Abstracts

Microwave Bandpass Filters Containing High-Q Dielectric Resonators

S.B. Cohn. "Microwave Bandpass Filters Containing High-Q Dielectric Resonators." 1968 Transactions on Microwave Theory and Techniques 16.4 (Apr. 1968 [T-MTT]): 218-227.

This paper is concerned with dielectric disks used as resonators in microwave bandpass filters. For many years it has been known that modes of resonance occur in isolated dielectric bodies having air boundaries, and that very compact high-Q resonators can be achieved when /spl epsiv/ /sub r/, is high and tan /spl delta/ is low. High-purity TiO/sub 2/ ceramic material, for example, has an /spl epsiv/ /sub r/ about 100, tan /spl delta/ about 0.0001, and Q/sub u/ about 10 000. Practical applications of dielectric resonators have previously been limited by insufficient design information. Formulas are derived for the coupling coefficient between adjacent dielectric-disk resonators within a metal waveguide below cutoff. This metal enclosure is necessary for shielding and to prevent radiation loss. Comparisons between theoretical and experimental coupling coefficient values show very good agreement in each of the three bandpass configurations treated in this paper. Techniques of loop and probe coupling to the end resonators of a multiresonator bandpass filter are discussed and methods of supporting the resonators are suggested. The conclusion is made that microwave dielectric resonators offer important size reductions compared to conventional resonators of similar high Q, but that the center-frequency change of the dielectric resonators as a function of temperature is excessive for many applications. Temperature stabilization is one solution, but preferably a material should be developed having electrical characteristics similar to TiO/sub 2/ ceramic, but with at least an order of magnitude improvement in temperature sensitivity.

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