Draft ETSI EN 303 360 V1.1.0 (2016-06)

Short Range Devices;
Transport and Traffic Telematics (TTT);
Radar equipment operating in the 76 GHz to 77 GHz range;
Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU;
Obstacle Detection Radars for Rotorcraft Use

Reference
DEN/ERM-TGSRR-71

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

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Contents

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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.3].

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
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.

Introduction

The present document, together with ETSI EN 303 396 [1], covers the assessment of certain types of equipment as defined herein.

1 Scope

The present document applies to radar equipment for obstacle detection for rotorcraft use in the frequency range from 76 GHz to 77 GHz. It covers integrated transceivers.

The present document specifies the requirements for Short Range Devices (SRD) intended for the use on board rotorcrafts with the application to detect obstacles.

NOTE 1: The intention of the application is to detect obstacles to increase safety for aircrew, passengers and persons on ground by reducing risk of collision with obstacles. It is not considered as a safety of life application.

NOTE 2: Protection to the Radio Astronomy Service as detailed in Annex B is applicable for obstacle detection radars for rotorcraft use as described in the present document.

The present document contains the technical characteristics and test methods for obstacle detection for rotorcraft use radar equipment fitted with integral antennas operating in the frequency range from 76 GHz to 77 GHz and references CEPT/ERC/ECC Recommendation 70-03 [i.1], Annex 5 and Commission Decision 2006/771/EC [i.2] as amended.

In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present document and ETSI EN 303 396 [1], the provisions of the present document take precedence.

The present document does not necessarily include all the characteristics which may be required by a user, nor does it necessarily represent the optimum performance achievable.

These radio equipment types are capable of operating in all or part of the frequency bands given in table 1.

Table 1: Permitted range of operation (Commission Decision 2006/771/EC [i.2])

Permitted range of operation	
Transmit	76 to 77 GHz
Receive	76 to 77 GHz

The present document contains requirements to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

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.

[1] ETSI EN 303 396 (V1.1.0) (04-2016): " Short Range Devices; Measurement Techniques for automotive and surveillance radar equipment".

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] CEPT/ERC Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)". Annex 5: Road Transport and Traffic Telematics (RTTT).

[i.2] Commission Decision 2006/771/EC of 9 November 2006 on harmonisation of the radio spectrum for use by short-range devices as amended.

[i.3] European 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.4] CEPT/ERC/REC 74-01: "Unwanted emissions in the spurious domain".

[i.5] ETSI EG 203 336: "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.6] ECC Decision (16)01: "The harmonised frequency range 76-77 GHz, technical characteristics, exemption from individual licensing and free carriage and use of obstacle detection radars for rotorcraft use".

[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] ITU: Radio regulations.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI EN 303 396 [1] and the following apply:

helicopter: rotorcraft that, for its horizontal motion, depends principally on its engine-driven motors

rotorcraft: heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors

3.2 Symbols

For the purposes of the present document, the symbols given in ETSI EN 303 396 [1] and the following apply:

D antenna scan duty factor

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 303 396 [1] and the following apply:

e.r.p.	equivalent radiated power
e.i.r.p.	equivalent isotropic radiated power
IRAM	Institut de Radioastronomie Millimétrique
RAS	Radio Astronomy Service

4 Technical requirements specifications

4.1 Environmental conditions

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the supplier. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile. The normal and extreme test conditions are defined in clauses 4.4.3 and 4.4.4 of ETSI EN 303 396 [1].

4.2 General

4.2.1 Background information

In this clause all general considerations for the testing of radar applications for the EUT are given.

All operating bandwidths of the equipment (see clause 4.3.1) shall be declared by the equipment manufacturer (see clause 4.2 of ETSI EN 303 396 [1]).

Where equipment has more than one operating bandwidth, a sufficient number of operating bandwidths shall be chosen for testing so as to encompass the lower and higher limits of the operating frequency and the minimum and maximum bandwidth.

The EUT modulation during testing should be representative of normal use of the equipment. The manufacturer shall employ the mode of operation of the equipment which results in the highest transmitter activity consistent with the requirement to measure the highest power transmission which would be available in operation, and should ensure that:

- transmissions occur regularly in time;
- sequences of transmissions can be repeated accurately.

For transmitters that have multi-modulation schemes incorporated, it may be necessary to test each scheme.

The meaning of EUT with scanning/steerable antenna is that the EUT TX antenna pattern is electronically or mechanically adjustable.

4.2.2 Wanted performance criteria

The wanted performance criterion is that the EUT shall indicate the properties of a given target at a given distance. Since EUT considered here are typically tailored to specific applications, no single wanted performance criterion can be defined here.

Therefore:

- the relevant properties (e.g. presence, range, relative speed, azimuth angle) shall be declared by the manufacturer;
- the type and RCS of the target and the distance shall be declared by the manufacturer.

4.2.3 Fixed and scanning antennas

The provisions of ETSI EN 303 396 [1], clause 4.3.5 apply.

4.3 Transmitter Conformance Requirements

4.3.1 Operating Frequency Range

4.3.1.1 Applicability

This requirement applies to all EUT.

4.3.1.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.2 applies.

4.3.1.3 Limits

The upper and lower limits of the operating frequency range shall meet the following conditions:

- $f_H \leq 77$ GHz.
- $f_L \geq 76$ GHz.

4.3.1.4 Conformance

The conformance test suite for operating frequency range shall be as defined in clause 6.3.2 of ETSI EN 303 396 [1].

Conformance shall be established under normal and extreme test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.3.2 Average power spectral density (mean e.i.r.p. spectral density)

4.3.2.1 Applicability

This requirement applies to all EUT.

4.3.2.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.6 applies.

4.3.2.3 Limits

The average power spectral density for EUT shall not be greater than 3 dBm/MHz.

4.3.2.4 Conformance

The conformance test suite for mean power shall be as defined in clause 6.3.5 of ETSI EN 303 396 [1].

Conformance shall be established under normal and extreme test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 30 396 [1].

4.3.3 Peak Power

4.3.3.1 Applicability

This requirement applies to all EUT.

4.3.3.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.4 applies.

4.3.3.3 Limits

The peak power for EUT with fixed beam or scanning antenna shall not be greater than 30 dBm.

4.3.3.4 Conformance

The conformance test suite for peak power shall be as defined in clause 6.3.3 of ETSI EN 303 396 [1].

Conformance shall be established under normal and extreme test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.3.4 Power Duty cycle

4.3.4.1 Applicability

This requirement applies to all EUT.

4.3.4.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.7 applies.

4.3.4.3 Limits

The power duty cycle for EUT shall not be greater than 56 %/s.

4.3.4.4 Conformance

The conformance test suite for power duty cycle shall be as defined in clause 6.3.6 of ETSI EN 303 396 [1].

Conformance shall be established under normal and extreme test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.3.5 Unwanted emissions in the out-of-band domain

4.3.5.1 Applicability

This requirement applies to all EUT.

4.3.5.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.11 applies.

4.3.5.3 Limits

The RMS mean power spectral density radiated in the calculated out-of-band domain (between F_1 to f_L and f_H to F_2 band) shall not be greater than the values given in table 2.

Table 2: Limits for out-of-band radiation [i.4]

Frequency [GHz]	RMS mean power spectral density [dBm/MHz]
$F_1 \leq f < f_L$	0
$f_H < f \leq F_2$	0

The values f_L and f_H are the results of the operating frequency range conformance test, see clause 4.3.1.4.

The values F1 and F2 are calculated as in ETSI EN 303 396 [1], clause 6.2.11.

Note that that the out-of-band domain may be larger or smaller than the maximum permitted range of operation.

4.3.5.4 Conformance

The conformance test suite for unwanted emissions in the out-of-band domain shall be as defined in clause 6.3.10 of ETSI EN 303 396 [1].

Conformance shall be established under normal test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.3.6 Unwanted emissions in the spurious domain

4.3.6.1 Applicability

This requirement applies to all EUT.

4.3.6.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.11 applies.

4.3.6.3 Limits

The effective radiated power of any radiated spurious emission shall be not greater than the values given in table 3.

Table 3: Limits of radiated spurious emissions (CEPT/ERC/REC 74-01 [i.4])

Frequency range (MHz)	Limit values for spurious radiation	Detector type
47 to 74	-54 dBm e.r.p.	Quasi-Peak
87,5 to 118	-54 dBm e.r.p.	Quasi-Peak
174 to 230	-54 dBm e.r.p.	Quasi-Peak
470 to 790	-54 dBm e.r.p.	Quasi-Peak
otherwise in band 30 to 1 000	-36 dBm e.r.p.	Quasi-Peak
f > 1 000 to 300 000 (see note)	-30 dBm e.i.r.p.	mean
NOTE: According to CEPT/ERC/REC 74-01 [i.4], spurious emission is measured up to the 2nd harmonic of the fundamental frequency.		

4.3.6.4 Conformance

The conformance test suite for unwanted emissions in the spurious domain shall be as defined in clause 6.3.10 of ETSI EN 303 396 [1].

Conformance shall be established under normal test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.4 Receiver Conformance Requirements

4.4.1 Introduction

ETSI EG 203 336 [i.5] lists candidate technical parameters to be included in a Harmonised Standard aimed at providing a presumption of conformity of radio equipment with the essential requirements in articles 3.1(b) and 3.2 of the Radio Equipment Directive 2014/53/EU [i.3].

Essential requirements are high level objectives described in European Directives. The purpose of the Harmonised Standard is to translate those high level objectives into detailed technical specifications.

The present document applies to radar systems for which the "classical" receiver parameters are not necessarily relevant. Where applicable, suitable alternative technical requirements are included, see clause 4.4.3.

4.4.2 Receiver spurious emissions

4.4.2.1 Applicability

Receiver spurious emission testing shall apply for any mode other than transmit mode.

NOTE: Otherwise receiver spurious emissions are measured as part of the transmitter spurious emissions, see clause 4.3.6.

4.4.2.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.12 applies.

4.4.2.3 Limits

The effective radiated power of any narrowband receiver spurious emission shall be not greater than the values given in table 4.

Table 4: Narrowband spurious emission limits for receivers

Frequency range	Limit
30 MHz to 1 GHz	-57 dBm (e.r.p.)
above 1 GHz to 300 GHz	-30 dBm (e.i.r.p.)

NOTE 1: According to CEPT/ERC/REC 74-01 [i.4], spurious emission is measured up to the 2nd harmonic of the fundamental frequency.

Wideband receiver spurious emissions shall be not greater than the values given in table 5.

Table 5: Wideband spurious emission limits for receivers

Frequency range	Limit
30 MHz to 1 GHz	-47 dBm/MHz (e.r.p.)
above 1 GHz to 300 GHz	-30 dBm/MHz (e.i.r.p.)

NOTE 2: According to CEPT/ERC/REC 74-01 [i.4], spurious emission is measured up to the 2nd harmonic of the fundamental frequency.

4.4.2.4 Conformance

The conformance test suite for unwanted receiver spurious emissions shall be as defined in clause 6.3.11 of ETSI EN 303 396 [1].

Conformance shall be established under normal test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.4.3 Receiver in-band, out-of-band and remote-band signals handling

4.4.3.1 Applicability

This requirement applies to all EUT.

4.4.3.2 Description

The description in ETSI EN 303 396 [1], clause 6.2.13 applies.

4.4.3.3 Limits

The EUT shall achieve the wanted performance criterion, see clause 4.2.2, in the presence of unwanted signals defined in ETSI EN 303 396 [1], clause 6.3.12.4.

If the wanted performance criterion is not achieved then the EUT shall issue a respective blindness message.

4.4.3.4 Conformance

The conformance test suite for receiver in-band, out-of-band and remote-band signals handling shall be as defined in clause 6.3.12 of ETSI EN 303 396 [1].

Conformance shall be established under normal test conditions defined in clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 4.6 of ETSI EN 303 396 [1].

4.4.4 Receiver sensitivity

Receiver sensitivity is not specified in the present document in order to allow manufacturers the freedom to tailor equipment to specific circumstances.

For instance, equipment covered by the present document may be intended to detect a target at maximum range or may be intended to discriminate features such as size, shape or velocity at shorter range. The level of minimum usable signal would be different in each case.

5 General considerations for performing the tests

The provisions of ETSI EN 303 396 [1], clause 4 shall apply except as varied herein.

6 Test setup and procedures

The provisions of ETSI EN 303 396 [1], clause 5 shall apply except as varied herein.

7 Conformance methods of measurement for transmitter and receiver

The provisions of ETSI EN 303 396 [1], clause 6 shall apply except as varied herein.

All measurement results shall be recorded in a test report, see clause 4.7 in ETSI EN 303 396 [1].

Annex A (normative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

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.3].

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.

Table A.1: Relationship between the present document and the essential requirements of Directive 2014/53/EU

Harmonised Standard ETSI EN 303 360 The following requirements are relevant to the presumption of conformity under the article 3.2 of Directive 2014/53/EU [i.3]				
Requirement			**Requirement Conditionality**	
No	**Description**	**Reference: Clause No**	**U/C**	**Condition**
1	Operating Frequency Range	4.3.1	U	
2	Average power spectral density	4.3.2	U	
3	Peak Power	4.3.3	U	
4	Power Duty cycle	4.3.4	U	
5	Unwanted emissions in the out-of-band domain	4.3.5	U	
6	Unwanted emissions in the spurious domain	4.3.6	U	
7	Receiver spurious emissions	4.4.2	C	It applies for any mode other than transmit mode
8	Receiver in-band, out-of-band and remote-band signal handling	4.4.3	U	

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement shall be unconditionally applicable (U) or is conditional upon the manufacturers claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement shall or shall not be applicable for a requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

Annex B (informative): Protection of Radio Astronomy Service

B.1 General

Protection of the Radio Astronomy Service is linked to putting into service and not placing on the market. Therefore the manufacturer provides the user all necessary information.

Obstacle detection radars for rotorcraft use provide protection to the Radio Astronomy Service (RAS) by inhibiting sensor transmission during cruise flight phase and when flying inside a RAS exclusion zone defined in ECC Decision (16)01 [i.6], Annex 2.

Changes of the exclusion zones (new RAS sites or withdrawal of RAS sites, exclusion zones) are notified by administrations to the European Communications Office (ECO) specifying the date on entry into force or when this exclusion zone is no longer required. Effective date for changes of exclusion zones in the obstacle detection radar equipment is 12 months after the notification of the specified exclusion zones. Changes are recorded by adding a new exclusion zone and indicating the end date on the previous version of that zone in Annex 2 of ECC Decision (16)01 [i.6].

Changes of the exclusion zones will be reflected by an update in ECC Decision (16)01 [i.6]. The status of April 2016 is given in clause B.2 for information.

B.2 ECC Decision (16)01, Annex 2: "Protection of Radio Astronomy Service (RAS) sites"

Administrations can define on a national level the size of the exclusion zone to protect the RAS as appropriate. One example of an assessment method that might be used on a national level is a procedure provided in Annex 10 of ECC Report 222 [i.6].

In case of life-saving missions, the obstacle detection radar devices may be used without protecting the radio astronomy sites (RAS), only on decision by the pilot on case by case basis and by activation from the pilot pursuant Article 4.9 of ITU Radio Regulations [i.8].

The following table lists the RAS stations in the CEPT operating in the range 76 GHz to 77 GHz.

<table>
<tr><th>Observatory Name</th><th>Administration</th><th>Latitude (N) Longitude (E)</th><th>Altitude (Above Mean Sea Level) (in metres)</th><th>Geographical Characteristics</th><th>Date of entry into force of this exclusion zones</th><th>Date at which the exclusion zone was no longer required</th><th>Exclusion Zone Implementation (see note)</th></tr>
<tr><td>Plateau de Bure,
12 × 15 m Array, IRAM,</td><td>France</td><td>44º38'02"
05º54'28.5"</td><td>2 250</td><td>Isolated high mountaintop in line-of-sight to various public facilities</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E) Central point</th><th>Radius (kilometres)</th></tr>
<tr><td>< 3</td><td colspan="2">No protection (*)</td></tr>
<tr><td rowspan="2">3 to < 100</td><td>44.638499°N, 6.020521°E</td><td>43</td></tr>
<tr><td>44.112578°N, 6.076490°E</td><td>39</td></tr>
<tr><td rowspan="2">100 to < 300</td><td>44.666733°N, 6.021409°E</td><td>46</td></tr>
<tr><td>44.121552°N, 6.069830°E</td><td>49</td></tr>
<tr><td rowspan="2">300 to 1 000</td><td>44.150002°N, 6.01667°E</td><td>57</td></tr>
<tr><td>44.661033°N, 5.974051°E</td><td>74</td></tr>
<tr><td colspan="3">(*)The rotorcraft radar has to be turned off during take-off and landing from the station of Bure
The protection zones were derived from the respective maximum height above ground level</td></tr>
</table>
</td></tr>
<tr><td>Maido (la Réunion)
Horns 0,25 × 0,36 m,
0,70 × 0,48 m</td><td>France</td><td>-21°04'46"
55°23'01"</td><td>2 200</td><td>Mountain top</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above Ground (metres)</th><th>Latitude (N), Longitude (E) Central point</th><th>Radius (kilometres)</th></tr>
<tr><td>< 3</td><td colspan="2">No protection zone (*)</td></tr>
<tr><td rowspan="2">3 to 1 000</td><td>-20.771199°N, 54.972865°E</td><td>69</td></tr>
<tr><td>-21.539077°N, 54.778243°E</td><td>66</td></tr>
<tr><td colspan="3">(*)The rotorcraft radar has to be turned off during take-off and landing from the station of Maido
The protection zones were derived from the respective maximum height above ground level</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Observatory Name</th><th>Administration</th><th>Latitude (N) Longitude (E)</th><th>Altitude (Above Mean Sea Level) (in metres)</th><th>Geographical Characteristics</th><th>Date of entry into force of this exclusion zones</th><th>Date at which the exclusion zone was no longer required</th><th>Exclusion Zone Implementation (see note)</th></tr>
<tr><td>Effelsberg, 100 m</td><td>Germany</td><td>50º31'32" 06º53'00"</td><td>369</td><td>Broad flat plain exposed to nearby roads</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>< 3</td><td colspan="2">No protection zone</td></tr>
<tr><td>3 to < 100</td><td>50.52898°N, 6.906735°E</td><td>8,5</td></tr>
<tr><td rowspan="2">100 to < 300</td><td>50.527057°N, 6.959232°E</td><td>21</td></tr>
<tr><td>50.785613°N, 7.185484°E</td><td>20</td></tr>
<tr><td>300 to 1 000</td><td>50.569565°N, 7.110509°E</td><td>53</td></tr>
<tr><td colspan="3">The protection zones were derived from the respective maximum height above ground</td></tr>
</table>
</td></tr>
<tr><td>Pico de Veleta, 30 m IRAM</td><td>Spain</td><td>37º03'58" -03º23'34"</td><td>2 850</td><td>Mountainside overlooking nearby ski resort, line of sight to city of Granada</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td rowspan="2">0 to < 1 000</td><td>37°03'58"N, -3°23'34"E</td><td>15 (*)</td></tr>
<tr><td>37°03'58"N, -3°23'34"E</td><td>101 (**)</td></tr>
<tr><td colspan="3">(*) Circle of 15 km radius around Pico Veleta
(**) Circle sector around Pico Veleta of 101 km radius from azimuth of 224° up to azimuth of 52°.</td></tr>
</table>
</td></tr>
<tr><td>Yebes 40 m Yebes 14 m</td><td>Spain</td><td>40º31'27" -03º05'22"</td><td>981</td><td>Broad flat plain exposed to roads</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>0 to < 1 000</td><td>40°31'27"N, -3°05'22"E</td><td>101</td></tr>
</table>
</td></tr>
<tr><td>Sardinia Radio Telescope 64 m</td><td>Italy</td><td>39º29'34" 09º14'42"</td><td>600</td><td>On a valley partially surrounded by hills, no natural shields in North and West directions. Exposed to nearby roads.</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>< 3</td><td colspan="2">No protection zone</td></tr>
<tr><td rowspan="2">3 to < 100</td><td>39.677757°N, 8.656262°E</td><td>23</td></tr>
<tr><td>39.653577°N, 9.135560°E</td><td>25</td></tr>
<tr><td rowspan="2">100 to < 300</td><td>39.748209°N, 8.887414°E</td><td>38</td></tr>
<tr><td>39.449300°N, 9.268361°E</td><td>13</td></tr>
<tr><td rowspan="2">300 to 1000</td><td>39.800684°N, 8.895254°E</td><td>51</td></tr>
<tr><td>39.353442°N, 8.978644°E</td><td>47</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Observatory Name</th><th>Administration</th><th>Latitude (N) Longitude (E)</th><th>Altitude (Above Mean Sea Level) (in metres)</th><th>Geographical Characteristics</th><th>Date of entry into force of this exclusion zones</th><th>Date at which the exclusion zone was no longer required</th><th>Exclusion Zone Implementation (see note)</th></tr>
<tr><td>Noto 32 m</td><td>Italy</td><td>36°52'33″
14°59'20″</td><td>90</td><td>Relatively isolated. More exposed in South and West directions.</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>< 3</td><td colspan="2">No protection zone</td></tr>
<tr><td rowspan="2">3 to < 100</td><td>36.843323°N,
14.948270°E</td><td>10</td></tr>
<tr><td>36.927102°N,
14.831307°E</td><td>7</td></tr>
<tr><td rowspan="2">100 to < 300</td><td>36.907848°N,
14.837616°E</td><td>20</td></tr>
<tr><td>36.648057°N,
14.949379°E</td><td>18</td></tr>
<tr><td rowspan="2">300 to 1 000</td><td>36.839554°N,
14.854403°E</td><td>35</td></tr>
<tr><td>36.369523°N,
14.870684°E</td><td>35</td></tr>
</table>
</td></tr>
<tr><td>Onsala 20 m</td><td>Sweden</td><td>57º23'45"
11º55'35"</td><td>23</td><td>Waterside, forested, relatively isolated</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Distance from Onsala</th><th>Rotorcraft height above ground (metres)</th><th>Comments</th></tr>
<tr><td>0-10 km</td><td>-</td><td>Radar should not be used in this area</td></tr>
<tr><td>10-25 km</td><td>< 50</td><td></td></tr>
<tr><td>25-35 km</td><td>< 100</td><td></td></tr>
<tr><td>35-55 km</td><td>< 300</td><td></td></tr>
<tr><td>> 55 km</td><td>No limit</td><td></td></tr>
</table>
</td></tr>
<tr><td>Metsahovi 14 m</td><td>Finland</td><td>60º13'04"
24º23'37"</td><td>61</td><td></td><td>4 March 2016</td><td>--</td><td>An exclusion zone is not defined because there is no research activity at the moment in the 76 - 77 GHz frequency range.</td></tr>
<tr><td>Zelenchukskaya, 32 m IAA RAS</td><td>Russian Federation</td><td>43°47'16.2"
41°33'52.6"</td><td>1 175</td><td>Broad flat plain exposed to roads</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>Below 1 000 m</td><td>43°47'16.2"N,
41°33'52.6"E</td><td>15</td></tr>
<tr><td colspan="3">Radar should not be used in this area</td></tr>
</table>
</td></tr>
<tr><td>Badary, 32 m IAA RAS</td><td>Russian Federation</td><td>51°46'11.6"
102°14'04.95"</td><td>813</td><td>Relative isolated place</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>Below 1 000 m</td><td>51°46'11.6"N,
102°14'04.95"E</td><td>15</td></tr>
<tr><td colspan="3">Radar should not be used in this area</td></tr>
</table>
</td></tr>
<tr><td>Svetloe, 32 m IAA RAS</td><td>Russian Federation</td><td>60°31'56"
29°46'54"</td><td>86</td><td>Broad flat plain exposed to roads</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>Below 1 000 m</td><td>60°31'56"N, 29°46'54"E</td><td>15</td></tr>
<tr><td colspan="3">Radar should not be used in this area</td></tr>
</table>
</td></tr>
<tr><td>Zelenchukskaya, 600 m SAO RAS</td><td>Russian Federation</td><td>43°49'34.2"
41°35'12.06"</td><td>970</td><td>Broad flat plain exposed to roads</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>Below 1 000 m</td><td>43°49'34.2"N,
41°35'12.06"E</td><td>15</td></tr>
<tr><td colspan="3">Radar should not be used in this area</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Observatory Name</th><th>Administration</th><th>Latitude (N) Longitude (E)</th><th>Altitude (Above Mean Sea Level) (in metres)</th><th>Geographical Characteristics</th><th>Date of entry into force of this exclusion zones</th><th>Date at which the exclusion zone was no longer required</th><th>Exclusion Zone Implementation (see note)</th></tr>
<tr><td>Pushchino, 22 m
PRAO ASC LPI, RAS</td><td>Russian Federation</td><td>54°49'22″
37°37'57"</td><td>190</td><td>Broad flat plain exposed to roads</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>Below 1 000 m</td><td>54°49'22″ N,
37°37'57"E</td><td>30</td></tr>
<tr><td colspan="3">Radar should not be used in this area</td></tr>
</table>
</td></tr>
<tr><td>Kalyazin, 64 m</td><td>Russian Federation</td><td>57°13'23"
37°54'01"</td><td>195</td><td>Relatively isolated place</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>Below 1 000 m</td><td>57°13'23"N, 37°54'01"E</td><td>10</td></tr>
<tr><td colspan="3">Radar should not be used in this area</td></tr>
</table>
</td></tr>
<tr><td>Ussurijsk, 70 m</td><td>Russian Federation</td><td>44°0'57"
131°45'25"</td><td>20</td><td>Relatively isolated place</td><td>4 March 2016</td><td>--</td><td>
<table>
<tr><th>Height above ground (metres)</th><th>Latitude (N), Longitude (E)</th><th>Radius (kilometres)</th></tr>
<tr><td>Below 1 000 m</td><td>44°0'57"N, 131°45'25"E</td><td>10</td></tr>
<tr><td colspan="3">Radar should not be used in this area</td></tr>
</table>
</td></tr>
<tr><td colspan="8">NOTE: According to WGS84 (World Geodetic System 1984).</td></tr>
</table>

Annex C (informative): Bibliography

Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

Annex D (informative): Change History

Date	Version	Information about changes
February 2016	1.1.1._0.0.1	Initial version for TG SRR#XX
March 2016	1.1.1._0.0.2	Changes clause 4.4.2 and update of Annex 2 after approval of ECC Dec (16)01
April 2016	1.1.1._0.0.3	Corrections in clause 4.4.2.3
April 2016	1.1.1._1.0.0	TGSRR#24 amended for ENAP

History

Document history			
V1.1.0	June 2016	EN Approval Procedure	AP 20160925: 2016-06-27 to 2016-09-26