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**Satellite Earth Stations and Systems (SES);
Satellite broadcast reception equipment;
Part 2: Indoor unit;
Harmonised Standard for access to radio spectrum**

Reference

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Foreword

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

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

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

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.

IDUs in the scope of the present document demodulate broadcast carriers by means of a Zero IF tuner.

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.

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.

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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

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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; Part 1: Outdoor unit receiving in the 10,7 GHz to 12,75 GHz frequency band; Harmonised Standard for access to radio spectrum".
- [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 (V1.2.1): "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] EN 50585:2014: "Communications protocol to transport satellite delivered signals over IP networks" (produced by CENELEC).

- [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.

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

roll-off: the bandwidth of a pulse shaping filter that is occupied beyond the symbol rate, divided by the symbol rate

signal to noise ratio threshold: lowest signal to noise ratio at demodulator input that allows receiving a bit stream quasi error free

NOTE: The meaning of quasi error free depends on the modulation and coding standard applied. For example, with DVB-S it means a bit error rate of 10^{-11} , with DVB-S2 a packet error rate of 10^{-7} and with DVB-S2X a frame error rate of 10^{-5} .

3.2 Symbols

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

F	ideal signal occupied bandwidth
R_s	symbol rate
α	roll-off

3.3 Abbreviations

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

EFTA	European Free Trade Association
EIRP	Equivalent Isotropically Radiated Power
IDU	InDoor Unit
IF	Intermediate Frequency
IP	Internet Protocol
LNB	Low Noise Block down-converter
ODU	OutDoor Unit
RF	Radio Frequency
SAT>IP	SATellite over Internet Protocol

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 in accordance with its intended use. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the operational environmental profile defined by its intended use.

4.2 Equipment capabilities

The technical requirements of the present document apply under the capabilities of the equipment, which shall be specified by the manufacturer. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the specified 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 signal to noise ratio threshold 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
$-F - 4 \text{ MHz}$	10 dB
$-F - 2 \text{ MHz}$	4 dB
$-F$	0 dB
F	0 dB
$F + 2 \text{ MHz}$	4 dB
$F + 4 \text{ MHz}$	10 dB

The signal to noise ratio threshold 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 α is the roll-off.

NOTE 3: The case with frequency offset F represents carriers sharing a transponder, $F + 2 \text{ MHz}$ represents carriers on adjacent transponders of a satellite, $F + 4 \text{ MHz}$ 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 operational environmental profile defined by its intended use.

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 operational environmental profile defined by its intended use) to give confidence of compliance for the affected technical requirements.

6 Test methods

6.1 Adjacent signal selectivity

- a) Two test signal generators shall be used. Each signal generator shall generate a modulated signal in the IDU input frequency range. The first test signal generator shall also generate additive thermal noise with a settable signal to noise ratio. The modulated signals of the two generators shall be uncorrelated.
- b) The signal generators shall be connected to the IDU input through a splitter (combiner).
- c) The symbol rate of both signal generators shall be set to the low end of the IDU's range. The frequency and level of the first signal generator shall be set to the centre of the IDU's range (clause 4.2).
- d) For each row of table 1:
 - 1) The IDU shall be set to receiving the signal of the first test signal generator.
 - 2) The second test signal generator shall be set to output signal off. It shall be set to frequency and level according to the current row of table 1.
 - 3) The signal to noise ratio of the first test signal generator shall be varied in order to determine the signal to noise ratio threshold.
 - 4) The second signal generator shall be set to output signal on.
 - 5) The signal to noise ratio of the first test signal generator shall be varied in order to determine the signal to noise ratio threshold.

- 6) The signal to noise ratio threshold increase is equal to the signal to noise ratio threshold determined in step 5 minus that determined in step 3.
- e) Repeat from d) with symbol rate set to the high end of the IDU's range.
- f) The test is passed if the signal to noise ratio threshold increase in both cases is less than 0,4 dB.

NOTE 1: Some IDUs display on the connected screen an indication for the estimated bit error rate, for example as "signal quality" between 0 % and 100 %, with 100 % corresponding to quasi error free. This indication may be used for determining the signal to noise ratio thresholds.

NOTE 2: Figure 1 illustrates the test set-up.

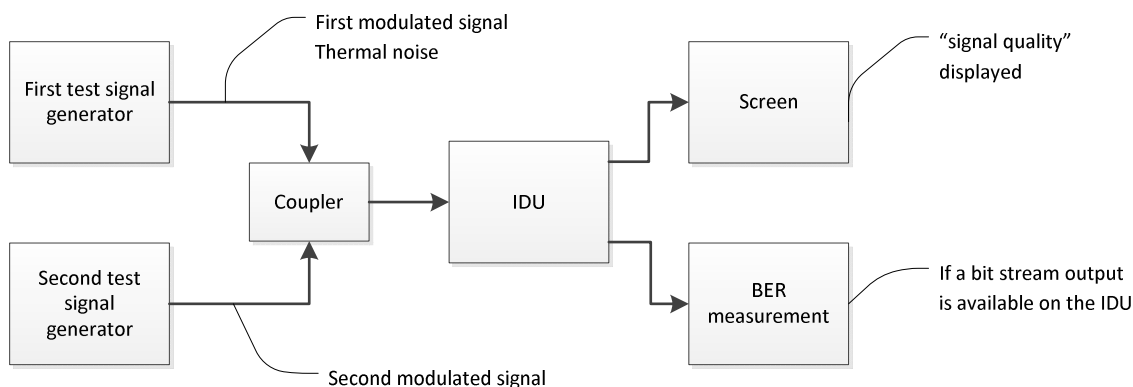


Figure 1: Test set-up for adjacent signal selectivity

NOTE 3: A test signal generator may be capable of generating two modulated signals and thermal noise. Figure 2 illustrates this case.

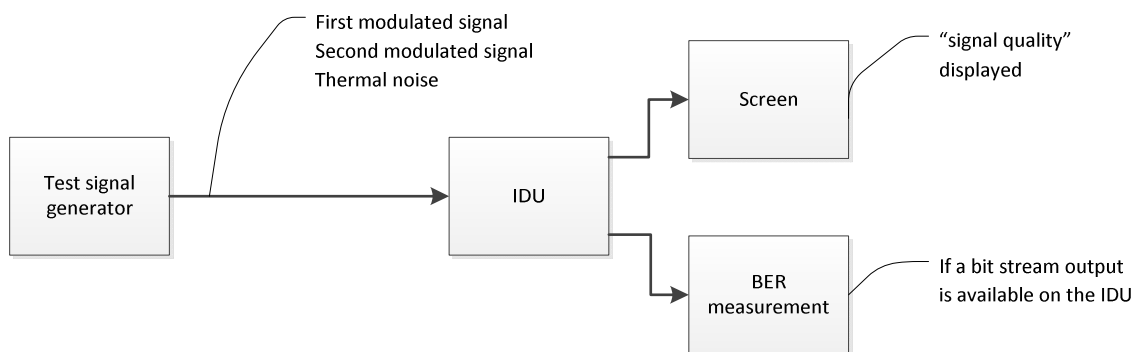


Figure 2: Test set-up for adjacent signal selectivity with generator capable of two modulated signals

6.2 Dynamic range

- a) A test signal generator that generates a modulated signal in the IDU input frequency range shall be used.
- b) The test signal generator shall be connected to the IDU input.
- c) The test signal generator frequency shall be set to the lowest, centre and highest frequency of the IDU's range (clause 4.2):
- 1) The test signal generator level shall be set to lowest, centre and highest level of the IDU's range (clause 4.2):
 - i) It shall be verified that the IDU demodulates the test modulator signal successfully.
- d) The test is passed if the highest minus lowest level of the IDU's range is at least 40 dB, and steps a) to c) are performed successfully.

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

Annex A (informative): 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					
Requirement				Requirement Conditionality	
No	Description	Essential requirements of Directive	Clause(s) of the present document	U/C	Condition
1	Adjacent signal selectivity	3.2	4.3.1	U	
2	Dynamic range	3.2	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.

Essential requirements of Directive

Identification of article(s) defining the requirement in the Directive.

Clause(s) of the present document

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 is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement is or is not 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): Interface between ODU and IDU

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

Annex C (normative): Applicability in conjunction with EN 50585:2014

EN 50585:2014 [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 inputs for connection to an ODU and with an IP network interface. In that case conformance testing shall 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 shall 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	Receiver adjacent channel selectivity	4.3.1	Adjacent signal selectivity	
5.3.4.4	Receiver spurious response rejection	-	-	The IDU performs demodulation. Satellite broadcast carriers are demodulated by means of a Zero IF tuner. With this concept the parameter is not relevant. Regarding the ODU, requirements are contained in the ODU parts of the present multi-part deliverable.
5.3.4.3	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.
5.3.4.5	Receiver radio-frequency intermodulation	-	-	This parameter is not applicable, because it is a network specific requirement.
5.3.6.1	Receiver dynamic range	4.3.2	Dynamic range	
5.3.6.2	Reciprocal mixing	-	-	The effect is negligible, because noise sidebands of the local oscillator have a negligible power spectral density outside the signal bandwidth.
5.3.2.3	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.

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

Annex F (informative): Change history

Version	Information about changes
1.1.1	First publication of the standard
1.2.1	Correction of editorial errors, more detailed test procedures

History

Document history		
V1.1.1	April 2016	Publication
V1.2.0	March 2021	EN Approval Procedure AP 20210620: 2021-03-22 to 2021-06-21