

**Waveguide type dielectric resonators Part
1-4: General information and test conditions
- Measurement method of complex relative
permittivity for dielectric resonator
materials at millimetre-wave frequency**

Waveguide type dielectric resonators Part 1-4:
General information and test conditions -
Measurement method of complex relative permittivity
for dielectric resonator materials at millimetre-wave
frequency

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 61338-1-4:2006 sisaldab Euroopa standardi EN 61338-1-4:2006 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 13.04.2006 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 61338-1-4:2006 consists of the English text of the European standard EN 61338-1-4:2006.</p> <p>This document is endorsed on 13.04.2006 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p>Käsitlusala: Describes the measurement method of dielectric properties for dielectric resonator materials at millimetre-wave frequency. Proposes two measurement methods: a) the dielectric rod resonator method and b) the cut-off waveguide method.</p>	<p>Scope: Describes the measurement method of dielectric properties for dielectric resonator materials at millimetre-wave frequency. Proposes two measurement methods: a) the dielectric rod resonator method and b) the cut-off waveguide method.</p>
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ICS 31.140

Võtmesõnad:

Waveguide type dielectric resonators
Part 1-4: General information and test conditions -
Measurement method of complex relative permittivity
for dielectric resonator materials at millimetre-wave frequency
(IEC 61338-1-4:2005)

Résonateurs diélectriques
à modes guidés
Partie 1-4: Informations générales
et conditions d'essais -
Méthode de mesure de la permittivité
relative complexe des matériaux
des résonateurs diélectriques fonctionnant
à des fréquences millimétriques
(CEI 61338-1-4:2005)

Dielektrische Resonatoren
vom Wellenleitertyp
Teil 1-4: Allgemeine Informationen
und Prüfbedingungen -
Messverfahren für die komplexe relative
Dielektrizitätskonstante von dielektrischen
Resonatorwerkstoffen im Mikrowellen-
Frequenzbereich
(IEC 61338-1-4:2005)

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Comité Européen de Normalisation Electrotechnique
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Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 49/748/FDIS, future edition 1 of IEC 61338-1-4, prepared by IEC TC 49, Piezoelectric and dielectric devices for frequency control and selection, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61338-1-4 on 2005-12-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2006-09-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2008-12-01

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Endorsement notice

The text of the International Standard IEC 61338-1-4:2005 was approved by CENELEC as a European Standard without any modification.

INTERNATIONAL STANDARD

IEC
61338-1-4

First edition
2005-11

Waveguide type dielectric resonators –

Part 1-4:

**General information and test conditions –
Measurement method of complex relative
permittivity for dielectric resonator materials
at millimetre-wave frequency**



Reference number
IEC 61338-1-4:2005(E)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

WAVEGUIDE TYPE DIELECTRIC RESONATORS –

**Part 1-4: General information and test conditions –
Measurement method of complex relative permittivity for
dielectric resonator materials at millimetre-wave frequency**

FOREWORD

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International Standard IEC 61338-1-4 has been prepared by IEC Technical committee 49: Piezoelectric and dielectric devices for frequency control and selection.

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

FDIS	Report on voting
49/748/FDIS	49/751/RVD

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.

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 millimetre-wave frequency
- Part 2: Guidelines for oscillator and filter applications
- Part 4: Sectional specification
- Part 4-1: Blank detail specification

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

A bilingual version of this publication may be issued at a later date.

WAVEGUIDE TYPE DIELECTRIC RESONATORS –

Part 1-4: General information and test conditions – Measurement method of complex relative permittivity for dielectric resonator materials at millimetre-wave frequency

1 Scope and object

This part of IEC 61338 describes the measurement method of dielectric properties for dielectric resonator materials at millimetre-wave frequency.

This standard consists of two measurement methods: a) the dielectric rod resonator method excited by NRD-guide (Non-Radiative Dielectric waveguide) and b) the cut-off waveguide method excited by coaxial cables with small loops.

- a) The dielectric rod resonator method excited by NRD-guide is similar to the dielectric rod resonator method given in IEC 61338-1-3. This method has the following characteristics:
 - a complete and exact mathematical solution of complex permittivity is given by computer software;
 - the measurement error is less than 0,3 % for ε' and less than $0,05 \times 10^{-4}$ for $\tan \delta$;
 - the applicable measuring ranges of complex permittivity for this method are as follows:

frequency:	$30 \text{ GHz} < f < 100 \text{ GHz}$;
relative permittivity:	$2 < \varepsilon' < 30$;
loss factor:	$10^{-6} < \tan \delta < 10^{-2}$.
- b) The cut-off waveguide method excited by coaxial cables with small loops uses a dielectric plate sample placed in a circular cylinder of the TE_{011} mode. This method has the following characteristics:
 - fringe effect is corrected using the correction charts on the basis of rigorous analysis;
 - the measurement error is less than 0,5 % for ε' and less than $0,05 \times 10^{-4}$ for $\tan \delta$;
 - the TCF is measured with high accuracy;
 - the applicable measuring ranges of dielectric properties for this method are as follows:

frequency:	$30 \text{ GHz} < f < 100 \text{ GHz}$;
relative permittivity:	$2 < \varepsilon' < 30$;
loss factor:	$10^{-6} < \tan \delta < 10^{-2}$.

2 Normative references

The following referenced documents are indispensable for the application 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 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*