Abstracts

Tunable, Dielectric-Loaded Microwave Cavities Capable of High Q and High Filling Factor

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Many applications require the presence of a dielectric inside a microwave resonator. This paper presents a new type of dielectric-loaded cavity and contains a detailed analysis of its properties. The cavity consists of a waveguide of arbitrary but uniform cross section, filled with dielectric for part of its length, with movable shorting plungers in the guide beyond one or both ends of the dielectric. Such a structure supports resonances at frequencies where a particular waveguide mode is above cutoff in the dielectric, but below cutoff outside. These resonances can have high Q's, especially when the cavity ends are open. Frequency tuning is possible via the movable plungers. The present analysis investigates resonant frequency, tuning range, and electric and magnetic filling factors. Wall losses are calculated for the particular case of a circular cross section. All results are plotted as universal design curves. The results indicate that this configuration is quite versatile and should be useful in numerous applications, including microwave solid-state masers, microwave light modulators, and the study of "ghost mode" resonances in waveguide windows.

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