

# INTERNATIONAL STANDARD



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**Cylindrical cavity method to measure the complex permittivity of low-loss dielectric rods**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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ICS 33.120.30

ISBN 978-2-8322-2264-5

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CYLINDRICAL CAVITY METHOD TO MEASURE  
THE COMPLEX PERMITTIVITY OF LOW-LOSS DIELECTRIC RODS**

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

CDV	Report on voting
46F/242/CDV	46F/260/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.

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## CYLINDRICAL CAVITY METHOD TO MEASURE THE COMPLEX PERMITTIVITY OF LOW-LOSS DIELECTRIC RODS

### 1 Scope

This International Standard relates to a measurement method for complex permittivity of a dielectric rod at microwave frequency. This method has been developed to evaluate the dielectric properties of low-loss materials in coaxial cables and electronic devices used in microwave systems. It uses the  $TM_{010}$  mode in a circular cylindrical cavity and presents accurate measurement results of a dielectric rod sample, where the effect of sample insertion holes is taken into account accurately on the basis of the rigorous electromagnetic analysis.

In comparison with the conventional method described in IEC 60556 [2]<sup>1</sup>, this method has the following characteristics:

- the values of the relative permittivity  $\epsilon'$  and loss tangent  $\tan\delta$  of a dielectric rod sample can be measured accurately and non-destructively;
- the measurement accuracy is within 1,0 % for  $\epsilon'$  and within 20 % for  $\tan\delta$ ;
- the effect of sample insertion holes is corrected using correction charts presented;
- this method is applicable for the measurements on the following condition:
  - frequency:  $1\text{ GHz} \leq f \leq 10\text{ GHz}$ ;
  - relative permittivity:  $1 \leq \epsilon' \leq 100$ ;
  - loss tangent:  $10^{-4} \leq \tan\delta \leq 10^{-1}$ .

### 2 Normative references

Void.

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<sup>1</sup> Figures in square brackets refer to the Bibliography.