Broadband Planar Antenna Using CPW-Fed Monopoles in a Rectangular Aperture

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Broadband planar antennas are highly desirable in many applications due to their low cost, lightweight, and amenability for integration with active devices. Using coplanar waveguides as feed transmission lines eases integration with active devices due to their uniplanar design. Improving the bandwidth of printed antennas, such as microstrip antennas, has been the subject of numerous research papers. The most common techniques include stacked multilayer configurations and parasitically coupled single layer configurations. Multilayer configurations improve bandwidth at the cost of increased complexity and overall thickness, which in turn increases loss due to surface waves. Parasitic configurations result in larger area and distortions in radiation patterns. Planar antennas fed with coplanar waveguides concentrated mostly on slot antennas using a single substrate or slot-coupled microstrip patches. In this paper, we introduce a new antenna design that uses a coplanar waveguide transmission line feeding planar monopoles in a rectangular aperture. The monopoles are extensions of the center conductor of the coplanar waveguide. A rectangular aperture surrounding the monopoles is formed in the ground planes of the coplanar waveguide. The entire design is uniplanar. This new antenna can achieve very broadband impedance behavior. Full wave theoretical simulations of an antenna with two monopoles forming a V-shape printed on a 1.27 mm thick substrate with 10.2 dielectric constant shows impedance bandwidth of about 40%. This bandwidth far exceeds bandwidths achievable using conventional microstrip or slot antennas on similar substrates. Effect of various dimensions, geometry, and substrate properties on input impedance and radiation characteristics are investigated theoretically and experimentally. The geometry, design techniques, and results for the proposed antenna will be presented.