Abstracts

Rigorous Modal-S-Matrix Design of a New Class of Broadband 180-Degree Branch Guide Couplers

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A new class of 180-degree branch guide couplers is introduced which combines the advantages of the ultra-broadband potential of conventional waveguide E-plane multiple-branch couplers with the low-insertion-loss qualities of E-plane stub-loaded phase shifters. Based on the modal scattering matrix method, the rigorous design takes into account both the finite branch heights and the higher order mode interaction at all step discontinuities. Computer-optimized five-branch three-stub prototypes, designed for 3 ± 0.2 dB coupling, for the waveguide Ku- (12 - 18 GHz) and Ka-bands (26 - 40 GHz), respectively, achieve typically a 180° ± 1° differential phase shift at the output ports, within about 19 percent bandwidth, as well as more than 30 dB isolation and return loss. The theory is verified by available measured results.

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