

Dual-Ferrite Slot Line for Broadband, High-Nonreciprocity Phase Shifters

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A novel phase shifting structure that exhibits both broadband operation and high nonreciprocity is presented. This structure is comprised of a slot line between two oppositely-magnetized ferrite substrates. A full-wave, spectral-domain analysis is used, where Green's functions are formulated using a transmission matrix approach. By eliminating the use of relatively thick high-dielectric substrates, a bandwidth of 3:1 and a differential phase of 50° /cm are feasible. The geometry of the present structure can be optimized to increase both the nonreciprocity and the bandwidth. The characteristic impedance of the slot line is presented and shows a strong dependence on the slot width and the state of ferrite magnetization. The addition of thin layers of high-dielectric material increases the differential phase to over 100° /cm without significantly reducing the bandwidth. These layers were found to reduce the variation of characteristic impedance versus the ferrite magnetization.

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