Chapter 11
A Novel Dual Polarized Dual Band Antenna for Wireless Backscattering Applications

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ABSTRACT

This chapter presents a compact patch antenna for backscattering application. The model utilizes a crossed slot etched on single layer low loss substrate. The dimensions of the radiating patch are tuned through parametric analysis of the model in order to improve cross-polarization (dB) isolation and the axial ratio beamwidth of the antenna, and the results are compared with other conventional antennas. The antenna attains an impedance characteristic of -17.65dB at 2.15GHz and -22.28 dB at 2.4GHz operating frequency and provides an impedance bandwidth (|S11|≤-10dB) of 60MHz ant both bands. The antenna achieves a maximum gain of 6.8dB at 2.15GHz and 7.3dB at 2.4GHz in the direction of propagation. The antenna also gives a cross-polarization (dB) of -12 dB for a wide beam angle. Finally, a good agreement has been obtained for using the proposed design for modern dual-band wireless backscattering applications.

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INTRODUCTION

Due to advancement in recent communication systems, reduced profile configuration with simplified geometries, broader impedances, and stable gain are becoming vital design requirements for practical applications of micro-strip antennas. The micro-strip antenna has the advantages of modest structure, flexible manufacture options, and compact size in arrays. Due to channel capacity requirements in wireless channel, frequency and polarization diversity antennas plays a crucial role in wireless systems. Hence lots of researches are carried in these antennas (Wong et.al 2004, Guo et.al 2002). Muli-band polarization reconfigurable antennas are much widely used in due to its robustness in noisy environment and multi path fading channel conditions (Priya et.al 2020). These antennas are used for body area networks, mm-Wave 5G Base Station Antenna Array and many other wireless applications. A dual-band dual-polarized antenna is proposed (Ma & Zhang 2010) for off-body communication and is operated as a circular patch-type antenna with the polarization parallel to body surface to radiate unidirectional beam normal to the body for the off-body links. A dual-band dual-polarized antenna for 5G millimeter-wave base station antenna array based on a stacked square ring patches arrangement to achieve wide dual band and stable radiation pattern is presented (Siddiqui et.al 2020). A magneto-electric dipole antenna excited by F-shaped strips for a broadband dual-band is proposed (An et.al 2012) and achieve a common impedance bandwidth of 25.5% and 39.5% in the lower and the upper band. A Series-Fed Dual-Band Dual-Polarized Antenna Lattice Fed by Slot-Coupled Power Dividers is presented (Wincza & Gruszczynski 2015) which comprises of slot-coupled power dividers and a series feeding network allowing simultaneously for frequency separation. A Dual-polarized Dual-Band Antenna with Omni-Directional Radiation Patterns is demonstrated in (Liu et.al 2017) which utilizes a circular patch with eight open slots, eight shorted metal pins, and a central feed coaxial probe. By utilizing TM 01 mode, Omni-directional circular polarization can be generated over the lower band andWhen the basic TM 02 mode is excited, omni-directional linear polarization can be generated over the higher band.

In (Choudhary et.al 2021) design of antenna for automobile application has been done with dual band polarization and permutation of different slots. The compact design satisfies the connectivity of “Left Hand Polarization” as well as “Right hand polarization” suitable for incorporating GPS via single feed.