Abstracts

Powder Core Dielectric Channel Waveguide

W.M. Bruno and W.B. Bridges. "Powder Core Dielectric Channel Waveguide." 1994 Transactions on Microwave Theory and Techniques 42.8 (Aug. 1994 [T-MTT]): 1524-1532.

A powder-filled rectangular groove in the surface of a plastic substrate has been demonstrated as a dielectric waveguide at 94 GHz. Propagation losses as low as 0.09 dB/cm were measured by direct transmission with nickel-aluminum titanate powder in a polypropylene substrate and with barium tetratitanate powder in a polytetraflnoroethylene (PTFE) substrate; values as low as 0.06 dB/cm were deduced from ring resonator measurements. Guide wavelengths measured for various combinations of guide dimensions, powders, and substrates agree within 10% with values predicted by the approximate theory of Marcatili for the E/sup Y//sub 11/ mode. Effective loss tangents for the powders at 94 GHz were calculated from waveguide attenuation measurements, using Marcatili's field solutions. Ring resonators fabricated by filling a groove in a polypropylene substrate with nickel-aluminum titanate powder exhibit Q's as high as 2400 at 94 GHz in an 8 cm diameter ring. Coupling to the resonators was achieved with adjacent straight powder core channel guides as directional couplers.

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