Abstracts

Synthesis, Design, and Construction of Ultra-Wide-Band Nonuniform Quadrature Directional Couplers in Inhomogeneous Media

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A computer-aided synthesis design procedure is given for nonuniform quadrature directional couplers in inhomogeneous media. A wiggly geometry is employed which effectively slows the odd-mode phase velocity to match the even-mode phase velocity. The wiggly geometry results in improved isolation and increased effective dielectric constant. This technique provides a shorter coupler length due to increased effective dielectric constant. Cubic splines of strip width, strip spacing, and wiggle depth as functions of coupling coefficient are computed using static capacitances of uniform coupled lines. These functions are then used as synthesis functions to evaluate the continuous physical parameters of nonuniform coupled lines by using the continuously varying coupling coefficient. A nonuniform interdigitated coupler is introduced to realize the tight coupling values. Manufacturing tolerances on wiggle depth are derived. Geometrical details are given for the construction of nonuniform wiggly lines. Computational and experimental data are also given for a 2-18 GHz, -3 dB tandem nonuniform directional coupler built on alumina substrate.

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