

Polarization Reconfigurable Omnidirectional Antennas

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Abstract - A $\pm 45^\circ$ slant polarization (SP) reconfigurable omnidirectional antenna and a circular polarization (CP) reconfigurable omnidirectional antenna are proposed. 16 PIN diodes are employed for the $\pm 45^\circ$ SP reconfigurable omnidirectional antenna while 8 PIN diodes are used for the CP reconfigurable omnidirectional antenna. Simulation and experimental results are demonstrated.

Index Terms —Polarization reconfigurable antenna, omnidirectional antenna.

1. Introduction

In recent years, a number of polarization reconfigurable antennas have been developed. But most of those are unidirectional antennas [1]–[4]. An omnidirectional circular polarization (CP) reconfigurable antenna is presented in [5] with 48 PIN diodes. In this paper, a $\pm 45^\circ$ slant polarization (SP) reconfigurable omnidirectional antenna with 16 PIN diodes and a CP reconfigurable omnidirectional antenna with 8 PIN diodes are proposed.

2. $\pm 45^\circ$ SP Reconfigurable Omnidirectional Antenna

The configuration of a $\pm 45^\circ$ SP reconfigurable omnidirectional antenna is depicted in Fig. 1. The $\pm 45^\circ$ SP omnidirectional antenna consists of 4 crossed dipoles and a feeding network. 4 PIN diodes are introduced in each crossed dipole. When PIN diodes 1 and 3 are switched on and PIN diodes 2 and 4 switched off, $+45^\circ$ SP is obtained; otherwise -45° SP is implemented. A prototype, the S-parameter, and the radiation pattern of the $\pm 45^\circ$ SP reconfigurable omnidirectional antenna are shown in Figs. 2, 3, and 4, respectively.

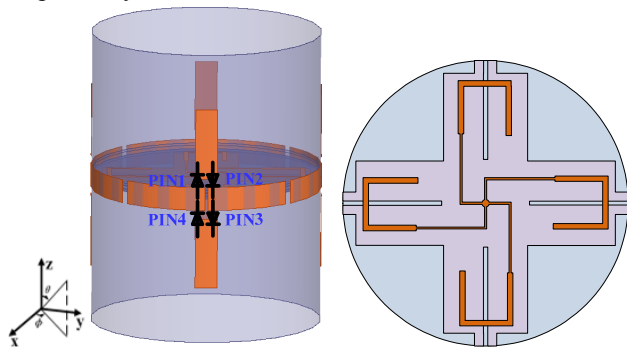


Fig. 1. Configuration of the $\pm 45^\circ$ SP reconfigurable omnidirectional antenna.

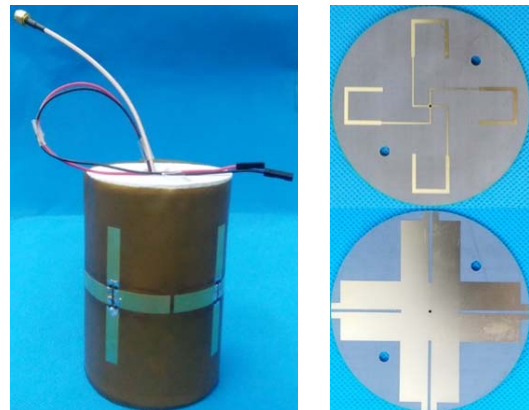


Fig. 2. A prototype of the $\pm 45^\circ$ SP reconfigurable omnidirectional antenna.

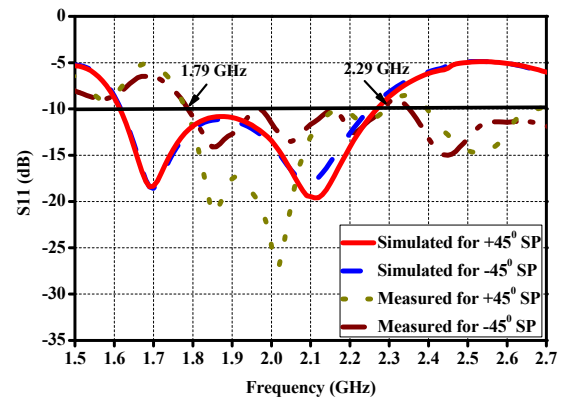


Fig. 3. S-parameter of the $\pm 45^\circ$ SP reconfigurable omnidirectional antenna.

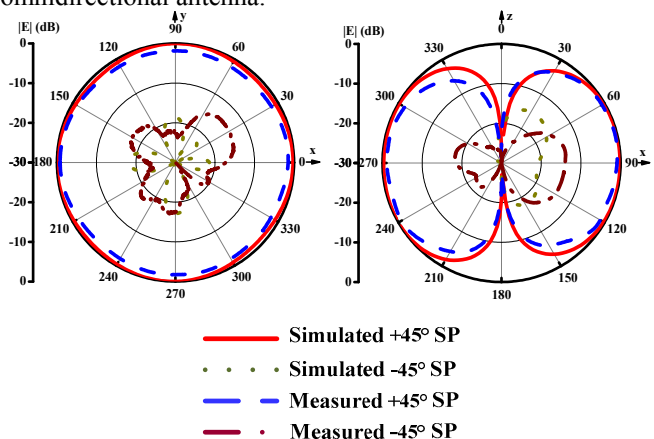


Fig. 4. Radiation pattern of the $\pm 45^\circ$ SP reconfigurable omnidirectional antenna for $+45^\circ$ SP.

3. CP Reconfigurable Omnidirectional Antenna

The configuration of a CP reconfigurable omnidirectional antenna is illustrated in Fig. 5. The CP omnidirectional antenna consists of 4 rectangular loops, a metallic cylinder, and a feeding network. 2 PIN diodes are inserted in each rectangular loop. When PIN diode 1 is switched on and PIN diodes 2 switched off, left-handed CP (LHCP) is achieved; otherwise right-handed CP (RHCP) is realized. A prototype, the S-parameter, axial ratio, and the radiation pattern of the CP reconfigurable omnidirectional antenna are demonstrated in Figs. 6, 7, 8, and 9, respectively.

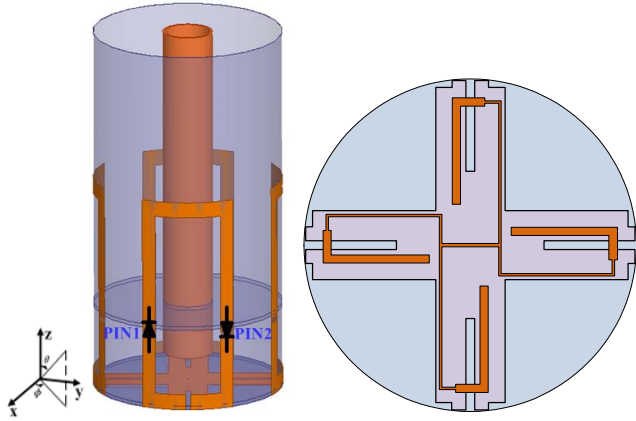


Fig. 5. Configuration of the CP reconfigurable omnidirectional antenna.

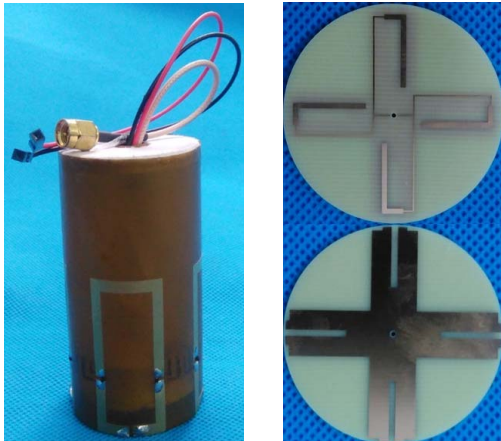


Fig. 6. A prototype of the CP reconfigurable omnidirectional antenna.

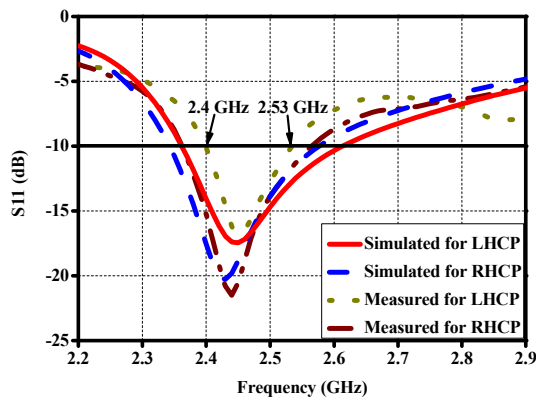


Fig. 7. S-parameter of the CP reconfigurable omnidirectional antenna.

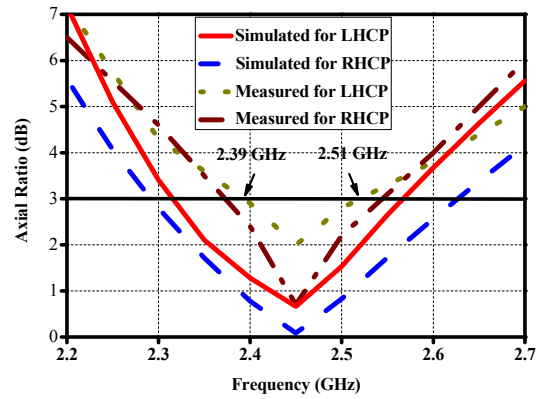


Fig. 8. Axial ratio of the CP reconfigurable omnidirectional antenna.

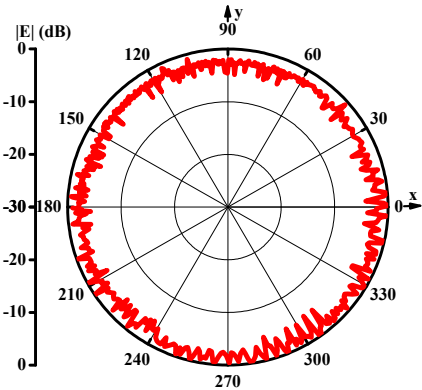


Fig. 9. Radiation pattern of the CP reconfigurable omnidirectional antenna for LHCP.

4. Conclusion

A $\pm 45^\circ$ SP reconfigurable omnidirectional antenna and a CP reconfigurable omnidirectional antenna are developed. 16 PIN diodes are used for the $\pm 45^\circ$ SP reconfigurable antenna while 8 PIN diodes are employed for the CP reconfigurable antenna. These polarization reconfigurable omnidirectional antennas may find applications in polarization diversity for wireless communications.

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References

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