Abstracts

Co-layered integration and interconnect of planar circuits and nonradiative dielectric (NRD) waveguide

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A concept of hybrid integration between planar circuits and a nonradiative dielectric (NRD) waveguide is proposed in this paper with preliminary experiments. This approach utilizes co-layered arrangement of the two dissimilar structures, which allows the NRD-guide in direct contact with (or surface mounted on) the planar circuits. Two basic building-block schemes are presented that involve microstrip line and coplanar waveguide (CPW) with the NRD-guide. The first is to deposit the NRD-guide on the top of a relatively thin microstrip substrate, thus forming unbalanced NRD-guiding hybrid circuits, while the second is to design CPW circuits directly etched on the ground planes of the NRD-guide. The unbalanced NRD-guide is subject to a certain leakage loss, but at a negligible level, and it may even be suppressed completely in certain circumstances. Such an integration technique is found consistent with the concept of low loss interconnects at millimeter-wave frequencies. In other words, the NRD-guide can be used for viable interconnects of co-layered planar circuits with a simple "put and cover" procedure. Measured results of several co-layered hybrid transitions/baluns indicate that satisfactory transmission properties can readily be achieved. The new building blocks are expected to provide an alternative design approach to three-dimensional multilayered millimeter-wave circuits and systems.

❑ Return to main document.