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Research Article

Multi-Input Multi-Output Compact Antenna with One-Way Circular Polarization for WiMAX 3.5 and ITU-R Applications

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Abstract

In this research, a compact multi-layer microstrip antenna for Multiple-Input Multiple-Output (MIMO) systems with dual-band circular polarization capability has been designed, simulated, and fabricated. The structure of this antenna utilizes separate coupling networks for each frequency band. Each network consists of intricate components such as a hairpin resonator, a straight slot, and a U-shaped groove. This design allows for the creation of two paths with appropriate phase differences to connect the input signal to the patch. By applying a positive or negative 90-degree phase shift, the antenna achieves linear operation capability in both frequency bands. The main innovation of this research lies in creating circular polarization using a multi-layer feeding pattern that ensures an axial ratio of less than 3 dB. This is achieved through the combination of a straight slot and U-shaped groove to produce a circular polarization resonance mode. This antenna is capable of generating right-hand and left-hand circular polarization characteristics in different bands. Results from simulations and practical experiments confirm the desirable performance of this antenna. The designed antenna has impedance bandwidths in the ranges of 3 to 4.2 GHz and 5.5 to 6.6 GHz, and it achieves circular polarization characteristics in almost the entire first frequency band. The antenna gain curve also shows a linear increasing trend with an average of 5 dB.

Keywords: Antenna, Dual-band, Circular polarization, Multi-Input Multi-Output.

Highlights

- Realization of circular polarization completely in one of the functional bands.
- Suitable gain in functional bands.
- The compactness of the structure.

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