



SLOVENSKI STANDARD
SIST EN 303 364-3 V1.1.1:2019

01-september-2019

Primarni nadzorni radar (PSR) - Harmonizirani standard za dostop do radijskega spektra - 3. del: Senzorji PSR za nadzor zračnega prometa (ATC), ki delujejo v frekvenčnem pasu od 8500 MHz do 10.000 MHz (pas X)

Primary Surveillance Radar (PSR) - Harmonised Standard for access to radio spectrum - Part 3: Air Traffic Control (ATC) PSR sensors operating in 8 500 MHz to 10 000 MHz frequency band (X band)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 303 364-3 V1.1.1:2019](https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d609c5b41934/sist-en-303-364-3-v1-1-1-2019)

[https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-](https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d609c5b41934/sist-en-303-364-3-v1-1-1-2019)

[d609c5b41934/sist-en-303-364-3-v1-1-1-2019](https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d609c5b41934/sist-en-303-364-3-v1-1-1-2019)

Ta slovenski standard je istoveten z: ETSI EN 303 364-3 V1.1.1 (2019-07)

ICS:

| | | |
|-----------|---------------------------------------|---|
| 03.220.50 | Zračni transport | Air transport |
| 33.060.99 | Druga oprema za radijske komunikacije | Other equipment for radiocommunications |

SIST EN 303 364-3 V1.1.1:2019 **en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 303 364-3 V1.1.1:2019

<https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d609c5b41934/sist-en-303-364-3-v1-1-1-2019>

ETSI EN 303 364-3 V1.1.1 (2019-07)



**Primary Surveillance Radar (PSR);
Harmonised Standard for access to radio spectrum;
Part 3: Air Traffic Control (ATC) PSR sensors operating
in the frequency band 8 500 MHz to 10 000 MHz (X band)**

<https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d609c5b41934/sist-en-303-364-3-v1-1-1-2019>

ReferenceDEN/ERM-TGAERO-31-3

Keywords

aeronautical, harmonised standard, radar, radio

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
Sous-Préfecture de Grasse (06) N° 7803/88

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Important notice

<https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d0c15b41974/sist-en-303-364-3-v1-1-1-2019>
The present document can be downloaded from:
<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at <https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:
<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2019.
All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.
3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M™ logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Contents

| | |
|---|----|
| Intellectual Property Rights | 5 |
| Foreword..... | 5 |
| Modal verbs terminology..... | 6 |
| 1 Scope | 7 |
| 2 References | 7 |
| 2.1 Normative references | 7 |
| 2.2 Informative references..... | 8 |
| 3 Definition of terms, symbols and abbreviations..... | 8 |
| 3.1 Terms..... | 8 |
| 3.2 Symbols..... | 9 |
| 3.3 Abbreviations | 9 |
| 4 Technical requirements specifications | 10 |
| 4.1 Environmental profile..... | 10 |
| 4.2 Conformance requirements | 10 |
| 4.2.1 Transmitter requirements | 10 |
| 4.2.1.1 Frequency Tolerance..... | 10 |
| 4.2.1.1.1 Definition..... | 10 |
| 4.2.1.1.2 Limits | 10 |
| 4.2.1.1.3 Conformance | 10 |
| 4.2.1.2 Measured B_{40} Bandwidth | 10 |
| 4.2.1.2.1 Definition..... | 10 |
| 4.2.1.2.2 Limits | 10 |
| 4.2.1.2.3 Conformance | 11 |
| 4.2.1.3 Out-of-band emissions | 11 |
| 4.2.1.3.1 Definition..... | 11 |
| 4.2.1.3.2 Limits | 11 |
| 4.2.1.3.3 Conformance | 12 |
| 4.2.1.4 Spurious emissions..... | 12 |
| 4.2.1.4.1 Definition..... | 12 |
| 4.2.1.4.2 Limits | 13 |
| 4.2.1.4.3 Conformance | 13 |
| 4.2.1.5 Stand-by Mode Emissions..... | 14 |
| 4.2.1.5.1 Definition..... | 14 |
| 4.2.1.5.2 Limits | 14 |
| 4.2.1.5.3 Conformance | 14 |
| 4.2.2 Receiver requirements | 14 |
| 4.2.2.1 System Noise Figure | 14 |
| 4.2.2.1.1 Definition..... | 14 |
| 4.2.2.1.2 Limits | 14 |
| 4.2.2.1.3 Conformance | 14 |
| 4.2.2.2 Receiver Selectivity | 14 |
| 4.2.2.2.1 Definition..... | 14 |
| 4.2.2.2.2 Limit | 14 |
| 4.2.2.2.3 Conformance | 14 |
| 4.2.2.3 Receiver Compression Level | 15 |
| 4.2.2.3.1 Definition..... | 15 |
| 4.2.2.3.2 Limit | 15 |
| 4.2.2.3.3 Conformance | 15 |
| 5 Testing for compliance with technical requirements..... | 15 |
| 5.0 General requirements | 15 |
| 5.1 Environmental conditions for testing | 15 |
| 5.1.1 Test Conditions | 15 |
| 5.1.2 Normal temperature and humidity | 15 |
| 5.1.3 Normal test power supply | 16 |

| | | |
|-------------------------------|---|-----------|
| 5.2 | Interpretation of the measurements results | 16 |
| 5.3 | Radio test suites | 16 |
| 5.3.1 | Transmitter test specification | 16 |
| 5.3.1.1 | Frequency Tolerance | 16 |
| 5.3.1.2 | Transmitter power | 16 |
| 5.3.1.3 | Measured B ₄₀ bandwidth | 16 |
| 5.3.1.4 | Out-of-Band-emissions | 17 |
| 5.3.1.5 | Spurious emissions | 19 |
| 5.3.1.6 | Stand-by Mode Emissions | 19 |
| 5.3.2 | Receiver test specification | 20 |
| 5.3.2.1 | System Noise Figure | 20 |
| 5.3.2.1.0 | General | 20 |
| 5.3.2.2 | Receiver Selectivity | 20 |
| 5.3.2.2.0 | General | 20 |
| 5.3.2.2.1 | Receiver Out-of-Band selectivity | 21 |
| 5.3.2.3 | Receiver Compression Level | 22 |
| 5.3.2.3.0 | General | 22 |
| 5.3.2.3.1 | Receiver Compression Level | 22 |
| Annex A (informative): | Relationship between the present document and the essential requirements of Directive 2014/53/EU | 23 |
| Annex B (normative): | Transmission power and unwanted emissions of radar systems with indirect methods..... | 24 |
| Annex C (normative): | Calculation of the -40 dB Bandwidth | 25 |
| Annex D (informative): | Maximum Measurement Uncertainty..... | 27 |
| Annex E (informative): | Bibliography | 28 |
| History | SIST EN 303 364-3 V1.1.1:2019 | 29 |

<https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d609c5b41934/sist-en-303-364-3-v1-1-1-2019>

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

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.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 3 of a multi-part deliverable covering Primary Surveillance Radars, as identified below:

- Part 1: "Air Traffic Control (ATC) Primary Surveillance Radar sensors operating in 1 215 MHz to 1 400 MHz frequency band (L band)";
- Part 2: "Air Traffic Control (ATC) Primary Surveillance Radar sensors operating in 2 700 MHz to 3 100 MHz frequency band (S band)";
- Part 3: "Air Traffic Control (ATC) Primary Surveillance Radar sensors operating in 8 500 MHz to 10 000 MHz frequency band (X band)".**

| National transposition dates | |
|--|-------------------|
| Date of adoption of this EN: | 17 June 2019 |
| Date of latest announcement of this EN (doa): | 30 September 2019 |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 31 March 2020 |
| Date of withdrawal of any conflicting National Standard (dow): | 31 March 2020 |

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 303 364-3 V1.1.1:2019](#)

<https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d609c5b41934/sist-en-303-364-3-v1-1-1-2019>

1 Scope

The present document specifies technical characteristics and methods of measurements for monostatic X-band radar sensors intended for the surveillance of airspace traffic with the following characteristics:

- Operating in the frequency range 8 500 MHz to 10 000 MHz utilizing modulated pulses.
- 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 Table 1 of ERC Recommendation 74-01 [2].

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: Multi-static radars are not covered by the present document.

NOTE 4: 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.

iTeh STANDARD PREVIEW

2 References (standards.iteh.ai)

2.1 Normative references

SIST EN 303 364-3 V1.1.1:2019
<https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d609c5b41934/sist-en-303-364-3-v1-1-1-2019>

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] ECC Recommendation (02)05 (2012): "Unwanted emissions".
- [2] ERC Recommendation 74-01 (2019): "Unwanted emissions in the spurious domain".
- [3] ITU Radio Regulations (2016).
- [4] Recommendation ITU-R M.1177-4 (04-2011): "Techniques for measurement of unwanted emissions of radar systems".

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] 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.

iTeh STANDARD PREVIEW

3 Definition of terms, symbols and abbreviations

3.1 Terms <https://standards.iteh.ai/catalog/standards/sist/4c7be5b0-12d0-4948-808e-d609c5b41934/sist-en-303-364-3-v1-1-1-2019>

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

active state: 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. Also a generic frequency allocation table is available in the ITU Radio Regulations [3].

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

NOTE 1: Will often correspond to an allocated band nationally.

NOTE 2: The declared band for a given region or country is always contained within the allocated band.

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

Minimum Detectable Signal (MDS): measure of the lowest detectable signal amplitude for a given signal type for a given radar

NOTE: For solid state radars a processing gain can be associated with a received signal. This processing gain has the effect of lowering the MDS level in comparison to a MDS which is based only on noise temperature. MDS in the present document is defined as including the processing gain for the chosen test signal.

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 [3].

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 $\beta/2$ of the total mean power of a given emission

NOTE 1: This definition is taken from ITU Radio Regulations [3].

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

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.

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 [3].

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

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 |
| dB_{pp} | dB with respect to peak power |
| $D_{no\ spur}$ | Detectability Factor (function of PD & Pfa) |
| k | Boltzmann's constant |
| NF_{sys} | Noise Factor of the system |
| P_D | Probability of detection |
| P_{FA} | 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 | Pulse length (of individual chirp) in seconds |
| λ | Wavelength |

3.3 Abbreviations

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

| | |
|------|---------------------------------|
| AC | Alternating Current |
| EFTA | European Free Trade Association |
| EN | European Standard |
| FM | Frequency Modulation |
| LNA | Low Noise Amplifier |

| | |
|-----|----------------------------|
| MDS | Minimum Detectable Signal |
| OoB | Out-of-Band |
| PEP | Peak Envelope Power |
| ppm | part(s) per million |
| PSR | Primary Surveillance Radar |
| RF | Radio Frequency |
| WG | WaveGuide |

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 declared by the manufacturer, 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 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 requirements

4.2.1 Transmitter requirements

4.2.1.1 Frequency Tolerance

4.2.1.1.1 Definition

The transmitter of a pulsed radar produces microwave pulses, which cause a broad frequency spectrum, depending on the pulse duration.

The frequency tolerance is the 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.

4.2.1.1.2 Limits

The frequency tolerance for radars shall not exceed 1 250 ppm as per appendix 2 of the ITU Radio Regulations [3].

4.2.1.1.3 Conformance

The conformance tests are specified in clause 5.3.1.1.

4.2.1.2 Measured B₋₄₀ Bandwidth

4.2.1.2.1 Definition

The measured -40 dB bandwidth (B₋₄₀) is the measured bandwidth of the emission 40 dB below the measured PEP.

4.2.1.2.2 Limits

The measured -40 dB bandwidth of the signal shall be contained completely within the declared band in all operating modes.

In case of multiple carrier-frequencies, all measured -40 dB emissions shall be contained within the declared band.

NOTE: The declared band is always contained in the 8 500 MHz to 10 000 MHz frequency range.