Abstracts

Ultra-low absorption measurement in dielectrics in millimeter- and submillimeter-wave range

A.F. Krupnov, V.N. Markov, G.Y. Golugyatnikov, I.I. Leonov, Y.N. Konoplev and V.V. Parshin. "Ultra-low absorption measurement in dielectrics in millimeter- and submillimeter-wave range." 1999 Transactions on Microwave Theory and Techniques 47.3 (Mar. 1999 [T-MTT]): 284-289.

A measurement of ultra-low absorption of microwave radiation in dielectrics is reported. Two Fabry-Perot resonators with /spl ges/600000 quality factors, fully general-purpose interface bus programmable millimeter-wave frequency synthesizer with 10-15-mW continuous wave (CW) power level, 100-Hz frequency resolution from 78 to 118 GHz, and corresponding hardware and software for signal processing were used. The /spl plusmn/500-Hz accuracy of resonance curve width measurements was reached. This high accuracy allowed loss tangent measurement as small as 10/sup -6/-10/sup -7/ in dielectric samples with a thickness of /spl sim/0.5 mm. A convenient method of measurements of almost arbitrary plane parallel samples has been developed and described. Practical applications such as development and control of thin low-loss resonant windows of powerful (/spl sim/1-MW CW) gyrotrons used in thermonuclear experiments, precise reflection coefficient of metals measurements, as well as other applications are discussed. The existence of such technique up to frequencies exceeding 1 THz makes measurements described at the whole millimeter- and submillimeter-wave bands affordable.

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