Abstracts

Resonant Phenomena in Conductor-Backed Coplanar Waveguides (CBCPW's) (Dec. 1993 [T-MTT])

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This paper presents a thorough and systematic investigation of resonant phenomena in conductor-backed coplanar waveguides (CBCPW's). We used a full-wave analysis first to establish benchmark results and a series of measurements have been conducted to confirm the theoretical results. As many as ten structures of different side-plane patterns were bulk and tested. All the test circuits exhibit many resonances over a frequency range, as measured in terms of two-port scattering parameters. Our full-wave analysis is capable of analyzing shielded guided-wave structures with finite-width substrate, and yields the scattering parameters of the coplanar waveguide circuits accounting for the overmoded-wave propagation. Finally, simple models are developed for physical understanding and interpretation of the resonant phenomena. When treating the side planes as patch resonators, we show that the resonant frequencies can be accurately estimated by this simple model. Followed by another MSL (microstrip-like) model, which considers the excitation of the first and the second MSL modes, the resonant frequencies thus obtained are also shown to be in very good agreement with measured results. By displaying the current distributions on the conductor strips in the through or resonant states of the test circuits, the MSL modes of resonances or the patch-type resonances can be clearly seen. When resonance occurs, the electromagnetic energy is confined or carried underneath the side planes and the signal energy can hardly propagate through the central signal line of the test circuit.

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