Abstracts

Rigorous Field Theory Design of Millimeter-Wave E-Plane Integrated Circuit Multiplexer

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The overall field theory designs of two types of quasi-planar millimeter-wave multiplexer utilizing low-cost, low-insertion-loss printed metallic E-plane filters are described. Very compact components are achieved by using E-plane filters printed on a common metal sheet which is directly integrated in the septate sections of an E-plane n-furcated split-block waveguide housing. The second configuration proposed extends the useful principle of waveguide H-plane slit-coupled manifold multiplexer to the case of millimeter-wave printed metallic E-plane filters. Based on the modal scattering matrix description of suitable key building blocks, the rigorous simulation technique used comprises the complete multiplexer structure including the E-plane transformer or iris elements, the waveguide E- or H-plane junctions, and the filter sections. The optimization process takes all relevant influences into account, such as finite metallization thicknesses and the higher order mode interactions of all discontinuities. Computer-optimized data are presented for seven-resonator metal insert filter diplexer and triplexer examples in the E-band (60-90 GHz) designed for common-port passband return losses of more than 25 dB and 20 dB, respectively. The theory is verified by measured results of typical individual components and of a septate E-plane diplexer realized in the Ku-band.

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