Design of Frequency Selective Surface to shield mobile radiations

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Abstract - **In this paper, Frequency Selective Surface is designed to be used in walls of buildings to shield mobile radiations to enter inside it. Patch type FSS with two square loop slots of different widths is designed. Simulation is done using ANSOFT® Designer software. The simulated results shows that the designed FSS exhibit two resonant frequencies one at 1.18GHz and other at 2.26GHz. The proposed FSS provides two stop bands one at frequency 1.09GHz to 1.21 GHz and other at 1.89GHz to 2.5GHz. The FSS will be able to stop mobile radiations of bands- 2G (GSM 900 MHz, GSM 1800 MHz.), 3G (WCDMA/HSPA/UMTS 2100 MHz) and 4G (TD-LTE 2300 MHz). A pass band is of width 0.76 GHz between them is also found.**

keywords **- Frequency Selective Surface, Patch, Resonant Frequency, radiation, slot, Transmitted Electric Field**

I. INTRODUCTION

Mobiles are part and parcel of our life. But the radiations emitted by mobile phones and mobile towers are dangerous to human health. Various studies shows that these radiations causes, genetic damage, tumors, memory loss, increased blood pressure, weakening of the immune system and sperm count reduction in men [1,2]. To solve this problem, recently researchers use Frequency selective surfaces [3-4]. Two dimensional periodic array of metallic patches on a dielectric sheet or apertures made on a metallic sheet supported by dielectric is called FSS [5,6]. This structure provides a filtering response to incident electromagnetic energy, which is caused by inductive and capacitive coupling between its constituting elements. FSS is being investigated for the last few decades for its wide range of applications [7-10]. Recently, Frequency selective surfaces (FSSs) have been used in telecommunication system, interference mitigation between adjacent wireless network. For which FSS with more than one stop band is required. In this paper FSS with two stop bands is designed, which can be used in walls of the buildings to reduce the effect of harmful radiations on mobile users without interfering much the communication.

II. DESIGN OF FSS

The proposed FSS consist of two dimensional array of square patches. Each patch is of size 50 mm x 50 mm. On each patch, two square ring slots of width 1mm and 5mm respectively, has been cut out. The dimensions of each unit cell is shown in Fig.1. Periodicity is taken 55 mm in x direction and 55 mm in y direction as shown in Fig 2. The patches are present on one side of a thin dielectric slab of thickness 0.8mm and copper coating on the other side of the slab is completely removed.

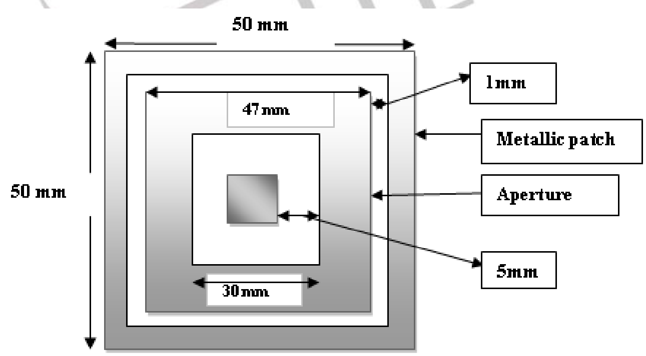

Fig.1. Unit cell (Patch with circular ring slot) under investigation

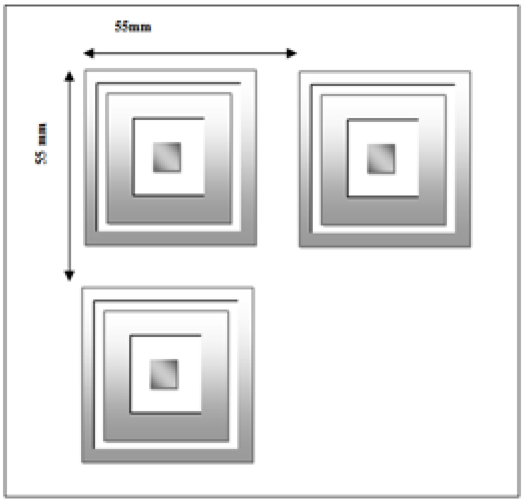

Fig.2. Two dimensional array of Unit cell (Patch with circular ring slot) under investigation

III. RESULT

FSS containing square patches with two square ring slots is simulated in ANSOFT® Designer Software and the result have been shown in Table1 and Figure 3.

TABLE 1

S.No.	Resonant Frequency (GHz)	Normalized Transmitted Electric Field (dB)
1.	2.26	-40.16
2.	1.18	-26.45

IV. OBSERVATION

It has been observed from Table 1 that the proposed FSS resonates at two frequencies one at 2.26GHz and other at 1.18GHz.The result is plotted graphically in Fig 3. It can be observed from the plot that a pass band of 0.76GHz is found between them.

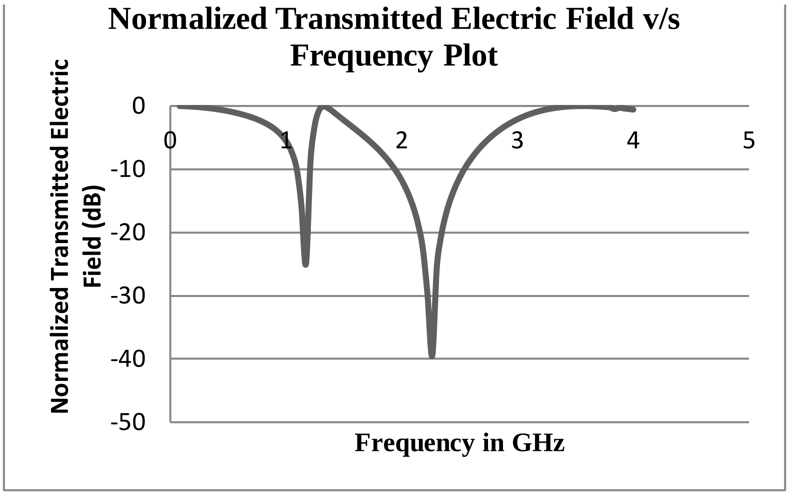

Fig.3. Graph showing Normalized Transmitted Electric Field versus Frequency plot of the proposed FSS.

V. CONCLUSION

FSS consisting of square patches with two square ring slots at the centre has been proposed. Simulated results showed that the FSS provides two stop bands at frequencies 1.09GHz to1.21 GHz and 1.89GHz to 2.5GHz. A pass band exist between them from 1.21GHz to 1.89GHz.

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