
Methods of measurement for radio equipment used in satellite earth stations - Part
2: Measurements for sub-systems - Section 3: Low-noise amplifier

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METHODS OF MEASUREMENT FOR RADIO EQUIPMENT
USED IN SATELLITE EARTH STATIONS
PART 2: MEASUREMENTS FOR SUB-SYSTEMS
SECTION THREE - LOW-NOISE AMPLIFIER

Méthodes de mesure pour les
équipements radioélectriques
utilisés dans les stations
terriennes de télécommunication
par satellites
Deuxième partie: Mesures sur les
sous-ensembles
Section trois - Amplificateur à
faible bruit

Meßverfahren für Funkgerät
in Satelliten-Erdfunkstellen
Teil 2: Messungen an Untersystemen
Hauptabschnitt drei: Rauscharmer
Verstärker

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BODY OF THE HD

The Harmonization Document consists of:

- IEC 510-2-3 (1989) ed 1; IEC/SC 12E, not appended
- <https://standards.iteh.ai/en/standards/iec/55713a1b-ecbf-49a4-b410-fac4dad60fa/sist-hd-467-2-3-s1-2002>
[SIST HD 467.2.3 S1:2002](#)

This Harmonization Document was approved by CENELEC on 1990-06-01.

The English and French versions of this Harmonization Document are provided by the text of the IEC publication and the German version is the official translation of the IEC text.

According to the CENELEC Internal Regulations the CENELEC member National Committees are bound:

to announce the existence of this Harmonization Document at national level by or before 1990-12-15

to publish their new harmonized national standard by or before 1991-06-15

to withdraw all conflicting national standards by or before 1991-06-15.

Harmonized national standards are listed on the HD information sheet, which is available from the CENELEC National Committees or from the CENELEC Central Secretariat.

The CENELEC National Committees are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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**NORME
INTERNATIONALE
INTERNATIONAL
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IEC**

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Première édition
First edition
1989-01

**Méthodes de mesure pour les équipements
radioélectriques utilisés dans les stations
terriennes de télécommunication par satellites**

Deuxième partie:

Mesures sur les sous-ensembles

Section trois – Amplificateur à faible bruit

**Methods of measurements for radio equipment
used in satellite earth stations**

Part 2:

Measurements for sub-systems

Section Three – Low-noise amplifier

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Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

METHODS OF MEASUREMENT FOR RADIO EQUIPMENT
USED IN SATELLITE EARTH STATIONS

Part 2: Measurements for sub-systems

Section Three - Low-noise amplifier

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

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PREFACE

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This standard has been prepared by Sub-Committee 12E: Radio relay and fixed-satellite communications systems, of IEC Technical Committee No. 12: Radiocommunications.

The text of this standard is based on the following documents:

| Six Months' Rule | Report on Voting |
|------------------|------------------|
| 12E(C0)38 | 12E(C0)66 |

Full information on the voting for the approval of this standard can be found in the Voting Report indicated in the above table.

The following IEC publications are quoted in this standard:

Publications Nos. 510-1-2 (1984): Methods of measurement for radio equipment used in satellite earth stations, Part 1: Measurements common to sub-systems and combinations of sub-systems. Section Two - Measurements in the r.f. range.

510-1-5 (1988): Section Five - Measurement of noise temperature.

METHODS OF MEASUREMENT FOR RADIO EQUIPMENT USED IN SATELLITE EARTH STATIONS

Part 2: Measurements for sub-systems

SECTION THREE - LOW-NOISE AMPLIFIER

1. Scope

This standard describes methods of measurement of the electrical characteristics of the low-noise receiver amplifier which follows an earth station antenna.

Measurements need not necessarily be limited to those described. When additional tests are required, they shall be subject to mutual agreement between the parties concerned.

2. General

The input ports and the output ports of the amplifier shall be identified and any associated networks, such as r.f. filters, r.f. switches or directional couplers, shall be stated. The location of these sub-system interface points shall be mutually agreed.

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Unless otherwise stated or agreed, the levels of the test signals applied to the input of a low-noise amplifier shall be comparable with the operating level of the amplifier or shall be low enough to ensure that the amplifier is not driven into compression, or to the point where damage may occur.

A low-noise amplifier shall remain electrically stable when it is switched from one signal source or load to another, and when it is overloaded to a specified extent. Alternatively, the amplifier shall return automatically to a stable operating condition when the switching operation is completed or when the overload signal is removed.

3. Power gain

See Clause 5, Part 1, Section Two of this publication: Measurements in the r.f. range.

If required, a curve relating the output level to the input level can be obtained by varying the input signal from a low level up to the maximum operating level. This curve enables the gain compression of the amplifier to be evaluated.

4. Gain stability

4.1 Definition

Gain stability is defined as the variation with time of the actual gain from the initial gain at a specified frequency. It is convenient to distinguish between short-term stability (of the order of 1 min) and long-term stability (of the order of one day).

4.2 Method of measurement

The method of measurement is the same as that for the gain measurement described in Sub-clause 5.2, Part 1, Section Two of this publication: Measurements in the r.f. range, except that a suitable instrument shall be added to the measuring arrangement to record the measured values against time. This measurement may require repetition at various specified input frequencies.

5. Amplitude/frequency characteristic

See Clause 6, Part 1, Section Two of this publication: Measurements in the r.f. range.

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6. Noise temperature (standards.iteh.ai)

Due to the low noise temperature to be measured, it is recommended that the hot/cold load method ("Y-method") should be used.

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The noise temperature of the low-noise amplifier shall be measured at specified frequencies in a specified bandwidth.

Since the noise temperature is to be determined with reference to the agreed low-noise amplifier sub-system input point, the calculation is based upon the noise temperature of the loads referred to this point, taking into account the transmission-line loss, the physical temperature of each unit and any mismatches. The method of calculation and conditions of measurement of noise temperature are described in Part 1, Section Five of this publication: Measurement of noise temperature.

7. Input and output return loss

See Clause 4, Part 1, Section Two of this publication: Measurements in the r.f. range.

8. The effect of out-of-band signals upon gain compression and noise temperature

Out-of-band signals can cause gain compression and can increase the noise temperature of a low-noise amplifier.