



# SLOVENSKI STANDARD

## SIST EN 302 288-1 V1.1.1:2006

01-marec-2006

9`Y\_fca U[ bYfbUnXfi y`1j cgh]b`nUXYj Y`j`nj Yn]`n`fUX]`g`\_ja`gdY\_fca`fØFAŁĚ  
BUdfUj Y`fUh\_Y[ UXcgY[ UĚ7 YghUfUbgdcfU]b`dfca YfbUH`Ya U]\_U`fHHŁĚ  
CdfYa UnUfUXUf`\_fUh\_Y[ UXcgY[ UĚ\_]XYi`Y`j`ZY\_j Yb bYa`cVa c`1`&`; <n`3Ě`%  
XY.`HM b] bY`nU`Hj Y]b`a Yf]bY`a YfcXY

Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices;  
Road Transport and Traffic Telematics (RTTT); Short range radar equipment operating in  
the 24 GHz range; Part 1: Technical requirements and methods of measurement

[SIST EN 302 288-1 V1.1.1:2006](https://standards.iteh.ai/catalog/standards/sist/bab36c70-3e7b-4b91-a2ad-76669b58c85e/sist-en-302-288-1-v1-1-1-2006)

<https://standards.iteh.ai/catalog/standards/sist/bab36c70-3e7b-4b91-a2ad-76669b58c85e/sist-en-302-288-1-v1-1-1-2006>

Ta slovenski standard je istoveten z: EN 302 288-1 Version 1.1.1

### ICS:

33.060.99	Druga oprema za radijske komunikacije	Other equipment for radiocommunications
33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general
35.240.60	Uporabniške rešitve IT v transportu in trgovini	IT applications in transport and trade

SIST EN 302 288-1 V1.1.1:2006 en

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 302 288-1 V1.1.1:2006

<https://standards.iteh.ai/catalog/standards/sist/bab36c70-3e7b-4b91-a2ad-76669b58c85e/sist-en-302-288-1-v1-1-1-2006>

# ETSI EN 302 288-1 V1.1.1 (2005-01)

---

*European Standard (Telecommunications series)*

**Electromagnetic compatibility  
and Radio spectrum Matters (ERM);  
Short Range Devices;  
Road Transport and Traffic Telematics (RTTT);  
Short range radar equipment operating in the 24 GHz range;  
Part 1: Technical requirements and methods of measurement**

---

**iTeh STANDARD PREVIEW  
(standards.iteh.ai)**

[SIST EN 302 288-1 V1.1.1:2006](https://standards.iteh.ai/catalog/standards/sist/bab36c70-3e7b-4b91-a2ad-76669b58c85e/sist-en-302-288-1-v1-1-1-2006)

<https://standards.iteh.ai/catalog/standards/sist/bab36c70-3e7b-4b91-a2ad-76669b58c85e/sist-en-302-288-1-v1-1-1-2006>



## Reference

---

DEN/ERM-TG31B-002-1

## Keywords

---

radar, radio, testing, SRD, RTTT

**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)**

SIST EN 302 288-1 V1.1.1:2006

<https://standards.iteh.ai/catalog/standards/sist/bab36c70-3e7b-4b91-a2ad-76669b58c834/ETSI-ERM-TG31B-002-1-v1-1-1-2006>

**Important notice**

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

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

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

[http://portal.etsi.org/chaicor/ETSI\\_support.asp](http://portal.etsi.org/chaicor/ETSI_support.asp)

---

**Copyright Notification**

No part may be reproduced except as authorized by written permission.  
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2005.  
All rights reserved.

**DECT™**, **PLUGTESTS™** and **UMTS™** are Trade Marks of ETSI registered for the benefit of its Members.  
**TIPHON™** and the **TIPHON logo** are Trade Marks currently being registered by ETSI for the benefit of its Members.  
**3GPP™** is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

# Contents

Intellectual Property Rights .....	6
Foreword.....	6
1 Scope .....	7
2 References .....	7
3 Definitions, symbols and abbreviations .....	8
3.1 Definitions .....	8
3.2 Symbols.....	10
3.3 Abbreviations .....	10
4 Technical requirements specifications .....	11
4.1 Presentation of equipment for testing purposes.....	11
4.1.1 Choice of model for testing .....	11
4.2 Mechanical and electrical design.....	11
4.3 Auxiliary test equipment .....	11
4.4 Interpretation of the measurement results .....	12
5 Test conditions, power sources and ambient temperatures .....	12
5.1 Normal and extreme test conditions .....	12
5.2 External test power source.....	12
5.3 Normal test conditions.....	12
5.3.1 Normal temperature and humidity .....	12
5.3.2 Normal test power source .....	12
5.3.2.1 Mains voltage .....	13
5.3.2.2 Other power sources .....	13
5.4 Extreme test conditions .....	13
5.4.1 Extreme temperatures .....	13
5.4.1.1 Procedure for tests at extreme temperatures.....	13
5.4.1.2 Extreme temperature ranges.....	13
5.4.2 Extreme test source voltages.....	13
5.4.2.1 Mains voltage .....	13
5.4.2.2 Other power sources.....	13
6 General conditions.....	13
6.1 Test fixture .....	14
6.1.1 Requirements .....	14
6.1.2 Calibration .....	14
6.1.3 General requirements for RF cables.....	16
6.1.4 Shielded anechoic chamber.....	17
7 Methods of measurement and limits for transmitter parameters .....	18
7.1 Methods of measurement and limits for transmitters in the 22,000 GHz to 26,625 GHz band.....	18
7.1.1 Permitted range of operating frequencies .....	18
7.1.1.1 Definition .....	18
7.1.1.2 Method of measurement.....	18
7.1.1.3 Limits .....	19
7.1.2 Maximum radiated average power density (e.i.r.p.) .....	19
7.1.2.1 Definition .....	19
7.1.2.2 Method of measurement.....	19
7.1.2.3 Limits .....	21
7.1.3 Maximum radiated peak power density (e.i.r.p.) .....	21
7.1.3.1 Definition .....	21
7.1.3.2 Method of measurement.....	21
7.1.3.3 Standard procedure and setup extensions.....	22
7.1.3.4 Limits .....	22
7.1.4 Methods of measurement and limits for emissions in the 24,050 GHz to 24,250 GHz band .....	23
7.1.4.1 Equivalent isotropically radiated power (e.i.r.p.).....	23

7.1.4.1.1	Definition.....	23
7.1.4.1.2	Method of measurement .....	23
7.1.4.1.2.1	Transmitters with a -6 dB bandwidth up to 20 MHz.....	23
7.1.4.1.3	Limits .....	25
7.1.4.2	Permitted range of operating frequencies.....	25
7.1.4.2.1	Definition.....	25
7.1.4.2.2	Method of measurement for equipment not using FH modulation.....	25
7.1.4.2.3	Method of measurement for equipment using pulsed FH modulation.....	26
7.1.4.2.4	Limit .....	26
7.1.5	Vertical plane transmitter emissions in the 23,6 GHz to 24 GHz range .....	27
7.1.5.1	Definition .....	27
7.1.5.2	Measurement procedure .....	27
7.1.5.3	Vertical emission limits in the 23,6 GHz to 24,0 GHz range.....	27
7.2	Radiated spurious and out-of-band emissions .....	27
7.2.1	Definition.....	27
7.2.2	Measuring receiver .....	28
7.2.3	Method of measurement for radiated spurious or out-of-band emissions.....	28
7.2.4	Limits.....	29
8	Methods of measurement and limits for receiver parameters.....	29
8.1	Receiver spurious emissions.....	29
8.1.1	Definition.....	29
8.1.2	Method of measurement - radiated spurious emissions .....	29
8.1.3	Limit .....	30
9	Measurement uncertainty .....	30
<b>Annex A (normative):</b>	<b>Radiated measurements.....</b>	<b>31</b>
A.1	Test sites and general arrangements for measurements involving the use of radiated fields.....	31
A.2	Guidance on the use of radiation test sites .....	31
A.2.1	Substitution antenna .....	31
A.3	Indoor test site using a fully anechoic RF chamber.....	31
A.3.1	Example of the construction of a shielded anechoic chamber.....	31
A.3.2	Influence of parasitic reflections in anechoic chambers.....	33
A.3.3	Calibration of the shielded RF anechoic chamber.....	33
<b>Annex B (normative):</b>	<b>General description of measurement methods.....</b>	<b>34</b>
B.1	Radiated measurements.....	34
B.2	Performance requirements for preamplifier and horn antenna.....	35
B.3	Measurement of the residual carrier .....	35
<b>Annex C (informative):</b>	<b>Example of modulation schemes.....</b>	<b>36</b>
C.1	Pseudo Noise Pulse Position Modulation (PN PPM).....	36
C.1.1	Definition .....	36
C.1.2	Typical operation parameters .....	37
C.2	Pulsed FH (Pulsed Frequency hopping).....	37
C.2.1	Definition .....	37
C.2.2	Typical operation parameters .....	38
C.2.3	Additional requirements for pulsed FH equipment measurement .....	38
C.2.3.1	Pulsed FH modulation .....	38
C.2.3.2	Measurement requirements.....	38
C.3	PN-2-PSK (Pseudo noise binary coded phase shift keying).....	39
C.3.1	Definition .....	39
C.3.2	Typical operation parameters .....	40
<b>Annex D (normative):</b>	<b>Installation requirements of 24 GHz Short Range Radar (SRR) systems .....</b>	<b>41</b>

<b>Annex E (informative):</b>	<b>Conversion of power density to e.i.r.p.....</b>	<b>42</b>
E.1	Assumptions .....	42
E.2	Example.....	42
<b>Annex F (informative):</b>	<b>Bibliography.....</b>	<b>43</b>
History .....		44

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 302 288-1 V1.1.1:2006](https://standards.iteh.ai/catalog/standards/sist/bab36c70-3e7b-4b91-a2ad-76669b58c85e/sist-en-302-288-1-v1-1-1-2006)

<https://standards.iteh.ai/catalog/standards/sist/bab36c70-3e7b-4b91-a2ad-76669b58c85e/sist-en-302-288-1-v1-1-1-2006>

## Intellectual Property Rights

IPRs essential or potentially essential to the present document 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 (<http://webapp.etsi.org/IPR/home.asp>).

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.

## Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

For non EU countries the present document may be used for regulatory (Type Approval) purposes.

Equipment compliant with the present document is intended for fitment into road vehicles, therefore it is subject to automotive EMC type approval and has to comply with Directive 95/54/EC [8]. For use on vehicles outside the scope of Directive 95/54/EC [8] compliance with an EMC directive/standard appropriate for that use is required.

The present document is part 1 of a multi-part deliverable covering Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices, Road Transport and Traffic Telematics (RTTT); Short range radar equipment operating in the 24 GHz range, as identified below:

**Part 1: "Technical requirements and methods of measurement";**

Part 2: "Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".

SIST EN 302 288-1 V1.1.1:2006

[https://standards.iteh.ai/catalog/standards/sist/bab50c70-3c7b-4b91-a2ad-](https://standards.iteh.ai/catalog/standards/sist/bab50c70-3c7b-4b91-a2ad-76669b58c85e/sist-en-302-288-1-v1-1-1-2006)

76669b58c85e/sist-en-302-288-1-v1-1-1-2006

### National transposition dates

Date of adoption of this EN:	21 January 2005
Date of latest announcement of this EN (doa):	30 April 2005
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 October 2005
Date of withdrawal of any conflicting National Standard (dow):	31 October 2005



---

# 1 Scope

The present document specifies the technical requirements and methods of measurement for Short Range Devices (SRD) working as broadband devices with at least 500 MHz bandwidth in the 22,000 GHz to 26,625 GHz frequency range intended for Road Transport and Traffic Telematics (RTTT) applications, such as automotive 24 GHz Short Range Radar (SRR) for e.g. obstacle detection, stop and go, blind spot detection, parking aid, backup aid, precrash and other automotive applications.

The present document covers transmitters intended to operate in a temporary frequency designation as defined in a forthcoming decision of CEPT/ECC. The application is also subject to a forthcoming EU Commission decision on 24 GHz SRR. The present document applies to:

- a) Transmitters in the range from 22,000 GHz to 26,625 GHz operating as broadband devices over the specific bandwidth defined for the individual devices.
- b) Receivers operating in the range from 22,000 GHz to 26,625 GHz.
- c) Integrated transceivers.

The present document contains the technical characteristics and test methods for short range radar equipment fitted with integral antennas operating in the 24 GHz range.

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.

The present document covers short range radar mobile applications in the 24 GHz range. It covers integrated transceivers and separate transmit/receive modules.

The present document covers only 24 GHz SRR equipment for road vehicles.

---

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

- [1] ERC/REC 70-03: "Relating to the use of Short Range Devices (SRD)".
- [2] CISPR 16 (parts 1-1, 1-4 and 1-5): "Specifications for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".
- [3] ERC/REC 01-06: "Procedure for mutual recognition of type testing and type approval for radio equipment".
- [4] ETSI TR 102 273-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 2: Anechoic chamber".
- [5] Council Recommendation 1999/519/EC on the limitation of exposure of the general public to electromagnetic fields 0 Hz - 300 GHz.

- [6] ETSI EN 300 440-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 1: Technical characteristics and test methods".
- [7] ETSI TR 100 028 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [8] Commission Directive 95/54/EC of 31 October 1995 adapting to technical progress Council Directive 72/245/EEC on the approximation of the laws of the Member States relating to the suppression of radio interference produced by spark-ignition engines fitted to motor vehicles and amending Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers.
- [9] ETSI EN 302 288-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Road Transport and Traffic Telematics (RTTT); Short range Radar equipment operating in the 24 GHz range; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".
- [10] ERC/REC 74-01: "Spurious Emissions".

---

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**activity factor:** actual on-the-air time divided by active session time or actual on-the-air emission time within a given time window

**antenna scan duty factor:** ratio of the area of the beam (measured at its  $-3$  dB point) to the total area scanned by the antenna (as measured at its  $-3$  dB point)

**assigned frequency band:** frequency band within which the device is authorized to operate

**associated antenna:** antenna and all its associated components which are designed as an indispensable part of the equipment

**average time:** time interval on which a mean measurement is integrated

**blanking period:** time period where either no waveform or a constant waveform within the 24 GHz SRD band occurs

**boresight:** axis of the main beam in a directional antenna

**channel dwell duty cycle:** ratio of the time of uninterrupted continuous transmission within a given frequency channel to the channel repetition interval

NOTE: Channel dwell time/channel repetition interval.

**channel dwell time:** accumulated amount of transmission time of uninterrupted continuous transmission within a single given frequency channel and within one channel repetition interval

**duty cycle:** the ratio of the total on time of the "message" to the total off-time in any one hour period

NOTE: The device may be triggered either automatically or manually and depending on how the device is triggered will also depend on whether the duty cycle is fixed or random. The duty cycle is categorized in 4 different duty cycle classes.

**Equipment Under Test (EUT):** radar sensor including the integrated antenna together with any external antenna components which affect or influence its performance

**equivalent isotropically radiated power (e.i.r.p.):** total power or power density transmitted, assuming an isotropic radiator

NOTE: e.i.r.p. is conventionally the product of "power or power density into the antenna" and "antenna gain".  
e.i.r.p. is used for both peak or average power and peak or average power density.

**equivalent pulse power duration:** duration of an ideal rectangular pulse which has the same content of energy compared with the pulse shape of the EUT with pulsed modulation or on-off gating

**far field measurements:** measurement at a distance "X" of at least  $2d^2/\lambda$ , where d is the largest dimension of the antenna aperture of the EUT

**maximum safe level for radiated power density:** level which can be transmitted in accordance with the current recommended safety levels in Council Recommendation 1999/519/EC [5]

**on-off gating:** methods of transmission with fixed or randomly quiescent period that is much larger than the PRF

**operating frequency (operating centre frequency):** nominal frequency at which equipment is operated

NOTE: Equipment may be able to operate at more than one operating frequency.

**operating frequency range:** range of operating frequencies over which the equipment can be adjusted through switching or reprogramming or oscillator tuning

NOTE 1: For pulsed or phase shifting systems without further carrier tuning the operating frequency range is fixed on a single carrier line.

NOTE 2: For analogue or discrete frequency modulated systems (FSK, FMCW) the operating frequency range covers the difference between minimum and maximum of all carrier frequencies on which the equipment can be adjusted.

**peak envelope power:** mean power (round mean square for sinusoidal carrier wave type) supplied from the antenna during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions

**Power Spectral Density (PSD):** ratio of the amount of power to the used radio measurement bandwidth

NOTE: It is expressed in units of dBm/Hz or as a power in unit dBm with respect to the used bandwidth. In case of measurement with a spectrum analyser the measurement bandwidth is equal to the RBW.

**precrash:** time before the crash occurs when safety mechanism are deployed

**Pulse Repetition Frequency (PRF):** inverse of the Pulse Repetition Interval, averaged over a time sufficiently long as to cover all PRI variations

**Pulse Repetition Interval (PRI):** time between the rising edges of the transmitted (pulsed) output power

**quiescent period:** time instant where no intentional emission occurs

**radome:** external protective cover which is independent of the associated antenna, and which may contribute to the overall performance of the antenna (and hence, the EUT)

**spatial radiated power density:** power per unit area normal to the direction of the electromagnetic wave propagation

NOTE: Spatial radiated power density is expressed in units of W/m<sup>2</sup>.

**spread spectrum:** modulation technique in which the energy of a transmitted signal is spread throughout a larger frequency range

## 3.2 Symbols

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

$\lambda$	Wavelength
ac	alternating current
B	Bandwidth
$B_{FH}$	Frequency hopping bandwidth
d	largest dimension of the antenna aperture
$D_{fb}$	distance of ferrite beads
E	Field strength
$E_o$	Reference field strength
$f_c$	Carrier frequency
$f_{hop}$	Hopping frequency
$f_h$	highest frequency
$f_l$	lowest frequency
$G_a$	Antenna gain
$P_{rad}$	Radiated power
$P_{PK\ 3\ MHz}$	Radiated peak power measured in 3 MHz bandwidth
$P_s$	Signal generator power
R	Distance
$R_o$	Reference distance
Rx	Receiver
$\tau$	Pulse width
$T_{blk}$	Blank time period
$T_c$	Chip period
$T_{dw}$	Dwell time
$T_{fr}$	Frame time
$T_{pw}$	Pulse power duration
Tx	Transmitter

STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN 302 288-1 V1.1.1:2006

<http://standards.iteh.ai/catalog/standards/sist/bab36c70-3e7b-4b91-a2ad-76669b58c85e/sist-en-302-288-1-v1-1-1-2006>

## 3.3 Abbreviations

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

dB	decibel
dB <sub>i</sub>	gain in decibels relative to an isotropic antenna
DSB	Dual Side Band
DSS	Direct Sequence Signal
e.i.r.p.	equivalent isotropically radiated power
ECC	Electronic Communications Committee
EMC	Electro Magnetic Compatibility
ERC	European Radiocommunication Committee
EUT	Equipment Under Test
FH	Frequency Hopping
FHSS	Frequency Hopping Spread Spectrum
FMCW	Frequency Modulated Continuous Wave
FSK	Frequency Shift Keying
IF	Intermediate Frequency
LNA	Low Noise Amplifier
PDCF	Pulse Desensitisation Correction Factor
PM	Pulse Modulation
PPM	Pulse Position Modulation (staggered)
PRF	Pulse Repetition Frequency
PRI	Pulse Repetition Interval
PSK	Phase Shift Keying
R&TTE	Radio and Telecommunications Terminal Equipment

RBW	Resolution BandWidth
RF	Radio Frequency
RMS	Root Mean Square
RTTT	Road Transport and Traffic Telematics
SNR	Signal to Noise Ratio
SRD	Short Range Device
SRR	Short Range Radar
VBW	Video BandWidth
VSWR	Voltage Standing Wave Ratio

## 4 Technical requirements specifications

### 4.1 Presentation of equipment for testing purposes

Each equipment submitted for testing, where applicable, shall fulfil the requirements of the present document on all frequencies over which it is intended to operate. EMC type approval testing to Directive 95/54/EC [8] shall be done on the vehicle.

The provider shall provide one or more samples of the equipment, as appropriate for testing.

Additionally, technical documentation and operating manuals, sufficient to allow testing to be performed, shall be supplied.

The performance of the equipment submitted for testing shall be representative of the performance of the corresponding production model. In order to avoid any ambiguity in that assessment, the present document contains instructions for the presentation of equipment for testing purposes, conditions of testing (clause 5) and the measurement methods (clauses 7 and 8). Instructions for installation of the equipment in a road vehicle are provided in annex D.

Stand alone equipment submitted for testing shall be offered by the provider complete with any ancillary equipment needed for testing. The provider shall declare the frequency range(s), the range of operation conditions and power requirements, as applicable, in order to establish the appropriate test conditions.

The EUT will comprise the sensor, antenna and radome if needed and will be tested as a stand alone assembly. The EUTs test fixtures may be supplied by the provider to facilitate the tests (clause 6.1).

These clauses are intended to give confidence that the requirements set out in the present document have been met without the necessity of performing measurements on all frequencies.

#### 4.1.1 Choice of model for testing

If an equipment has several optional features, considered not to affect the RF parameters then the tests need only to be performed on the equipment configured with that combination of features considered to be the most complex, as proposed by the provider and agreed by the test laboratory.

### 4.2 Mechanical and electrical design

The equipment submitted by the provider shall be designed, constructed and manufactured in accordance with good engineering practice and with the aim of minimizing harmful interference to other equipment and services.

Transmitters and receivers may be individual or combination units.

### 4.3 Auxiliary test equipment

All necessary test signal sources and set-up information shall accompany the equipment when it is submitted for testing.