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**Satellite Earth Stations and Systems (SES);  
Satellite broadcast reception equipment;  
Harmonised Standard covering the essential requirements  
of article 3.2 of the Directive 2014/53/EU;  
Part 2: Indoor unit**

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Reference

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## Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

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.2].

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 2 of a multi-part deliverable. Full details of the entire series can be found in ETSI EN 303 372-1 [i.1].

<b>National transposition dates</b>	
Date of adoption of this EN:	13 April 2016
Date of latest announcement of this EN (doa):	31 July 2016
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2017
Date of withdrawal of any conflicting National Standard (dow):	31 January 2018

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## 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.

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## Introduction

See ETSI EN 303 372-1 [i.1].

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# 1 Scope

The present document applies to indoor units (IDUs) for satellite broadcast reception. An indoor unit gets on an input interface the signal that has been received from satellite and processed by the outdoor unit (ODU). It performs carrier selection, demodulation, audio and video decoding.

Part of the IDU functionality may be integrated with the ODU. In that case the present document applies to this part of functionality as well as the remaining part in the IDU.

The indoor unit may be integrated with a domestic television receiver.

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.

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## 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] ETSI EN 303 372-1: "Satellite Earth Stations and Systems (SES); Satellite broadcast reception equipment; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part-1: Outdoor unit receiving in the 10,7 GHz to 12,75 GHz frequency band".
- [i.2] 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.3] ETSI EG 203 336 (V1.1.1): "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.4] CENELEC EN 50585:2014: "Communications protocol to transport satellite delivered signals over IP networks".
- [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.

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## 3 Symbols and abbreviations

### 3.1 Symbols

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

$F$	ideal signal occupied bandwidth
$R_s$	symbol rate
$\alpha$	roll-off

### 3.2 Abbreviations

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

EIRP	Equivalent Isotropically Radiated Power
IDU	InDoor Unit
ODU	OutDoor Unit

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## 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 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.

### 4.2 Equipment capabilities

The technical requirements of the present document apply under the capabilities 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 equipment capabilities.

Equipment capabilities comprise the following characteristics:

- Input frequency band
- Input level range
- Modulation and coding format

### 4.3 Conformance requirements

#### 4.3.1 Adjacent signal selectivity

**Purpose:**

To enable reception of a wanted signal in presence of other signals on adjacent frequencies that are transmitted with high EIRP from near-by adjacent orbital positions.

NOTE 1: Signals transmitted from the same orbital position are under control of the satellite operator. Signals transmitted adjacent orbital position that is not near-by are suppressed by the antenna gain pattern.

**Specification:**

Adjacent signal selectivity is specified through an increase of the required signal to noise ratio caused by the adjacent signal.

The adjacent signal shall apply the same modulation as the wanted signal. Frequency offset and power level offset of the adjacent signal with regard to the wanted signal shall take the values given in table 1.  $F$  is the ideal signal occupied bandwidth.

**Table 1: Adjacent signal frequency and level**

Frequency offset from wanted signal	Power level offset from wanted signal
$-F - 4$ MHz	10 dB
$-F - 2$ MHz	4 dB
$-F$	0 dB
$F$	0 dB
$F + 2$ MHz	4 dB
$F + 4$ MHz	10 dB

The required signal to noise ratio in presence of an adjacent signal shall be less than 0,4 dB higher than in absence of adjacent signals.

NOTE 2: In case of amplitude or phase shift keying signals the occupied bandwidth of an ideal signal is  $F = R_s \times (1 + \alpha)$ , where  $R_s$  is the symbol rate and  $\alpha$  is the roll-off.

NOTE 3: The case with frequency offset  $F$  represents carriers sharing a transponder,  $F + 2$  MHz represents carriers on adjacent transponders of a satellite,  $F + 4$  MHz represents carriers on different satellites. Frequency offset is meant between centre frequencies of carriers.

**Verification:**

The test method specified in clause 6.1 shall apply.

### 4.3.2 Dynamic range

**Purpose:**

To allow a wide range of satellite EIRP and of ODU antenna diameter.

NOTE 1: Besides satellite EIRP and ODU antenna diameter, the dynamic range covers the range of coaxial cable length and LNB gain.

**Specification:**

The IDU shall be able to process without degradation input signals at any level in a range of at least 40 dB.

**Verification:**

The test method specified in clause 6.2 shall apply.

NOTE 2: The absolute input level range appears in clause 4.2.

## 5 Testing for compliance with technical requirements

### 5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile.

Where technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions (within the boundary limits of the declared operational environmental profile) to give confidence of compliance for the affected technical requirements.

## 5.2 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report.

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## 6 Test methods

### 6.1 Adjacent signal selectivity

- Two test signal generators shall be used. Each signal generator shall generate a modulated signal in the IDU input frequency range and thermal noise.
- The signal generators shall be connected to the IDU input through a splitter (combiner).
- The symbol rate shall be set to the low end of the IDU's range.
- The test signal generators shall be set to the frequencies and levels according to table 1. For each row of the table:
  - The IDU shall be set to receiving the signal of the first test signal generator.
  - The second test signal generator shall be set to output signal off.
  - The noise level (or signal to noise ratio) of the first test signal generator shall be varied in order to determine the threshold for quasi error free reception.
  - The second signal generator shall be set to output signal on.
  - The noise level (or signal to noise ratio) of the first test signal generator shall be varied in order to determine the threshold for quasi error free reception.
  - The degradation is equal to the noise level (or signal to noise ratio) determined in step e minus that determined in step c.
- Repeat from d) with symbol rate set to the high end of the IDU's range.
- The result is the highest degradation found.

### 6.2 Dynamic range

- A test signal generator that generates a modulated signal in the IDU input frequency range shall be used.
- The test signal generator shall be connected to the IDU input.
- The test signal generator frequency shall be set to the lowest, centre and highest frequency of the IDU input frequency band:
  - Set test signal generator level shall be set to lowest, centre and highest level:
    - It shall be verified that the IDU demodulates the test modulator signal properly.

Instead of a test modulator, a combination of random bit stream generator, modulator, frequency converter and variable attenuator can be used.

## 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.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.2].

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 303 372-2				
The following requirements are relevant to the presumption of conformity under the article 3.2 of Directive 2014/53/EU [i.2]				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Adjacent signal selectivity	4.3.1	U	
2	Dynamic range	4.3.2	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.

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## Annex B (informative): Interface between ODU and IDU

See ETSI EN 303 372-1 [i.1].

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## Annex C (informative): Applicability in conjunction with CENELEC EN 50585:2014

CENELEC EN 50585 [i.4] defines the SAT>IP communication protocol. It enables a SAT>IP server to forward satellite delivered signals to SAT>IP clients over IP networks. The typical use case would be the transport of television programs that were received from the satellite by the SAT>IP server to the SAT>IP client via the IP network. SAT>IP specifies a control protocol as well as the media transport.

With SAT>IP, the IDU functionality is divided up between SAT>IP server and SAT>IP client. All conformance requirements in the present document apply to the functionality in the SAT>IP server.

The SAT>IP server may be a dedicated unit with an inputs for connection to an ODU and with an IP network interface. In that case conformance testing can be carried out on the combination of server and client, with the client used for controlling the server.

The SAT>IP server may be integrated with an ODU. In that case conformance testing can be carried out with test signals up-converted to RF and coupled to the LNB input of the ODU.

## Annex D (informative): Applicability of parameters given in ETSI EG 203 336

ETSI EG 203 336 [i.3] gives guidance on the selection of technical parameters for the production of Harmonised Standards covering articles 3.1(b) and 3.2 of the Radio Equipment Directive [i.2]. Clause 5.3 of ETSI EG 203 336 [i.3] gives receiver parameters under article 3.2 that should be contained in a Harmonised Standard. Table D.1 explains how these parameters are considered in the present document.

**Table D.1: Parameters given in ETSI EG 203 336**

ETSI EG 203 336 [i.3]		The present document		Explanation
Clause	Parameter	Clause	Parameter	
5.3.2	Receiver sensitivity	-	-	This parameter is not applicable, because it is a network specific design choice.
5.3.3	Receiver co-channel rejection	-	-	Co-channel signals on other orbital positions are rejected by low antenna off-axis gain. This parameter is not applicable, because the IDU does not include an antenna. Requirements are contained in ODU parts of the present multi-part deliverable.
5.3.4.2.1	Single signal selectivity - receiver adjacent signal selectivity	4.3.1	Adjacent signal selectivity	
5.3.4.2.2	Receiver spurious response rejection	-	-	This parameter is not relevant, because a Zero IF tuner is applied typically.
5.3.4.3.1	Receiver blocking	-	-	This parameter is not applicable, because blocking signals do not reach the IDU. Requirements are contained in ODU parts of the present multi-part deliverable.
5.3.4.3.2	Receiver radio-frequency intermodulation	-	-	This parameter is not applicable, because it is a network specific requirement.
5.3.4.3.3	Receiver multiple signal selectivity – receiver adjacent signal selectivity	4.3.1	Adjacent signal selectivity	
5.3.4.4.1	Receiver dynamic range	4.3.2	Dynamic range	
5.3.4.4.2	Reciprocal mixing	-	-	The effect is negligible, because noise sidebands of the local oscillator have a negligible power spectral density outside the signal bandwidth.
5.3.4.4.3	Desensitization	-	-	This parameter is not applicable, because receiver sensitivity is not applicable. (See above.)
5.3.5	Receiver unwanted emissions in the spurious domain	-	-	This parameter is not applicable, because the IDU does not include an antenna or antenna port. Requirements are contained in ODU parts of the present multi-part deliverable.

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## Annex E (informative): Other IDU features and performance characteristics

The present document contains requirements on equipment characteristics that are relevant regarding harmful interference. Further characteristics of IDU equipment are relevant regarding the intended use. Network operators or satellite operators typically specify features and minimum performance requirements that enable satisfactory use in particular networks. Characteristics of this kind are listed in the following for information.

- Items of equipment capabilities in clause 4.2
- Items of conformance requirements in clause 4.3
- Number of tuners and demodulators
- Input frequency range
- Input level
- Input connector and impedance
- Input return loss
- LNB supply voltage including control signals
- LNB current supply
- Lock up time
- Modulation format
- Symbol rate
- Audio video output interface
- Conditional access system

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## History

<b>Document history</b>		
V1.1.0	January 2016	EN Approval Procedure AP 20160413: 2016-01-14 to 2016-04-13
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