SLOVENSKI STANDARD
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Meteorološki radarji - Harmonizirani standard za dostop do radijskega spektra - 1. del: Meteorološki radarski senzor S pasu, ki deluje v frekvenčnem pasu od 2 700 MHz do 2 900 MHz

Meteorological Radars - Harmonised Standard for access to radio spectrum - Part 1: S band Meteorological Radar Sensor operating in the frequency band 2 700 MHz to 2 900 MHz

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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.5] 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 1 of a multi-part deliverable covering meteorological radar systems for different frequency bands, as identified below:

Part 1: "S band Meteorological Radar Sensor operating in the frequency band 2 700 MHz to 2 900 MHz";

Part 2: "C band Meteorological Radar Sensor operating in the frequency band 5 250 MHz to 5 850 MHz";

Part 3: "X band Meteorological Radar Sensor operating in the frequency band 9 300 MHz to 9 500 MHz".

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
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

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.

1 Scope

The present document specifies technical characteristics and methods of measurements for S-band meteorological radar systems intended for the surveillance and classification of hydrometeors with the following characteristics:

- Operating in the following frequency range:
  - 2 700 MHz to 2 900 MHz.
- Utilizing unmodulated pulses or phase/frequency modulated pulses also known as pulse compression.
- The maximum output power (PEP) does not exceed 1 MW (i.e. 90 dBm).
- The transceiver antenna connection and its feeding RF line are using a hollow metallic rectangular or elliptic waveguide.
- The antenna is rotating and can be changed in elevation.
- The antenna feed is waveguide based and the antenna is passive.
- The orientation of the transmitted field from the antenna can be vertical or horizontal orientated or it can be both simultaneously.
- At the transceiver output a RF circulator is used.

NOTE 1: Since transceiver and antenna are based on hollow metallic rectangular waveguide the frequency range for measurements that needs to be addressed covers 2 077 MHz to 14 500 MHz. The lower limit of this frequency range is obtained as the cut-off frequency of the generally used WR284/WG10 waveguide according to IEC 60153-2 [i.2]. The upper limit corresponds to the upper limit stated in ERC/Recommendation 74-01, Table 1 [1]. The highest operating frequency of 2 900 MHz has been used to calculate the upper limit.

NOTE 2: Since at the transceiver output a RF circulator is used, it is assumed that the transceiver characteristics remain independent from the antenna.

NOTE 3: Meteorological radar systems covered by the present document are expected to use the band 2 700 MHz to 2 900 MHz. According to provision 5.423 of the ITU Radio Regulations [4], ground-based radars used for meteorological purposes in the band 2 700 MHz to 2 900 MHz are authorized to operate on a basis of equality with stations of the aeronautical radio navigation service.

NOTE 4: Further technical and operational characteristics of meteorological radar systems can be found in Recommendation ITU-R M.1849-1 [i.3].

NOTE 5: 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 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/.

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

[1] ERC/Recommendation 74-01 (2011): "Unwanted emissions in the spurious domain".

[2] ECC/Recommendation (02)05 (2012): "Unwanted emissions".

[3] Recommendation ITU-R M.1177-4 (04/2011): "Techniques for measurement of unwanted emissions of radar systems".

[4] ITU Radio Regulations (2016).

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] IEC 60153-2 (Edition 2.0, 1974): "Hollow metallic waveguides. Part 2: Relevant specifications for ordinary rectangular waveguides".

[i.3] Recommendation ITU-R M.1849-1 (09/2015): "Technical and operational aspects of ground-based meteorological radars".

[i.4] Recommendation ITU-R SM.1541-6 (08/2015): "Unwanted emissions in the out-of-band domain".

[i.5] 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.

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

active state: state which produces the authorized emission

allocated band: frequency span that regionally or nationally is allocated to one or more radio services on a primary or secondary basis

NOTE: A table of national frequency allocations are normally available from the radio authority for each national state. A generic frequency allocation table is also available in the ITU Radio Regulations [4].

assigned frequency: centre of the frequency band assigned to a station

NOTE: This definition is taken from the ITU Radio Regulations [4].

assigned frequency band: frequency band within which the emission of a station is authorized

NOTE 1: The width of the band equals the necessary bandwidth plus twice the absolute value of the frequency tolerance. Where space stations are concerned, the assigned frequency band includes twice the maximum Doppler shift that may occur in relation to any point of the Earth's surface.

NOTE 2: This definition is taken from the ITU Radio Regulations [4].

characteristic frequency: frequency which can be easily identified and measured in a given emission

NOTE 1: A carrier frequency may, for example, be designed as the characteristic frequency.

NOTE 2: This definition is taken from the ITU Radio Regulations [4].

declared band: band or bands within which the product under test is declared to operate in the applicable operating modes

NOTE: The declared band for a given region or country is always contained within the allocated band.

frequency tolerance: maximum permissible departure by the centre frequency of the frequency band occupied by an emission from the assigned frequency or, by the characteristic frequency of an emission from the reference frequency

NOTE 1: The frequency tolerance is expressed in parts in 10^6 or in Hertz.

NOTE 2: This definition is taken from the ITU Radio Regulations [4].

idle/standby state: state where the transmitter is available for traffic but is not in the active state

necessary bandwidth B_N: width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions for a given class of emission

NOTE: This definition is taken from the ITU Radio Regulations [4].

occupied bandwidth: width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage β/2 of the total mean power of a given emission

NOTE 1: Unless otherwise specified in a Recommendation ITU-R for the appropriate class of emission, the value of β/2 should be taken as 0,5 %.

NOTE 2: This definition is taken from the ITU Radio Regulations [4].

operating mode: predefined configuration for a given service accessible to the operator of the radar system

NOTE 1: Several operating modes may be available.

NOTE 2: Changing operating mode might affect the radio characteristics of the radar system.

out-of-band emission: emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious

NOTE: This definition is taken from the ITU Radio Regulations [4].

peak envelope power (of a radio transmitter): average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions

NOTE: This definition is taken from the ITU Radio Regulations [4].

product configuration: hardware variant of the same typology of system under test (e.g. different power outputs, magnetrons)

pulse duration: time in seconds between the 50 % amplitude (voltage) points of a transmitted pulse

pulse rise time: time taken for the leading edge of the pulse to increase from 10 % to 90 % of the maximum amplitude (voltage) in seconds

receiver selectivity: ability of a receiver to detect and decode a desired signal in the presence of an unwanted interfering signal which is usually in the adjacent band

reference frequency: frequency having a fixed and specified position with respect to the assigned frequency

NOTE 1: The displacement of this frequency with respect to the assigned frequency has the same absolute value and sign that the displacement of the characteristic frequency has with respect to the centre of the frequency band occupied by the emission.

NOTE 2: This definition is taken from the ITU Radio Regulations [4].

spurious emission: emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information

NOTE 1: Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

NOTE 2: This definition is taken from the ITU Radio Regulations [4].

system coupler: high power directional waveguide coupler with forward and reverse port or only a forward port

NOTE: The system coupler is inserted in the waveguide run between the circulator and the antenna but not directly located behind the antenna. Usually it is located very close behind the circulator.

3.2 Symbols

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

B_{-40}	-40 dB bandwidth
B_C	Chirp bandwidth
B_N	Necessary bandwidth
dB/dec	dB per decade
dBpp	dB with respect to peak power
f_c	characteristic frequency
f_t	transmitter frequency tolerance
k	Boltzmann's constant
t	Pulse duration
t_r	Pulse rise time