Investigation on Multiple Resonant Frequency and Size Reduction of Slot Loaded Square Patch Frequency Selective Surface

Ranjana Ray[1], Moumital Pal[2], Achintya Kumar Saha[3]
[1, 2] Asst. Professor, Dept of Electronics and Communication
[3]Dept of Electronics and Communication
[1, 2, 3] JIS College of Engineering

Abstract- *In this paper Frequency selective surfaces having two dimensional array of square patches with slots has been designed. Investigation has been done theoretically using HFSS software. Proposed design provides an improvement in increase of resonant frequencies. Multiple resonant frequencies has been achieved within 1Gz to 10 GHz and size reduction achieved is 72%.*

Keywords- Frequency Selective Surface; Resonant frequency; Size reduction

I. INTRODUCTION

A periodic array consisting of conducting patch within metallic screen is known as FSS.FSS are applicable in Antenna Radomes for controlling electromagnetic wave transmission and also used in reflector antenna systems.

II. DESIGN

Design of the frequency Selective Surface

A) Primary Design: A two dimensional array of a square patch of measurement 20mm *20mm is designed with similar vertical and horizontal periodicity with dielectric medium of permittivity of 2.8 as shown in fig below.

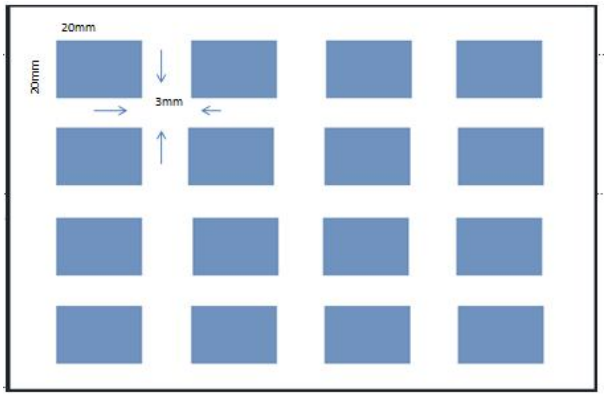

Figure 1 Patch type Frequency Selective Surface without slots

B) Design with slots in patch

When there are slots in this square patch, it gives some good result. The dimensions of slots are as given in figure below.1slot will be in rectangle in shape with length and breadth be 10mmby 10mm.Four rectangular slots with dimension 5mm by 1mm are also cut.Two are vertical and two slots are horizontal.Both pair are in union.

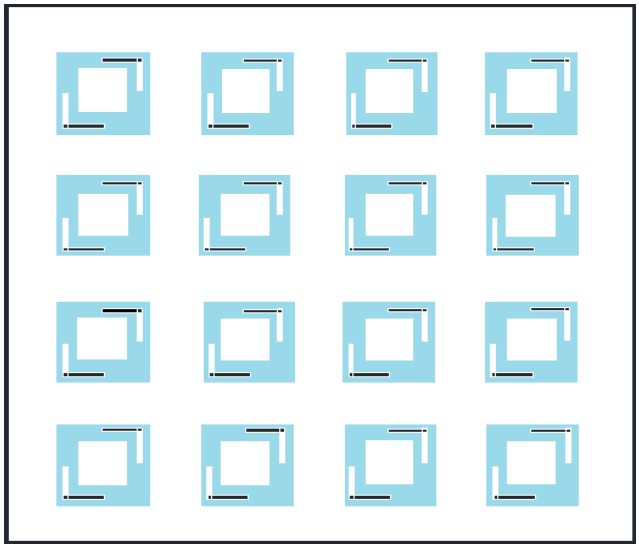

Figure 2 Frequency Selective Surface under experiment

III. RESULT

The experiment is done within 1GHz to 10 GHz frequency range.The resonating frequency without slots is 9.3GHz.After adding slots in every patch multiple resonant frequencies obtained at 5GHz,5.2GHz,7.5GHz. Secondly size reduction is about 72%.

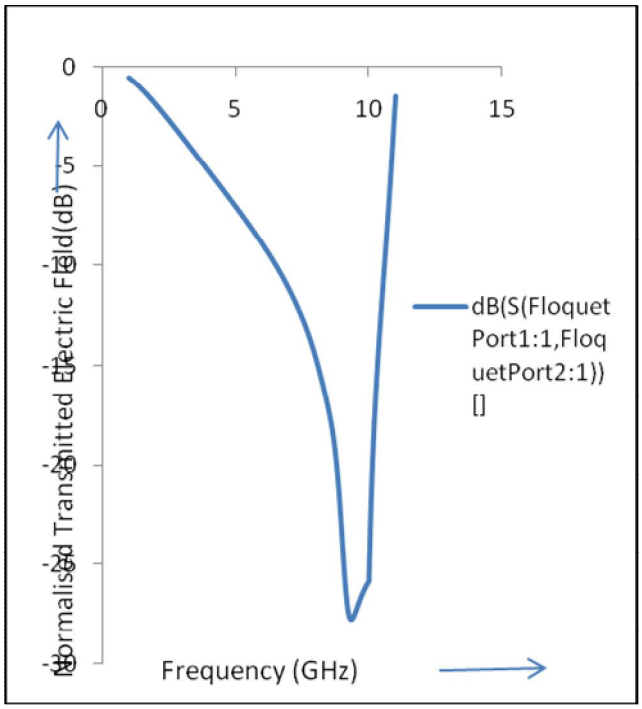

Figure 3 Normalised Transmitted Electric Field versus Frequency without slots

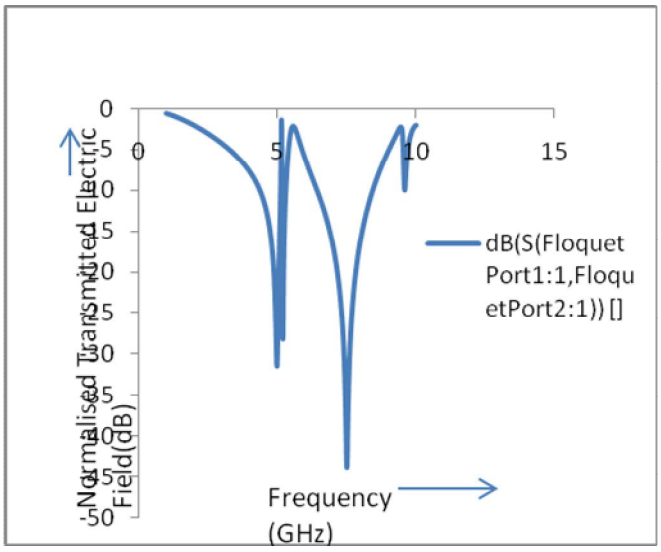

Figure 4 Normalised Transmitted Electric Field versus Frequency with slots

IV. CONCLUSION

From the theoretical results it can be concluded that this design is good in terms of size reduction and multiple resonating frequencies .So it can be used in satellite communication and designing radomes. . For FSS structure with square patch to resonate at 5GHz,the area of patch should be (10.75*10.75) 115.5mm^2.This shows that the size is reduced by 72%.

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