Study of Frequency Selective Surfaces as Band Reject Filter

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Abstract: In this research paper band reject characteristics of a Frequency Selective surface has been studied. Here the FSS is designed cutting ring shaped slot on a rectangular patch and important parameters for the proposed structure have been investigated theoretically and practically.

Keywords: Patch, FSS, resonance frequency, percentage bandwidth

I. INTRODUCTION

Frequency Selective surface which is widely used in wireless Communication can be regarded as filter of electromagnetic wave. The FSS can be defined as an array of metallic patch element for band stop response or as an array of slot elements for band pass response. In microwave engineering frequency selective surface is widely used as wireless counterpart of electrical filters. Areas where FSS has been applied include frequency separation in quasi optical beam splitters, the reflector antenna of a communication satellite or deep space exploration vehicle for multi frequency operation.

II. DESIGN OF FSS

In the proposed design, FSS structure was made of a periodic array of rectangular conducting patches with side

30mm x 20mm. From this rectangular patch a ring shaped slot of inner radius of 2mm and outer radius of 9mm has
been cut out. A periodic array of this patch is fabricated on a dielectric substrate with a periodicity of 32mm in horizontal axes and of 22mm in vertical axes. Here PTFE with permittivity of 2.4 thickness of 1.6m is used as dielectric.

III. MEASUREMENT

This FSS prototype was fabricated and measured using standard microwave bench to validate the simulated results.

IV. RESULTS

The proposed FSS structure has been theoretically and practically investigated. First it has been theoretically analyzed using Ansoft Designer Software which works on Method of Moment (MoM) followed by practical measurement. The two sets of numerical results (simulated and measured) have been plotted in a graph (Graph 1 & Graph 2) and the important parameters are summarized in table I.

Graph 1: Measured data
V. CONCLUSION

Analyzing above results it can be said that the proposed structure is working as a band reject filter. Here the parameter percentage bandwidth denotes the ratio of the factor -10dB bandwidth and the resonance frequency of the corresponding band. Comparing the measured and simulated data it can be said that simulated data is giving better percentage bandwidth as 59.83% compared to the measured result as 46.67%.

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