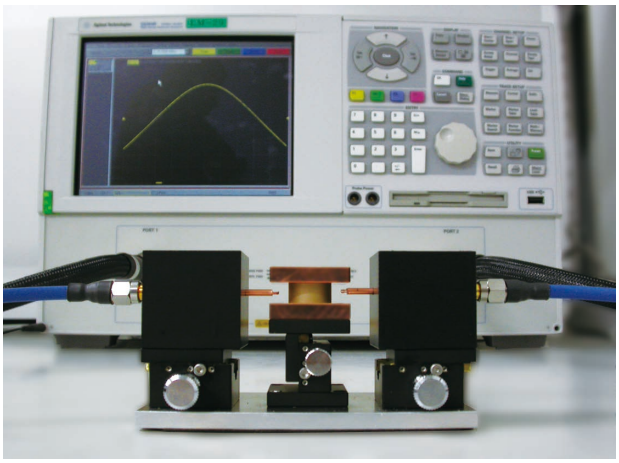
NEW

Dielectric Resonator Type Microwave Dielectrometer

The Dielectric Resonator Type Microwave Dielectrometer is a device that measures the permittivity (Dk) and dielectric tangent (Df) of low loss materials in microwave frequencies. By using the measurement software, complex permittivity of low loss dielectric materials can be simply and accurately measured. The dielectric resonator method was established by IEC(International Electrotechnical Commission) 61338-1-3 in 1999 and JIS(Japanese Industrial Standards) R1627 in 1996.



Specifications (Provisional Figures)

●Frequency:	Less than 20GHz
●Measuring Range:	εr(Dk)：5～200　tanδ(Df)：0.00001～0.001
●Measurement Accuracy:	εr：±1%　tanδ：±5%
●Sample Shape:	Cylinder, Toroidal
●Prerequisite Condition:	A network analyzer is required. The dielectric loss(Df) of materials is about 0.001 or less.

Applications

- ●Microwave dielectric ceramic components
- ●Parts for integrated circuits
- ●Materials for capacitors
- ●Circuit boards with high permittivity
- ●Magnetic recording materials

AET, INC. http://www.aetjapan.com
2-7-6 Kurigi, Asaoku, Kawasaki-city, Kanagawa, Japan
Tel : +81-44-980-0505　Fax : +81-44-980-1515
e-mail : info@aetjapan.com

AET Associates, Inc. http://www.aetassociates.com
20370 Town Center Lane, Suite 252, Cupertino, CA 95014 U.S.A
Tel : +1-408-996-1760　Fax : +1-408-996-1962
e-mail : info@aetassociates.com

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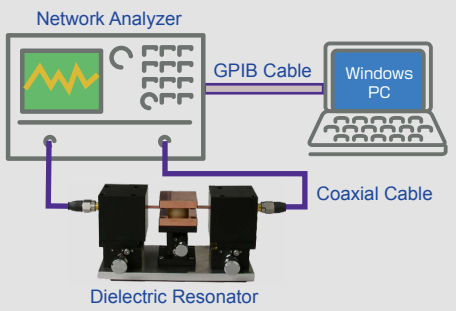
About a dielectric resonator method

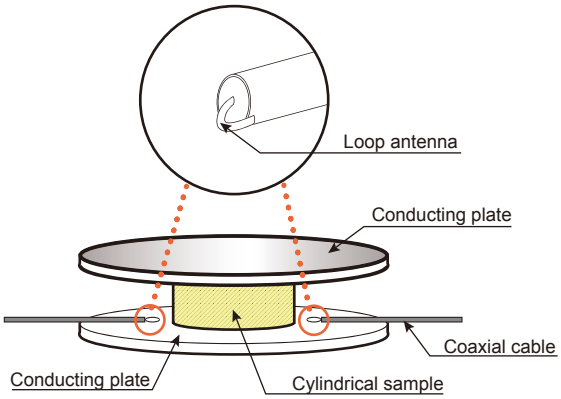
The dielectric resonator method, which was established by IEC61338-1-3 and JIS R1627, is the principal technique to measure the complex relative permittivity of dielectric resonator materials in microwave frequencies. The TE011 mode dielectric rod resonator is short-circuited at both ends by parallel conducting plates, and is coupled with a loop antenna, while the resonance frequency and unloaded Q factor are calculated. The measured parameters are εr, tan δ, TCF and the temperature dependence of tan δ at the resonance frequency.

System Components

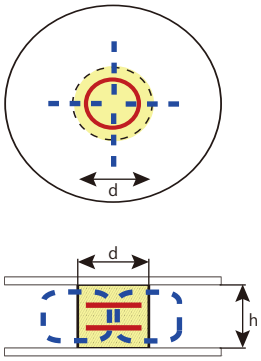


Structure of a dielectric resonator

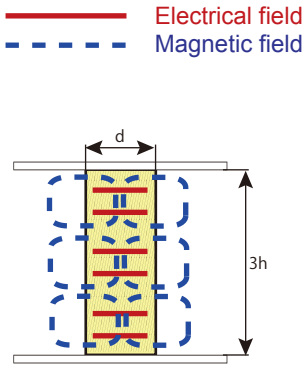
The TE011 mode dielectric rod resonator is short-circuited at both ends by parallel conducting plates, and is coupled with a loop antenna mounted at the tip of two coaxial cables. The position of the antennas can be adjusted according to the distance of a sample. The two reference materials, which are (Zr, Sn)TiO4 cylindrical ceramics, are composed of TE011 mode and TE013 mode resonators. The conductance of the conducting plates is measured and calibrated by the reference materials. The εr and tan δ are calculated from sample dimensions, the resonant frequencies and unloaded Q factors of the TE011 mode.



Structure of Dielectric Resonator

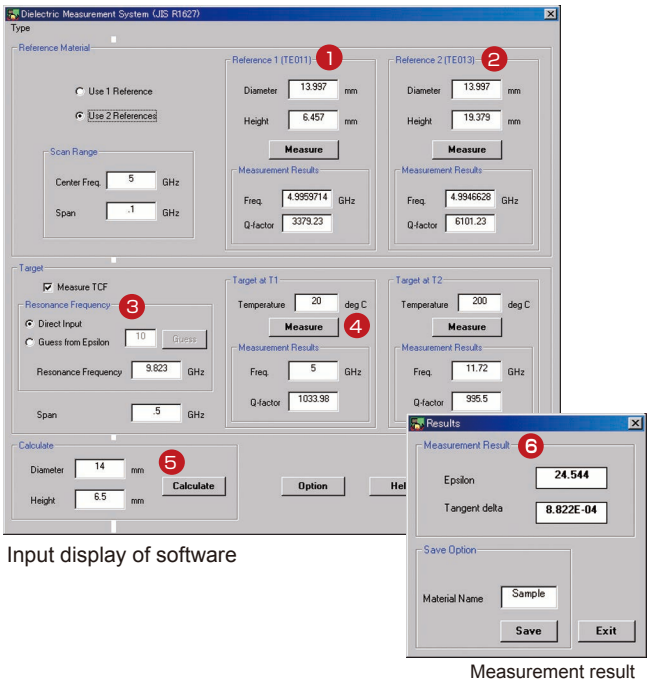


Direction of electromagnetic field (TE011 mode)



Direction of electromagnetic field (TE013 mode)

Measurement procedure



Input display of software

Measurement result

① Place the reference material 1 between the conducting plates, and find the resonance peak of the TE011 mode on a network analyzer. After clicking the “Measure” button, a resonant frequency and a Q value are measured.
② Place the reference material 2 between the conducting plates, and find the resonance peak of the TE013 mode on a network analyzer. After clicking the “Measure” button, a resonant frequency and a Q value are measured.
③ Place a sample between the conducting plates, and find the resonance peak of the TE011 mode on a network analyzer. (Resonance frequency presumption function attached: it is auxiliary functioned to find a resonance frequency easily.)
④ Click the “Measure” button.
⑤ Input the dimension of the sample and click the “Calculate” button.
⑥ The value of εr and tan δ of the sample are calculated and displayed. The measurement result can be saved in a CSV file.
* 〔TCF measurement〕 The value of εr and tan δ of the sample on the preset temperature can be measured.