A KUBAND FREQUENCY SELECTIVE SURFACE WITH HIGH SHIELDING EFFECTIVENESS FOR SATELLITE COMMUNICATION AND HIGH-RESOLUTION RADAR PROTECTION

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ABSTRACT

In this paper a compact frequency selective surface designed for electromagnetic protection in Kuband satellite communications and high-resolution radars is discussed. The structure is defined by a 10 mm x 10 mm unit cell and is made up of a 1.6 mm thick FR-4 substrate which guarantees a uniform stopband from 12.40 GHz to 18.12 GHz. The fullwave simulation with Floquet port excitation demonstrates that the entire band is covered with a superb attenuation level and that the peak value of shielding effectiveness reaches 82.5 dB. The properties of linear phase, symmetric TE and TM response and 15.64 GHz surface current distribution all signify the design's robustness for realistic shielding applications. The upcoming surface is a low-cost and compact option that can be utilized for isolating sensitive Ku-band communication and radar modules from interference.

Keywords: *Frequency Selective Surface, Ku-band shielding, Electromagnetic protection, Satellite communication, Radar systems*

1. INTRODUCTION

The presence of electromagnetic interference has turned into a serious issue in the fields of satellite communication and radar systems, where the dense electronic environments cause the mixing of signals and thus the quality of the signals is diminished. Wideband and high-data-rate systems require lightweight and frequency-selective shielding, while conventional metallic panels block entire spectra and cannot provide controlled discrimination. These limitations have increased interest in frequency selective surfaces, which use engineered periodic patterns to regulate transmission and reflection at desired bands. Frequency selective surfaces offer a simple planar architecture and integrate easily with radomes and satellite terminals. Their response depends on unit cell geometry, substrate characteristics and periodicity, enabling precise control of stop band and pass band behaviour. Their polarization stability and angular independence make them attractive for Ku-band applications. Recent developments demonstrate consistent progress. A flexible ultra wideband shielding surface was presented in [1]. Dual-band SATCOM structures appeared in [2], and a polarization-insensitive dual-band surface was reported in [3]. A switchable multistate Ku-band design was introduced in [4], while a compact two-and-a-half-dimensional structure for X and Ku-bands was shown in [5]. Optimization-driven techniques produced wide stop band designs in [6], and compact dual-band surfaces were proposed in [7] and [8]. Efficient resonance formation using simple patterns was demonstrated in [9], and a recent monolayer wideband shielding surface with stable oblique-incidence response was described in [10]. These studies highlight ongoing efforts to achieve compact, wideband and stable frequency selective surfaces for Ku-band systems. However, many existing structures still suffer from narrow rejection, multilayer reliance and reduced stability at high