

A Compact Reconfigurable Quadri-Polarization Diversity Patch Antenna

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This paper presents a compact size reconfigurable polarization diversity patch antenna, which can provide four polarization states either in dual-linear polarization state or dual-circular polarization state. The significance is that we can reconfigure the proposed patch antenna to provide a pair of orthogonal linear polarizations (dual-linear polarization state) or a pair of orthogonal circular polarizations (dual-circular polarization state). This compact size printed reconfigurable antenna was designed on two stacked low-priced FR-4 substrate of thickness 0.8 mm with a relative permittivity 4.4. Also the proposed antenna consists of a square radiating patch on top substrate, the two apertures on the ground plane and the feeding network under the ground plane were printed on the different side of the same dielectric substrate. The substrate of the radiating patch and the substrate of the ground plane are also separated by an air layer of thickness $h=1$ mm. The feeding network consists of the quadrature hybrid, eight DC block capacitors with $C=100\text{pF}$, four RF choke inductors, two 50Ω resistors and four pin-diodes produced different excited path. The quadrature hybrid can provide the 90 degrees phase difference and the same magnitude to produce circular polarization states.

Two pin-diodes are connected between the quadrature hybrid and the open-end microstrip lines and the others are connected between the 50Ω resistors and the quadrature hybrid. When the two pin-diodes which are connected between the open-end microstrip lines and the quadrature hybrid switched on, the proposed antenna can generate a pair of circular polarization from different excitation ports. On the other hand, the antenna produces a pair of linear polarization from different excitation ports while the right side pin-diode between the open-end microstrip line and the hybrid switched on and the left side pin-diode between the open end microstrip line and the 50Ω resistors switched on. Therefore, we can switch the polarization diversity state easily by controlling the DC bias voltage of the pin-diodes. Both the numerical and experimental results will be presented to validate our design. The detail design process and working principle will also be discussed in this presentation.