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Efficient Full-Wave Analysis of Resonant Modes of Circular Microstrip Antenna Printed on Isotropic or Uniaxially Anisotropic Substrate

Randa Bedra · Sami Bedra · Siham Benkouda · Tarek Fortaki

Abstract In this work, the influence of uniaxial anisotropy in the substrate on the radiation pattern of circular microstrip antenna is investigated theoretically. The analytical approach is based on the spectral-domain method of moments in conjunction with the stationary phase method. A new concise expression is derived for computing the radiation electric field. The validity of the solution is tested by comparing the computed results with the experimental data. Finally, numerical results of the variations of resonant frequency and radiation patterns of the structure of higher order mode, with respect to the anisotropy ratio of the substrate, for several values of substrate thickness and patch radius are also presented.

Keywords Circular-disk patch · Galerkin approach · Anisotropic substrate · Stationary phase method

1 Introduction

Circular microstrip patch antenna has been found to be more advantageous with respect to other well-known patch antenna types due to its easy adaptability to circular polarization and wideband operations having smaller patch sizes. Thus it has been preferred in mobile and satellite communication applications [1,2]. Various designs and formulations of circular disk microstrip antenna structure with isotropic or anisotropic substrates have been presented in the literature [1–8]. With the increasing complexity of geometry and material property, designing these antennas requires more and more dedicated and sophisticated computer-

R. Bedra · T. Fortaki
Electronics Department, University of Batna, 05000 Batna, Algeria

S. Bedra (✉)
Department of Industrial Engineering, University of Khenchela, 40004 Khenchela, Algeria
e-mail: bedra_sami@yahoo.fr

S. Benkouda
Electronics Department, University of Constantine 1, 25000 Constantine, Algeria

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