Abstracts

Elliptical cavity resonators for dual-mode narrow-band filters

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A novel cavity resonator with elliptical cross section is proposed in order to realize dual-mode narrow-band filters without tuning and coupling elements. The absence of any discontinuity inside the cavities significantly enhances the unloaded Q, the ability to operate with higher power levels, and the ease of manufacturing. Proper choice of the ellipticity and of the inclination angle controls the desired coupling and tuning actions. Dual-mode coupling is generated by the step discontinuity between the input rectangular waveguide and an inclined elliptical waveguide. A rigorous full-wave electromagnetic model for this discontinuity has been developed and validated using a specialized hardware configuration. Experimental data compare very favorably with theoretical results. Representative prototypes of elliptical cavities exhibiting various degrees of coupling have been carefully measured proving the accuracy of the model and its applicability for narrow-band X- and Ku-band filter design. The full-wave analysis of a complete four-pole narrow-band elliptic filter at 12 GHz and the measured response of a corresponding prototype demonstrate the capability of achieving reliable results using the proposed approach.

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