

Theory of Coupled Open Transmission Lines and its Applications

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A technique is presented which is applicable to any uniform coupled open transmission lines such as coupled optical integrated circuits. The proposed technique is as follows. The electromagnetic fields of the wave propagating along a coupled line is expressed in terms of a linear combination of the fields associated with the individual lines, as a zero-order approximation. Inserting this trial field description into the variational expression for the propagation constant β and applying the well-known Rayleigh-Ritz's procedure, accurate solutions for the propagation constants of the coupled lines are obtained. This method can be applied generally to analyze coupled structures in microwave, millimeter wave, and optical wave circuitry. As an illustrative example, the coupling between two optical transmission lines consisting of lens-like dielectric media has been analyzed by means of the proposed technique.

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