Novel Design of Dual-Polarized Coplanar Waveguide-Fed Aperture-Coupled Microstrip Patch Antenna for Ka-Band 5G Communication Applications

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For applications of 5G (5th generation mobile networks) communication systems, dual-polarized microstrip patch antenna operating at 30 GHz is designed on the package LTCC substrate. The design and numerical results of a coplanar waveguide-fed aperture-coupled microstrip patch antenna for dual linear polarization with emphasis on achieving a wide bandwidth by using stacked patch and coplanar waveguide feed are presented. The novelty of this work is that a single-layer LTCC substrate sandwiched by two copper layers is used for two perpendicular ports and coupling aperture. An aperture with two crossed slots in the center of the antenna structure is cut through this layer. One of the coplanar waveguide lines is printed on the upper copper surface of this layer, and the other one is perpendicularly printed on the lower copper surface. The antenna is implemented on a high dielectric constant (LTCC) substrate with a permittivity of 7.1 and a loss tangent 0.002 at 30 GHz, so that it can be used in the antenna arrays of 5G mobile communication network. The antenna structure combines of the advantages of CPW with those of the aperture-coupled stacked patch antenna and simplifies the antenna structure by reducing the number of feeding layers.