SLOVENSKI STANDARD
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Napredni sistem za vodenje in nadzor gibanja po zemlji (A-SMGCS) - 6. del: Harmonizirani standard, ki zajema bistvene zahteve člena 3.2 direktive 2014/53/EU za aktivno zaznavalo radarja za površinsko gibanje - 1. poddel: Zaznavala, ki delujejo v frekvenčnem pasu X (10,525 GHz), z impulznimi signali in oddajno močjo do 100 kW

Advanced Surface Movement Guidance and Control System (A-SMGCS) - Part 6: Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU for deployed surface movement radar sensors - Sub-part 1: X-band sensors using pulsed signals and transmitting power up to 100 kW

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Advanced Surface Movement Guidance and Control System (A-SMGCS); Part 6: Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU for deployed surface movement radar sensors; Sub-part 1: X-band sensors using pulsed signals and transmitting power up to 100 kW

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Foreword

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.13] 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 6, sub-part 1 of a multi-part deliverable covering Advanced Surface Movement Guidance and Control System (A-SMGCS), as identified below:

Part 1: "Community Specification for application under the Single European Sky Interoperability Regulation EC 552/2004 for A-SMGCS Level 1 including external interfaces";

Part 2: "Community Specification for application under the Single European Sky Interoperability Regulation EC 552/2004 for A-SMGCS Level 2 including external interfaces";

Part 3: "Community Specification for application under the Single European Sky Interoperability Regulation EC 552/2004 for a deployed cooperative sensor including its interfaces";

Part 4: "Community Specification for application under the Single European Sky Interoperability Regulation EC 552/2004 for a deployed non-cooperative sensor including its interfaces ";

Part 5: "Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU for multilateration equipment";

Part 6: "Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU for deployed surface movement radar sensors";

Sub-part 1: "X-band sensors using pulsed signals and transmitting power up to 100 kW".

NOTE: SMR systems using FM-CW signals may be covered by future sub-parts of this multi-part deliverable.

National transposition dates	
Date of adoption of this EN:	20 May 2016
Date of latest announcement of this EN (doa):	31 August 2016
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	28 February 2017
Date of withdrawal of any conflicting National Standard (dow):	28 February 2018

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.

Executive Summary

The present document covers the essential requirements for efficient use of radio spectrum by surface movement radar sensors in the bands 9 000 MHz to 9 200 MHz and 9 300 MHz to 9 500 MHz using pulsed signals and a transmitting power up to 100 kW. The current version includes necessary changes due to adaption to the new Radio Equipment Directive 2014/53/EU [i.1].

1 Scope

The present document applies to X-band radar sensors intended for the surveillance of airport surface movement traffic with the following characteristics:

- Operating in one or both of the following frequency ranges:
  - 9 000 MHz to 9 200 MHz and 9 300 MHz to 9 500 MHz utilizing modulated or unmodulated pulses.
- Transmitter Peak Envelope Power up to 100 kW.
- The transceiver-antenna connection is using a hollow metallic rectangular waveguide.
- The antenna is rotating, waveguide-based and passive.
- At the transceiver output an RF-circulator is used.

NOTE 1: Since transceiver and antenna are hollow metallic rectangular waveguide based the frequency range for measurements that needs to be addressed covers 6,56 GHz to 26 GHz. The lower limit of this frequency range is obtained as cut-off frequency of the combination of WR112/R84 taper section and a WR90/R100 Waveguide IEC 60153-2 [i.3]. The upper limit corresponds to the upper limit stated in ERC/Recommendation 74-01 [i.5].

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

NOTE 3: Aeronautical Surface Movement Radars covered by the present document are expected to use the bands 9 000 MHz to 9 200 MHz and/or 9 300 MHz to 9 500 MHz. According article 5 of the ITU Radio Regulations [i.6] the band 9 000 MHz to 9 200 MHz is allocated to the Aeronautical Radionavigation Service on a primary basis and the band 9 300 MHz to 9 500 MHz is allocated to the Radionavigation Service on a primary basis.

The present document contains requirements to demonstrate that "*... 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*" [i.1].

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the Radio Equipment Directive 2014/53/EU [i.1] as well as essential requirements under the SES Interoperability Regulation 552/2004 [i.9] and related implementing rules and/or essential requirements under the EASA basic regulation 216/2008 [i.12] may apply to equipment within the scope of the present document.

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 http://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.

Not applicable.

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] Merrill I. Skolnik: "Radar Handbook", 2nd Edition, McGraw Hill publications.

[i.3] IEC 60153-2 (Edition 2.0, 1974): "Hollow metallic waveguides. Part 2: Relevant specifications for ordinary rectangular waveguides".

[i.4] ECC/Recommendation (02)05 (2012): "Unwanted emissions".

[i.5] ERC/Recommendation 74-01 (2011): "Unwanted emissions in the spurious domain".

[i.6] ITU Radio Regulations (2012).

[i.7] Recommendation ITU-R M.1177-4 (2011): "Techniques for measurement of unwanted emissions of radar systems".

[i.8] Recommendation ITU-R SM.1541-5 (2013): "Unwanted emissions in the out-of-band domain".

[i.9] EC Regulation No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (interoperability Regulation), OJ L 96, 31.03.2004, p. 26 as amended by Regulation (EC) No 1070/2009, OJ L 300, 14.11.2009, p. 34.

[i.10] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[i.11] ETSI TR 100 028-2 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".

[i.12] Regulation (EC) 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.13] 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 Definitions, symbols and abbreviations

3.1 Definitions

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

necessary bandwidth: 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 ITU Radio Regulations [i.6].

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: This definition is taken from ITU Radio Regulations [i.6].

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

peak envelope power: 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 ITU Radio Regulations [i.6].

pulse duration: time between the 50 % amplitude (voltage) points

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

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
B_{res}	3 dB resolution bandwidth of transceiver
dB/dec	dB per decade
dBpp	dB with respect to peak power
$D_{no\ spur}$	Detectability Factor (function of PD & Pfa)
k	Boltzmann's constant
MDS	Minimum Detectable Signal
NF_{sys}	Noise Figure of the system
PD	Probability of detection
Pfa	Probability of false alarm
P_t	Pulse power of transmission
t	Time
t_p	Pulse duration
t_r	Pulse rise time
T_0	Temperature in Kelvin
T_C	Chirp length in seconds
λ	Wavelength

3.3 Abbreviations

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

AC	Alternating Current
A-SMGCS	Advanced Surface Movement Guidance and Control System
EASA	European Aviation Safety Agency
FM	Frequency Modulation
FM-CW	Frequency Modulated Continuous Wave
LNA	Low Noise Amplifier
MDS	Minimum Detectable Signal
OoB	Out-of-Band
PEP	Peak Envelope Power
RF	Radio Frequency
SES	Single European Sky
SMR	Surface Movement Radar