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**Radio-frequency connectors –
Part 1-6: Electrical test methods – RF power**

**Connecteurs pour fréquences radioélectriques –
Partie 1-6: Méthodes d'essai électrique – Puissance RF**



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RADIO-FREQUENCY CONNECTORS –

Part 1-6: Electrical test methods – RF power

FOREWORD

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IEC 61169-1-6 has been prepared by subcommittee 46F: RF and microwave passive components, of IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
46F/598/FDIS	46F/612/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 61169 series, published under the general title *Radio-frequency connectors*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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RADIO-FREQUENCY CONNECTORS –

Part 1-6: Electrical test methods – RF power

1 Scope

This part of IEC 61169 provides test methods for RF power rating and power handling of RF connectors at specified frequency, temperature and altitude.

This document is applicable to cabled RF connectors, microstrip RF connectors and RF connector adapters. It is also suitable to test RF channels in multi-channel RF connectors and hybrid connectors.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61169-1, *Radio frequency connectors – Part 1: Generic specification – General requirements and measuring methods*

IEC 61169-1-4, *Radio frequency connectors – Part – 1-4: Electrical test methods – Voltage standing wave ratio, return loss and reflection coefficient*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61169-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

power rating

input power at which neither peak working voltage nor maximum dielectric temperature for an RF connector is exceeded, if it is terminated

Note 1 to entry: See Annex A for typical dielectric materials for RF connectors and their maximum withstanding temperatures.

3.2

average power

power that is averaged over the defined frequency range and periods at the specified temperature and altitude and that can be handled by RF connectors

3.3

peak power

maximum power $P_{\max}$ that the RF connectors shall withstand for a pulse duration τ over a period T with a duty cycle R at the specified temperature and altitude, where the relationship between duty cycle, pulse duration, and period is expressed by formula (1)

Note 1 to entry: See Figure 1.

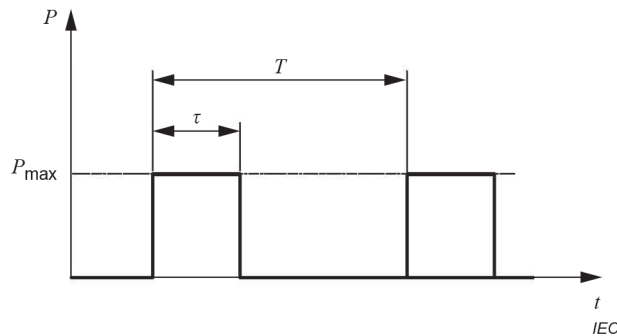


Figure 1 – Illustration of peak power

$$R = \frac{\tau}{T} \times 100(\%) \quad (1)$$

where

R is the duty factor, in %;

τ is the pulse duration, in s;

T is the period of pulse, in s.

3.4

continuous wave power

power transmitted in almost a straight line whose duty factor $R = 1$ in Formula (1)

3.5

power handling

ability of the RF connectors to handle the power specified in the relevant specification at the stated temperature, altitude and frequency

4 Preparation of test sample (TS)

4.1 Cabled RF connector

The cabled RF connector shall be made into a double-ended cable assembly as a test sample (TS) using a length of pre-selected RF cable with a power capacity greater than the connector.

4.2 Microstrip connector

The microstrip connector shall be provided with an appropriate test fixture at the microstrip end as specified in the relevant specification, and the microstrip connector with test fixture as a whole should be treated as a test sample (TS).

4.3 Adapter

The adapter shall be tested directly or indirectly by being mated to additional adapters at the ends that are suitable for the test setup interfaces and sufficient to meet the power capability requirements of the test. An adapter is just a test sample (TS). When the adapter is needed, the power capacity of the adapter should be greater than that of the sample.

When needed, it is recommended to drill a small hole in the test sample (TS) on the inner conductor to place a thermodetector (such as a fiber optic temperature sensor) to measure the temperature of the inner conductor.

5 Test conditions

The stability of test conditions includes temperature stability and altitude stability.

a) Temperature stability:

When the change of temperature of the test sample is not more than $\pm 2\text{ °C}$ in 5 min, the temperature shall be considered stabilized.

When the chamber is used for testing and the change of temperature of the chamber and the test sample have been not more than $\pm 2\text{ °C}$ in 5 min, the temperature shall be considered stabilized.

b) Altitude stability:

When requirements are specified for pressure in the relevant specifications, the altitude of the low-pressure test chamber that is stable within the range of $\pm 5\%$ of the specified value in 10 min is considered a stable altitude.

6 Test principle

A combination of power source, directional coupler, fixed attenuator (when required) and power meter is used for the test, as shown in Figure 2. When the incident power P_i passes through the coupler, the coupling power P_f is produced at its coupling port, and then is attenuated to the range of the power meter by a fixed attenuator (when necessary), so as to obtain the indication value of power P_0 .

Since the coupling factor C (calculated from Formula (2)) of coupler and attenuation value D (calculated from Formula (3)) of the fixed attenuator are invariable, the actual incident power of the sample can be obtained from Formula (4).

$$C = 10 \lg \frac{P_i}{P_f} \quad (2)$$

$$D = 10 \lg \frac{P_f}{P_0} \quad (3)$$

$$P = P_0 + D + C \quad (4)$$

where

- C is the coupling factor of the coupler, in dB;
- D is the attenuation of the fixed attenuator, in dB;
- P_i is the incident power of the test system, in dB;
- P_f is the power value of the coupling end of the coupler, in dB;
- P_g is the power value attenuated by the fixed attenuator, in dB;
- P is the measured power value, in dB;
- P_0 is the indicated value by power meter, in dB.

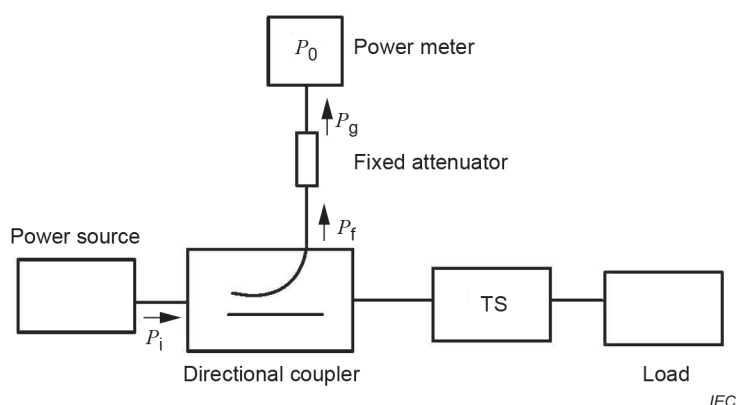


Figure 2 – Test principle

7 Test equipment

Test equipment is as follows:

- a) Power source, directional coupler, fixed attenuator, power meter, high-power load (or absorber), etc. The rated power of selected couplers, fixed attenuators, high-power loads and other devices shall be more than 2 to 2,5 times the maximum power measured, to prevent the devices from burning out due to overheating in case of nonsteady power.
- b) The thermodetector shall be able to measure inner and outer conductor temperatures, and have sufficient sensitivity with an accuracy of ± 1 °C.
- c) Temperature - altitude test chamber (if applicable) shall meet the test requirements stated in the relevant specifications.
- d) For the power rating test, the voltage standing wave ratio (VSWR) of the load should be less than 1,05; for power handling tests, unless otherwise specified, VSWR of the load shall not be less than 1,75.
- e) A test room to prevent air circulation, e.g. of fans of the climatic cabinet. If necessary, the test room should fit the climatic cabinet and be large enough so that the test items can be 20 cm (8 in) away from the walls of the test room.