.1): "Short Range Devices (SRD) using Ultra Wide Band technology (UWB); Receiver technical requirements, parameters and measurement procedures to fulfil the requirements of the Directive 2014/53/EU".

[i.5] CEPT/ERC/Recommendation 74-01: "Unwanted emissions in the spurious domain".

[i.6] ETSI EN 300 440 (V2.1.1): "Short Range Devices (SRD); Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".

[i.7] 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.8] ECC Report 111: "Compatibility studies between Ground Based Synthetic Aperture Radar (GBSAR) and existing services in the range 17.1 GHz to 17.3 GHz".

[i.9] ECC Report 315: "Feasibility of spectrum sharing between High-Definition Ground Based Synthetic Aperture Radar (HD-GBSAR) application using 1 GHz bandwidth within 74-81 GHz and existing services and applications".

[i.10] ECC/DEC/(21)02: "The harmonised frequency band 76-77 GHz, technical characteristics, exemption from individual licensing and free circulation and use of High Definition Ground Based Synthetic Aperture Radar (HD-GBSAR)".

[i.11] ECC Report 262: "Studies related to surveillance radar equipment operating in the 76 to 77 GHz range for fixed transport infrastructure".

[i.12] European Communications Office: "EFIS: ECO Frequency Information System".

[i.13] 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.14] ETSI TS 103 567 (V1.1.1): "Requirements on signal interferer handling".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 303 883-1 [1], ETSI EN 303 883-2 [2] and the following apply:

conducted measurements: measurements which are made using a wired/wave-guided connection to the equipment under test

dedicated antenna: antenna specifically designed for being attached to the radio equipment (i.e. with special mechanical fixing to the antenna port of the specific radio supplied), but can be separated from the equipment (typically for transport purpose) by using normal tools

Ground Based Synthetic Aperture Radar (GBSAR): radiodetermination application for the detection of movement related to structures potentially affecting the protection of workers and the general public

integral antenna: antenna designed to be connected to the equipment without the use of an external connector and considered to be part of the equipment

NOTE: An integral antenna may be fitted internally or externally to the equipment.

radiodetermination: determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves

receiver spurious emissions: receiver unwanted emissions that emanate from the EUT. Receiver spurious emissions are generated internally by the receiver or result from the interaction of the RX coupling with the TX signal

smart antenna systems: equipment that combines multiple transmit and/or receive chains with a signal processing function to increase the throughput and/or to optimize its radiation and/or reception capabilities

NOTE: These are techniques such as spatial multiplexing, beamforming, cyclic delay diversity, MIMO, etc.

3.2 Symbols

For the purposes of the present document, the symbols given in ETSI EN 303 883-1 [1], ETSI EN 303 883-2 [2] and the following apply:

B	bandwidth automotive radar
dBsm	decibels per square meter
f_{LP}	lower edge of the permitted frequency range
f_{HP}	upper edge of the permitted frequency range
ms	millisecond
M	margin of the measured maximum mean e.i.r.p. to the limit of table 4
MEP	Maximum mean e.i.r.p. measured across the EUT environmental profile
P_{DAA}	Peak power DAA threshold
P_{max}	measured Mean e.i.r.p. as measured and corrected by the EUT OFR
PSD_{MAX}	measured maximum Mean e.i.r.p. spectral density within the EUT OFR
P_I	HD-GBSAR conducted peak power at the transmitter antenna input in dBm
P_V	power value of HD-GBSAR DAA test signal
P_V^*	power value +10 dB above the value P_V
R	Reference value for the Maximum mean e.i.r.p.
σ_r	GBSAR/HD-GBSAR accuracy in measuring the displacement
σ_φ	GBSARHD-GBSAR accuracy in measuring phase differences
t_0	time at which GBSAR transmission is intentionally activated
t_D	minimum listen time
t_e	time at which GBSAR actual transmission is automatically interrupted by the DAA
t_L	minimum listen time after detection
t_{off}	GBSAR transmitter switch-off time
t_S	time at which the GBSAR DAA level falls below the DAA threshold
t_t	time at which GBSAR actual transmission is automatically switched-on

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 303 883-1 [1], ETSI EN 303 883-2 [2] and the following apply:

EDM	Error in Distance Measurement
EL	Emission Limit
GBSAR	Ground Based Synthetic Aperture Radar
HD-GBSAR	High Definition Ground Based Synthetic Aperture Radar

m	meter
mm	millimeter
WTPC	Wanted Technical Performance Criterion

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 EUT categories

The present document covers GBSAR and HD-GBSAR devices.

An overview of requirements for GBSAR and HD-GBSAR is given in table 1.

Table 1: Overview of requirements for GBSAR and HD-GBSAR covered by ERC/REC 70-03 [i.2], 2022/180/EU [i.3] and ECC/DEC/(21)02 [i.10]

EUT-category	TX-requirements				RX-requirements	
	Emission requirements		Active mitigation			
		clause		clause		clause
GBSAR	OFR	4.3.1	DAA	4.5.1	WTPC	C.2.1
	Mean e.i.r.p.	4.3.2			RBS	4.4.4 & C.2.2
	Mean e.i.r.p. spectral density	Not applicable				
	TX unwanted emissions	4.3.4			RBR	4.4.5 & C.2.3
	TX behaviour under complete environmentalprofile	4.3.5				
HD-GBSAR	OFR	4.3.1	DAA	4.5.2	WTPC	C.2.1
	Mean e.i.r.p.	4.3.2			RBS	4.4.4 & C.2.2
	Mean e.i.r.p. spectral density	4.3.3				
	TX unwanted emissions	4.3.4			RBR	4.4.5 & C.2.3
	TX behaviour under complete environmentalprofile	4.3.5				

4.3 Transmitter conformance requirements

4.3.1 Operating Frequency Range (OFR)

4.3.1.1 Applicability

This requirement shall apply to all EUT.

4.3.1.2 Description

The description of the Operating Frequency Range is given in clause 5.2 of ETSI EN 303 883-1 [1]. As requested in clause 5.2 of ETSI EN 303 883-1 [1], for all the EUT the value of X is specified to 23 dB.

4.3.1.3 Limits

The OFR of all the EUT shall lie within the permitted frequency range of the EUT (see table 2 for GBSAR and table 3 for HD-GBSAR).

GBSAR equipment within scope of the present document are capable of operating in all or part of the frequency bands given in table 2 with either a Radio Frequency (RF) output connection and dedicated antenna or an integral antenna with a Frequency Modulated Continuous Wave signal.

Table 2: GBSAR permitted frequency range [i.3]

	Frequency Band	Application
GBSAR Transmit and Receive	17,1 GHz to 17,3 GHz	Radiodetermination

HD-GBSAR equipment within scope of the present document are capable of operating in all or part of the frequency bands given in table 3 with either a Radio Frequency (RF) output connection and dedicated antenna or an integral antenna with a Frequency Modulated Continuous Wave signal.

Table 3: HD-GBSAR permitted frequency range [i.10]

	Frequency Band	Application
HD-GBSAR Transmit and Receive	76 GHz to 77 GHz	Radiodetermination

The OFR of all the EUT shall lie within the permitted frequency range of the device (see table 2 for GBSAR and table 3 for HD-GBSAR).

4.3.1.4 Conformance

The conformance test shall be done under normal conditions as defined in clause 5.1.2, the conformance test suite for OFR shall be as defined in clause 5.4.2.

4.3.2 Mean e.i.r.p.

4.3.2.1 Applicability

This requirement shall apply to all EUT.

4.3.2.2 Description

The description of Mean e.i.r.p. is given in clause 5.3.1.1 of ETSI EN 303 883-1 [1].

4.3.2.3 Limits

The transmitter Mean e.i.r.p. shall not exceed the values given in table 4.

Table 4: Mean e.i.r.p.

EUT category	Frequency Bands	Power	Notes
GBSAR	17,1 GHz to 17,3 GHz	400 mW (26 dBm)	See ERC/REC 70-03 [i.2]
HD-GBSAR	76 GHz to 77 GHz	63,1 W (48 dBm)	See ECC/DEC/(21)02 [i.10]

4.3.2.4 Conformance

The conformance test shall be done under normal conditions as defined in clause 5.1.2, the Mean e.i.r.p. shall be measured as described in clause 5.4.3 and not exceed the limits in clause 4.3.2.3.

4.3.3 Mean e.i.r.p. spectral density

4.3.3.1 Applicability

This requirement shall apply to all HD-GBSAR EUT.

4.3.3.2 Description

The description of Mean e.i.r.p. spectral density is given in clause 5.3.2.1 of ETSI EN 303 883-1 [1].

4.3.3.3 Limits

The transmitter Mean e.i.r.p. spectral density shall not exceed the values given in table 5.

Table 5: Maximum mean e.i.r.p. spectral density [i.10]

Frequency Bands	Limit	Notes
76 GHz to 77 GHz	18 dBm/MHz	See ECC/DEC/(21)02 [i.10]

4.3.3.4 Conformance

The conformance test shall be done under normal conditions as defined in clause 5.1.2, the Mean e.i.r.p. spectral density shall be measured as described in clause 5.4.4 and not exceed the limits in clause 4.3.3.3.

4.3.4 TX unwanted emissions

4.3.4.1 Applicability

This requirement shall apply to all EUT.

4.3.4.2 Description

The description of TX unwanted emissions is given in clause 5.5.1 of ETSI EN 303 883-1 [1].

4.3.4.3 Limits

Lower and upper frequency for the TX unwanted emissions test are as defined in clause 5.5.1 of ETSI EN 303 883-1 [1]. Based on the description in clause 4.3.4.2 this would lead to the following TX unwanted emissions in the OOB and Spurious Domain, for GBSAR EUT, see figure 1 and HD-GBSAR, see figure 2.