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Editors

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An Analytical Approach for Accurate Design of MSPA Using Dielectric Constant Engineering (DCE)

Monika Mathur, Ghanshyam Singh and S.K. Bhatnagar

Abstract This paper introduces a novel technique for retuning the microstrip patch antenna (MSPA) during fabrication to meet the desired frequency. Designing the patch antenna is a rigorous process due to its very low manufacturing tolerances. To defeat such limitations of the microstrip patch antenna, a new technique named as dielectric constant engineering (DCE) is proposed. In this proposed method, a new formula is given to cut the dielectric material from the substrate part of the patch antenna during fabrication so that the targeted resonant frequency can be achieved without affecting patch dimensions. The process is suitable for multilayer substrates. This method is very useful for bulk fabrication of patch antennas. The results are simulated and verified using FDTD-based optimizing tool HFSS® version 11.

Keywords Patch antenna · Dielectric constant engineering · Substrate cutting · Cavity

Introduction

MSPA has significant role in communication systems due to its compact structure and low cost. But, it has the limitations of poor efficiency, low gain, and narrow bandwidth [1, 2]. To overcome these limitations, various multilayer structures are proposed in the literature [3]. New designs protect the antenna from rain, heat, and structural damage [4, 5]. But, still the designers have a big challenge for low manufacturing tolerance of patch antenna. Yazdandoost et al. (2001) have studied the consequences of errors during the fabrications on the radiation characteristics of

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