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On the Performance of a Microstrip Antenna Based UC-PBG Structures for UHF RFID Readers

Abstract- *Microstrip antennas suffer from low gain bandwidth product due to surface wave effects and aperture diffractions that limit their use for long-range communications. On top of that, the difficulty of achieving a pure circularly polarized radiation with high gain due to the feeding structure effects. This paper is subjected to design a gain enhanced circularly polarized patch antenna using Uniplanar Compact-Photonic Band Gap (UC-PBG) structures for UHF RFID applications. The patch is structured as truncated corners with cross slots at the centre mounted on an FR-4 epoxy substrate of 1.6mm thickness with an overall area of $188 \times 188 \text{mm}^2$. The UC-PBG is constructed of two layers; each is made of 7×7 unit cells, separated by 20mm mounted from the top of the patch at 30mm height. The unit cell characterizations are evaluated in terms of their S-parameters and dispersion diagram CST-MWS environment. The antenna shows a boresight gain of about 8.2 dBi at 915MHz with a front to back ratio (F/B) of 13dB. The benchmark enhancement in boresight gain after adding the UC-PBG layers is found to be 3.4 dBi with a radiation efficiency of 87%. Finally, an excellent agreement is achieved between the obtained measurements and numerical results.*

Keywords- *Circular polarization, RFID, UHF, UC-PBG.*

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