Accepted Manuscript

Regular paper

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PII: S1434-8411(17)32190-8
DOI: https://doi.org/10.1016/j.aeue.2017.11.010
Reference: AEUE 52126

To appear in: *International Journal of Electronics and Communications*

Received Date: 11 September 2017
Revised Date: 8 November 2017
Accepted Date: 9 November 2017

Please cite this article as: A. Chatterjee, T. Mondal, D.G. Patanvariya, R.P.K. Jagannath, Fractal-based design and fabrication of low-sidelobe antenna array, *International Journal of Electronics and Communications* (2017), doi: https://doi.org/10.1016/j.aeue.2017.11.010

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ACCEPTED MANUSCRIPT

FRACTAL-BASED DESIGN AND FABRICATION OF LOW-SIDELOBE ANTENNA ARRAY

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Abstract— The aim of this work is to design and fabricate a compact four-element linear array of microstrip patch antennas to be operated at dedicated short range communication service (DSRCS) band. The array is designed in such a manner to direct most of the power in a particular direction by reducing the peak sidelobe level (peak SLL) in its beam pattern. In order to reduce the array size and also to increase its gain, a modified-Cantor square-fractal based design has been employed as an element of the array. The problem of reducing the peak SLL is formulated as an optimization problem with arguments as the inter-elemental spacing and elements excitation. Optimum values are obtained using Differential Evolution (DE) algorithm. The corporate feed network of the array is designed using the optimum values of the parameters. Finally, using those optimum values, the array is fabricated and the beam pattern of the fabricated array is compared with the simulated structure. The experimental characterization of the fabricated array closely resembles with the simulated structure.

Keywords: Microstrip patch antenna, Cantor square fractal, antenna array, peak sidelobe level (peak SLL), optimization, Differential Evolution (DE) algorithm.

1. INTRODUCTION

Antenna arrays are intrinsic part of many systems and such systems have applications in radar, sonar, aircraft, satellite communication systems, radio astronomy, etc. [1-7]. The microstrip patch arrays are compact, low cost and also, with easy integration capability with microwave devices [6,

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