Abstracts

A Class of Waveguide Filters for Over-Moded Applications

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As the frequency spectrum extends to the millimeter wave range, the rapid rise in intrinsic loss and the diminishing physical dimensions greatly curtail the usefulness of conventional waveguide filters in dominant mode waveguide. The incentive for designing filters in over-moded waveguide is all too apparent. However, filter design in over-moded waveguide faces challenging design criteria, such as mode conversion loss and intrinsic loss, ease of being analyzed and synthesized, and feasibility for economical fabrication. A filter structure is presented which fulfills all aspects of the design objectives. The structure involves a type of discontinuity which is not only free from mode conversion but also extremely simple to characterize analytically. The latter renders feasible the use of available filter synthesis techniques. While the proposed filter structure can be designed either as a bandpass filter, a bandstop filter or a low-pass filter in an over-moded uniform waveguide of arbitrary cross section, for illustration purposes only the low-pass filter in over-moded circular waveguide is discussed in great detail. Design theories are presented which allow the proposed structure to be designed either by the image method or by operating parameter filter synthesis. Excellent agreement between the theory and measurements made on filter models is shown.

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