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

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CONTENTS

FOREWORD.....	3
1 Scope	5
2 Normative references	5
3 Measurement parameters	5
4 Theory and calculation equations	5
5 Measurement system.....	12
6 Measurement procedure	14
6.1 Preparation of measurement apparatus.....	14
6.2 Measurement of reference level	14
6.3 Measurement of cavity parameters: σ_r	14
6.4 Measurement of complex permittivity of test sample: ϵ' , $\tan \delta$	15
Annex A (informative) Example of measurement results and accuracy	16
A.1 Measurement of ϵ' and $\tan \delta$ values	16
A.2 Measurement uncertainty of ϵ' and $\tan \delta$	17
Bibliography.....	19
 Figure 1 – Structure of a cylindrical cavity resonator	6
Figure 2 – Correction factor C_1 for ϵ'	7
Figure 3 – Correction factor C_2 for $\tan \delta$ with the different values of d_1	9
Figure 4 – Schematic diagram of measurement systems	13
Figure 5 – Resonance frequency f_0 , insertion attenuation IA_0 and half-power band width f_{BW}	14
Figure 6 – Frequency responses of the TM_{010} mode of cylindrical cavity	15
 Table 1 – Numerical values of correction factor C_1	8
Table 2 – Numerical values of correction factor C_2	10
Table 3 – Numerical values of correction factor C_2	11
Table A.1 – The parameters of the cavity and the rod sample	16
Table A.2 – The resonant frequencies and unloaded Q -factors	16
Table A.3 – The approximate values and the relative conductivity value	16
Table A.4 – Correction factors and the measurement results	16
Table A.5 – The measurement uncertainty of ϵ'	17
Table A.6 – The measurement uncertainty of $\tan \delta$	18

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**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:

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

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

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- withdrawn,
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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]¹, this method has the following characteristics:

- the values of the relative permittivity ϵ' 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 ϵ' 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.

¹ Figures in square brackets refer to the Bibliography.