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ENHANCING MICROSTRIP ANTENNA EFFICIENCY WITH NOVEL SLOT-INTEGRATED PATCH CONFIGURATIONS

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Research Paper

Abstract: *This research presents a concept, for an elliptical ring patch microstrip antenna (ERPA) which was created tested and produced Employing types of materials, with varying permittivity values. The antenna is meant for X band use. In this study the substrates employed are FR4 (Design (1)) and RT5880 (Design (2)) having permittivity values of 4.4 and 2.2 respectively and thicknesses of 1.6 mm and 1.575 mm. The ERPA design includes four rings, with holes of different sizes. The Ansoft HFSS, a high-frequency structure simulator, is utilized to model the antenna design, which is crucial for optimizing the design and accurately predicting its performance. Moreover, simulation tools were integral in optimizing antenna characteristics before physical testing. Curiously, there is a significant consensus over the comparative outcomes. The research primarily examines key characteristics, including radiation pattern gain, return loss, and input impedance, which have been shown to fall below acceptable thresholds. The results show that relative permittivity and difference in the thickness of the substrate materials have a substantial impact on both bandwidth and gain. The analysis of efficiency showed the superior efficiency of 85.70% by RT-5880 in contrast to 69.96% efficiency gained via FR-4 substrate. The bandwidth of both proposed antennas is greater than 2 GHz which is 2.420 GHz and 3500 GHz for Design (1) and Design (2) respectively. The gain 3 is observed in both the Designs 1 and 2. The higher bandwidth and gain makes RT5880 substrate more efficient, and provide better design for X- band applications. Maintaining the X-band frequency range the proposed antenna design can be applied to wide range of applications.*

Keywords: *Microstrip, Bandwidth, Slot, Elliptical, X-Band.*

1. Introduction

The Wireless Operating Microstrip Patch Antennas (MSPAs) are very useful in some applications in the communication, remote sensing, medical devices, radar

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