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High-Frequency Dielectric Measurements Part 24 in a Series of Tutorials on Instrumentation and Measurement James Baker-Jarvis, Michael D. Janezic, and Donald C. DeGroot Knowledge of the response of materials to electromagnetic (EM) fields in the radio frequency (RF) through

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terahertz (THz) frequency range is critical to numerous research

High-Frequency Dielectric Measurements - NIST

KNOWLEDGE of the response of materials to electromagnetic (EM) fields in the frequency range of radio frequency (RF) through terahertz (THz) is critical to nume High-Frequency Dielectric Measurements: A Tutorial | NIST

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In this paper we review the basic characteristics of the dielectric materials and the methods for permittivity measurements. Recent advances in high frequency metrology employing microwave network analysis is highlighted for bulk and thin-film materials.

Measurement of Materials Dielectric Properties | NIST

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Abstract Broadband dielectric measurements were performed on a series of trehalose-glycerol mixtures in a wide concentration range of glycerol and temperature swept from 220 K to 350 K. Relaxation spectra were obtained directly from the measured dielectric spectra by means of a regularization technique.

High-Frequency Dielectric Relaxation in Trehalose ... - NIST

The complex permittivity measured at frequencies of 100 Hz to 10 GHz for several films 50 m to 100 m thick, with a dielectric constant of 3.2 to 30, was fitted to a dielectric model expressed as a superposition of Havriliak-Negami functions. An intrinsic high frequency relaxation process has been identified.

High Frequency Dielectric Relaxation in Polymers ... - NIST

Our investigation concerns measuring broadband dielectric permittivity and loss tangent of thin film high dielectric

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constant (high-k) dielectric materials at microwave frequencies. The measurements are made in an APC-7 coaxial configuration where the test specimen represents a load terminating an air-filled coaxial transmission line.

Broadband Permittivity Measurements of High Dielectric ...

The applicability of the method has been verified at frequencies from 100 MHz to 10 GHz on several polymer composite films, 8Pm to 100Pm thick, having a dielectric constant ranging from 3.5 to 40.

TDR permittivity measurements of dielectric films - NIST

The measurement of complex dielectric properties of materials at radio frequency has gained increasing importance especially in the research fields, such as material science, microwave circuit design, absorber development, biological research, etc. Dielectric measurement is important

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because it can provide the electrical or magnetic characteristics of the materials, which proved useful in many research and development fields.

Measurement of Dielectric Material Properties

NIST Technical Note 1520 Dielectric and Conductor-Loss ... turized, the need for well-characterized dielectric measurements on thin materials increases [1—10]. Accurate measurement of complex permittivity is needed for circuit ... In high-speed or high-frequency circuits, the speed of signal propagation is impor-tant. The signal-propagation ...

Dielectric and Conductor-Loss Characterization and ... - NIST

Because of all these factors, both measurement techniques and accuracies for evaluation of dielectric properties are requisite for physical understanding. Various permittivity and dielectric loss tangent measurement techniques,

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including low-frequency complex impedance, free space, waveguide transmission and reflection, and resonance methods ...

Microwave Dielectric Property Measurements | NIST

The methods developed in this project use measurements of both propagation constant and characteristic impedance to characterize planar transmission lines and determine the material properties of the thin films of which they are composed. This allows R, L, G, and C to be determined individually, and separates metal and dielectric loss. This is a joint project between the Electromagnetic Fields ...

Thin-Film/Low-K Dielectric Constant Measurement | NIST

Abstract- A new time-domain-reflectometry measurement method is described that provides accurate measurements of the average high-frequency (0.1 GHz to 5 GHz) dielectric

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constant of printed wiring board (PWB) materials and that is suitable for

A Fast and Accurate Method for Measuring the Dielectric ...

Permittivity Measurements of High Dielectric Constant Films at Microwave Frequencies J. Obrzut and R. Nozaki NIST, Polymers Division Gaithersburg, MD 20899-854, USA Abstract We have developed a time-domain reflectometry (TDR) technique to measure the dielectric permittivity of high dielectric constant films. The test specimen consists of a planar

Permittivity Measurements of High Dielectric ... - NIST

(NIST), we have formerly developed a bidirectional scattering measurement system in the free-space setting based on a VNA that allows us to measure transmission and reflection scattering parameters at MMW frequencies [21]. In [21], we have validated the system's capability of measurements for

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A Thicknessless Method for the Low-Loss Dielectric ... - NIST

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Dielectric measurements of oil shale as functions ... - NIST

High-frequency dielectric measurements
Abstract: The demands on dielectric material measurements have increased over the years as electrical components have been miniaturized and device frequency bands have increased.

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High-frequency dielectric measurements - IEEE Journals ...

test patterns, specifically designed to evaluate the dielectric properties of high-k polymer composite films that were used by the NCMS Embedded Distributed Capacitance Project. The dielectric constant of the embedded capacitance materials was measured in the frequency range of 100 Hz to 5 GHz.

Evaluation of Dielectric Properties of ... - TSAPPS at NIST

Wavelength (λ) is the physical length from one point of a wave to the same point on the next wave
Long wavelength = low frequency and the opposite is true
Short wavelength = more waves in the same time frame so higher frequency
Amplitude is the height of the wave and often related to power
High electric field = High magnetic field = High amplitude = High power

Practical Measurements of Dielectric Constant and Loss for ...

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1530 Broadband Permittivity
Measurements of High Dielectric
Constant Films J. Obrzut¹, A.
Anopchenko¹ and R. Nozaki² ¹ Polymers
Division, National Institute of Standards
and Technology, Gaithersburg, MD
20899. ² Division of Physics, Graduate
School of Science, Hokkaido University,
Sapporo 060-0810, Japan. Abstract - Our
investigation concerns measuring
broadband

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183 1.Capacitanceandpowerfactor 183
2.Dielectricconstant 185 3.Conductance
187 4 ...

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