

# INTERNATIONAL STANDARD



**Passive RF and microwave devices, intermodulation level measurement –  
Part 3: Measurement of passive intermodulation in coaxial connectors**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**PASSIVE RF AND MICROWAVE DEVICES,  
INTERMODULATION LEVEL MEASUREMENT –****Part 3: Measurement of passive intermodulation in coaxial connectors****FOREWORD**

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**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62037-3:2012. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

IEC 62037-3 has been prepared by IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories. It is an International Standard.

This second edition cancels and replaces the first edition published in 2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) impact method changed to utilize a steel ball rather than a brass rod;
- b) impact energy required to test each connector type added;
- c) method added to calculate impact energy for connector types not listed in the document.

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

Draft	Report on voting
46/836/FDIS	46/857/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

A list of all the parts in the IEC 62037 series, published under the general title *Passive RF and microwave devices, intermodulation level measurement* 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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

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# PASSIVE RF AND MICROWAVE DEVICES, INTERMODULATION LEVEL MEASUREMENT –

## Part 3: Measurement of passive intermodulation in coaxial connectors

### 1 Scope

This part of IEC 62037 defines the impact test on coaxial connectors to evaluate their robustness against weak connections and particles inside the connector, as independently as possible from the effects of cable PIM (passive intermodulation).

For other connectors (e.g. panel mounted connectors), the cable can be replaced by an adequate transmission-line (e.g. airline, stripline). In order to evaluate the effects of mechanical stresses on the connectors, a series of impacts is applied to the connectors while measuring the PIM.

### 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 62037-1, *Passive RF and microwave devices, intermodulation level measurement – Part 1: General requirements and measuring methods*<sup>1</sup>

IEC 62037-4, *Passive RF and microwave devices, intermodulation level measurement – Part 4: Measurement of passive intermodulation in coaxial cables*<sup>2</sup>

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### 3 Terms, definitions and abbreviated terms

#### 3.1 Terms and definitions

No terms and definitions are listed in this document.

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>

#### 3.2 Abbreviated terms

DUT Device under test  
IM Intermodulation  
PIM Passive intermodulation

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<sup>1</sup>~~To be published.~~

<sup>2</sup>~~To be published.~~

## 4 Test method

### 4.1 Samples for testing

One of the two following set-ups may be used.

NOTE Correct assembly methods and techniques are critical to the proper operation of the connector on the cable.

#### a) Set-up 1 – Multi-port DUT

In order to minimize the effect of the transmission line, a short assembly should be tested. Identical connectors should be assembled at each end. An assembly, as short as physically practical, should be constructed.

#### a) Set-up 2 – One-port DUT

A single connector can be assembled on a length of transmission line for which it is designed, ~~loss or low loss~~, that exhibits at least 10 dB of attenuation in one direction at the lowest frequency in the receive band.

### 4.2 Connection of unit

The unit ~~should~~ shall be connected as described in IEC 62307-1.

### 4.3 Set-up 1 – Fixed frequency test considerations

Due to the phase interaction of the connectors and the length of the transmission line (configuration A) when measured in the reverse (reflected) mode, the frequency at which maximum PIM occurs within the band can vary and shall be determined.

An accepted method of sweeping is to fix ~~F1~~  $f_1$  at the low end of the transmit band and step ~~F2~~  $f_2$  down, starting at the top of the band for all combinations of frequencies that result in IM in the receive band. If desired, this procedure can be reversed by fixing ~~F1~~  $f_2$  at the highest frequency in the transmit band and then stepping ~~F2~~  $f_1$  up, starting at the bottom of the band.

If fixed frequency is used, assemblies of varying lengths shall be made to ensure that the PIM adds in-phase. Assemble two additional DUTs. The first one is to be  $\lambda/6$  longer and the second one is to be  $\lambda/3$  longer at the receive frequency of the test. The PIM of the three (3) assemblies is measured to determine which DUT exhibits maximum PIM. The impact test shall be performed on this DUT.

Multiple fixed frequencies may be used in lieu of varying the cable length.

The impact test is to be conducted at the frequency where the maximum PIM is measured.

The cable used as a load ~~should~~ shall be verified as having suitable PIM performance prior to being used in testing as measured by IEC 62037-4.

### 4.4 Set-up 2 considerations

The cable used as a load ~~should~~ shall be verified as having suitable PIM performance prior to being used in testing as measured by IEC 62037-4.

### 4.5 Impacts

Mount the DUT as shown in Figure 1. A minimum of five (5) impacts in accordance with Table 1 ~~should~~ shall be applied. (See Figure 1 for impact set-up ~~and Figure 2 for description of drop mass and tube~~.)

~~The tube should be vertical to the axis of the DUT to  $\pm 3^\circ$ .~~



The drop mass is a steel ball, ensuring that no sharp edge will damage the DUT and minimizing variation in the impact force. The steel ball is remotely released via a solenoid to prevent impact force variation due to manual operation.

The points of impact should cover as many different areas along the length of the connector as possible, but it is not necessary to rotate or otherwise disconnect and reposition the DUT.

The PIM is measured prior to, during, and after the impact.

**Table 1 – Impact information for some popular connectors**

Connector interface	Mass (min.) g	Drop height (min.) mm
7-16	30	300
N	30	300
TNC	30	300
SMA	30	300

Connector interface	Connector nominal hex dimension mm	Impact energy J	Steel ball diameter mm	Mass g	Drop height (min.) mm
7-16	31,8	0,083	19	28,4	300
4.3-10	22,2	0,058	19	28,4	210
N	19,1	0,050	19	28,4	180
TNC	14,3	0,037	19	28,4	130
SMA	7,9	0,021	19	28,4	75

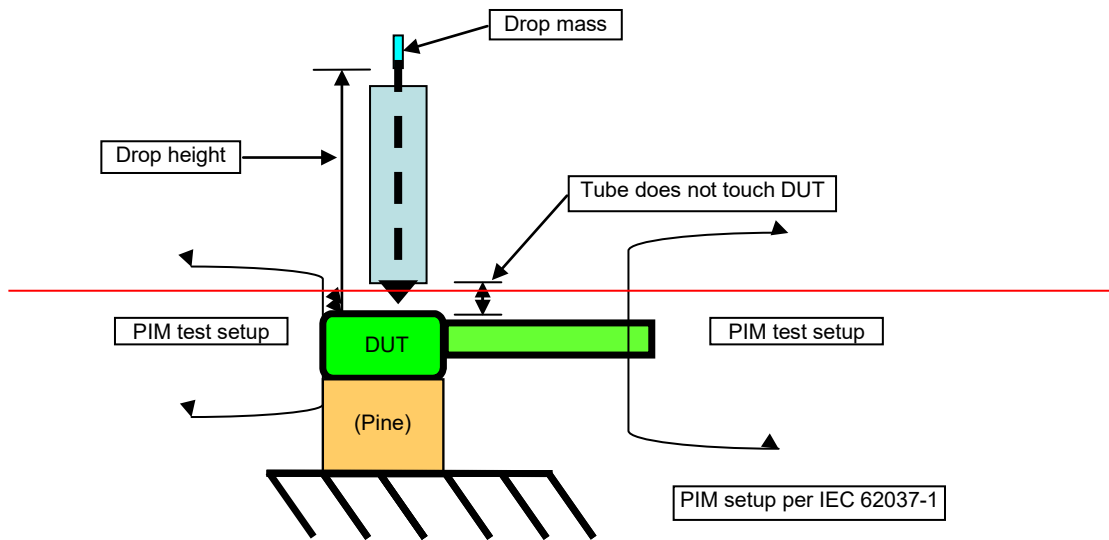
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~~The length dimension of the brass rod shall be greater than its diameter.~~ <http://standards.iteh.org/catalog/iec/62037-3-2021>

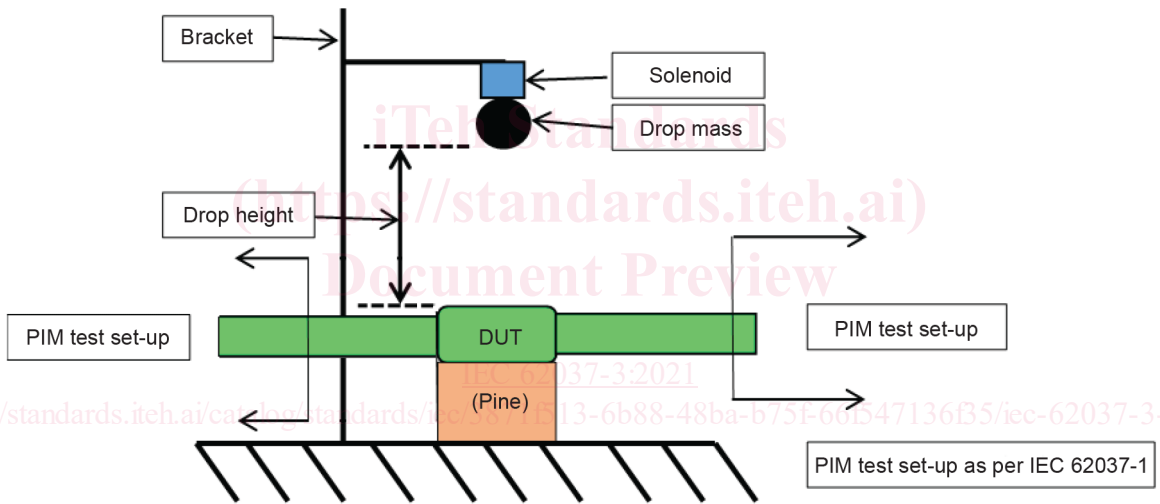
~~The given values are guidelines, and other connectors can be used as determined between customer and supplier.~~

Different steel ball diameters and drop heights may be used as long as equivalent impact energy is maintained. See Annex A for guidelines for calculating equivalent impact energy.

Other connector types can be tested in accordance with this document. The required impact energy for different connector types can be calculated as specified in Annex B.

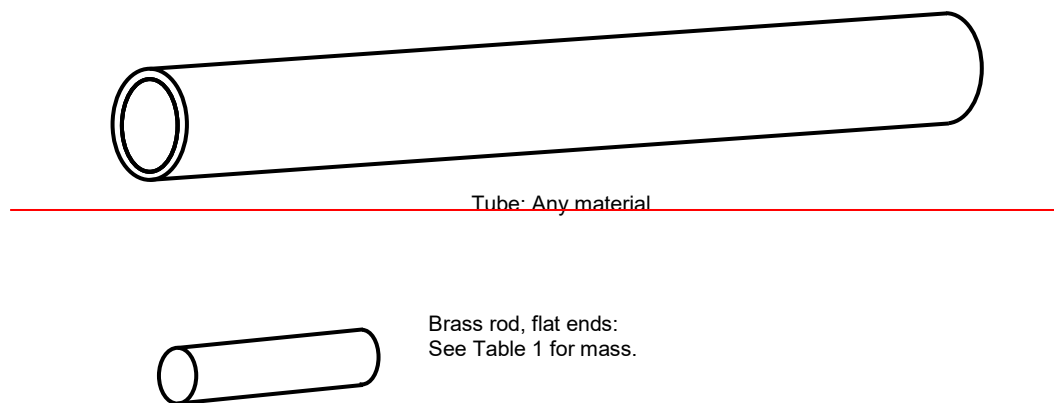


IEC 1533/12



IEC

Figure 1 – Impact test illustration



IEC 1534/12

**Figure 2 – Impact device**

## 5 Report

~~The report should document the height, mass, and distance dropped if different from the table and the PIM values prior to each impact, during impact, and after impact.~~

The report should document the drop height, steel ball mass and impact energy if different from Table 1 and the peak PIM values prior to, during, and after each impact.

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