



NSAI
Standards

Irish Standard
I.S. EN 61338-1-5:2015

Waveguide type dielectric resonators - Part 1-5: General information and test conditions - Measurement method of conductivity at interface between conductor layer and dielectric substrate at microwave frequency

I.S. EN 61338-1-5:2015

Incorporating amendments/corrigenda/National Annexes issued since publication:

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NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

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National Foreword

I.S. EN 61338-1-5:2015 is the adopted Irish version of the European Document EN 61338-1-5:2015, Waveguide type dielectric resonators - Part 1-5: General information and test conditions - Measurement method of conductivity at interface between conductor layer and dielectric substrate at microwave frequency

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EUROPEAN STANDARD

EN 61338-1-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2015

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English Version

**Waveguide type dielectric resonators - Part 1-5: General
information and test conditions - Measurement method of
conductivity at interface between conductor layer and dielectric
substrate at microwave frequency
(IEC 61338-1-5:2015)**

Résonateurs diélectriques à modes guidés - Partie 1-5:
Informations générales et conditions d'essais - Méthode de
mesure de la conductivité au niveau de l'interface entre une
couche conductrice et un substrat diélectrique fonctionnant
aux hyperfréquences
(IEC 61338-1-5:2015)

Dielektrische Resonatoren vom Wellenleitertyp - Teil 1-5:
Allgemeine Informationen und Prüfbedingungen -
Messverfahren für die Leitfähigkeit an der Grenzfläche
zwischen Leiterschicht und dielektrischem Träger im
Mikrowellen-Frequenzbereich
(IEC 61338-1-5:2015)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

EN 61338-1-5:2015

European foreword

The text of document 49/1089/CDV, future edition 1 of IEC 61338-1-5, prepared by IEC/TC 49 "Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61338-1-5:2015.

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publication of an identical national
standard or by endorsement
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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61338-1-3	-	Waveguide type dielectric resonators -- Part 1-3: General information and test conditions - Measurement method of complex relative permittivity for dielectric resonator materials at microwave frequency	EN 61338-1-3	-
IEC 62252	-	Maritime navigation and radiocommunication equipment and systems - Radar for craft not in compliance with IMO SOLAS Chapter V - Performance requirements, methods of test and required test results	EN 62252	-

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Edition 1.0 2015-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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de la conductivité au niveau de l'interface entre une couche conductrice et un
substrat diélectrique fonctionnant aux hyperfréquences**



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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IEC 61338-1-5

Edition 1.0 2015-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Waveguide type dielectric resonators –
Part 1-5: General information and test conditions – Measurement method of
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de la conductivité au niveau de l'interface entre une couche conductrice et un
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

WAVEGUIDE TYPE DIELECTRIC RESONATORS –

Part 1-5: General information and test conditions – Measurement method of conductivity at interface between conductor layer and dielectric substrate at microwave frequency

FOREWORD

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International Standard IEC 61338-1-5 has been prepared by IEC technical committee 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection.

This first edition cancels and replaces IEC PAS 61338-1-5 published in 2010.

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

- a) description of technical content related to patents (Japanese patent numbers JP3634966, JP3735501) in the Introduction;
- b) changes to normative references;
- c) addition to bibliography.

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

CDV	Report on voting
49/1089/CDV	49/1103/RVC

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61338 series, published under the general title *Waveguide type dielectric resonators*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

IEC 61338 consists of the following parts, under the general title *Waveguide type dielectric resonators*:

- Part 1: Generic specification
- Part 1-3: General information and test conditions – Measurement method of complex relative permittivity for dielectric resonator materials at microwave frequency
- Part 1-4: General information and test conditions – Measurement method of complex relative permittivity for dielectric resonator materials at millimeter-wave frequency
- Part 2: Guidelines for oscillator and filter applications
- Part 4: Sectional specification
- Part 4-1: Blank detail specification

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning:

- The use of a $TE_{01\delta}$ mode dielectric rod resonator for the interface resistance and the interface conductivity measurement, given in Clause 4;
- The use of a substrate/conductor/substrate layer structure, where a conductor is formed between two dielectric substrates, for the interface resistance and interface conductivity measurement, given in Clause 5.

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WAVEGUIDE TYPE DIELECTRIC RESONATORS –

Part 1-5: General information and test conditions – Measurement method of conductivity at interface between conductor layer and dielectric substrate at microwave frequency

1 Scope

Microwave circuits are popularly formed on multi-layered organic or non-organic substrates. In the microwave circuits, the attenuation of planar transmission lines such as striplines, microstrip lines, and coplanar lines are determined by their conductor loss, dielectric loss and radiation loss. Among them, the conductor loss is a major factor in the attenuation of the planar transmission lines. A new measurement method is standardized in this document to evaluate the conductivity of transmission line on or in the substrates such as the organic, ceramic and LTCC (low temperature co-fired ceramics) substrates. This standard describes a measurement method for resistance and effective conductivity at the interface between conductor layer and dielectric substrate, which are called interface resistance and interface conductivity.

This measurement method has the following characteristics:

- the interface resistance R_i is obtained by measuring the resonant frequency f_0 and unloaded quality factor Q_u of a $TE_{01\delta}$ mode dielectric rod resonator shown in Figure 2;
- the interface conductivity σ_i and the relative interface conductivity $\sigma_{ri} = \sigma_i / \sigma_0$ are calculated from the measured R_i value, where $\sigma_0 = 5,8 \times 10^7$ S/m is the conductivity of standard copper;
- the measurement uncertainty of σ_{ri} ($\Delta\sigma_{ri}$) is less than 5 %.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61338-1-3: *Waveguide type dielectric resonators – Part 1-3: General information and test conditions – Measurement method of complex relative permittivity for dielectric resonator materials at microwave frequency*

IEC 62562: *Cavity resonator method to measure the complex permittivity of low-loss dielectric plates*

3 Measurement and related parameters

The IEC 61338-1-3 described the measurement method for the surface resistance R_s and effective conductivity σ on the surface of the conductor. The term σ is designated as σ_s in this standard, and is called surface conductivity (Figure 1). This standard describes a measurement method for resistance and effective conductivity at the interface between conductor layer and dielectric substrate designated as R_i and σ_i respectively, and are called interface resistance and interface conductivity.

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