Reconfigurable and Broadband Microstrip Antennas Using Patches Of Various Shapes

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Microstrip antennas have been very popular due to their numerous advantages, which include being low cost, lightweight, low profile, conformal, and compatible with integrated circuits. Several patch shapes were investigated in the literature; however, the emphasis is on rectangular and circular patches. In general, microstrip antennas are narrowband due to their resonant nature. Several techniques for bandwidth enhancement have been explored in the literature. These techniques include stacked multilayer configurations, parasitically coupled single layer configurations, and single patches with shaped slots. There has also been a great deal of interest in designing reconfigurable antennas with multiband, multi-polarization capabilities. In this paper, we investigate the two aspects, broadband behavior and reconfigurability, of microstrip antenna designs using various patch shapes.

For bandwidth enhancement, we concentrate on parasitically coupled, single layer patches. The traditional configuration of this kind involves placing parasitic patches adjacent to an excited patch, all of the same shape. It has been applied mainly to rectangular patch antennas. This technique provides bandwidth enhancement at the cost of large area and distorted radiation patterns. In this paper, we investigate the use of mixed shapes in order to improve the bandwidth while reducing the occupied area and leaving the radiation patterns undistorted. In particular, we investigate circular/radial, rectangular/triangular, and triangular/triangular configurations with various feeding mechanisms to achieve our goal. For reconfigurable designs in terms of multiband and dual polarization capabilities, triangular patch shapes are used. Feed location and geometrical arrangement of these patches provide the desired performance. This research uses theoretical and experimental methods. Theoretical simulations are based on a full wave method of moment approach. For the experimental component, various antenna prototypes are designed, built, and tested.