Design and Simulation of Loop and Dipole Antenna over Polarized AMC Surface

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Abstract **-** In this project, we are implementing dipole and loop antennas over Artificial Magnetic Conductor (AMC) surface. The AMC surface is well known to achieve low-profile and low return losses. It is also known as Electromagnetic Band Gap (EBG) surface. AnAMC surface with a rectangular unit cell was adopted for two orthogonal polarizations with two different frequencies to achieve high output power. Dipole antenna and loop antenna are placed over polarized dependent AMC surface in order to reduce ground losses. . In existing method there will be more return losses due to normal surface. So we proposed this method. Finally, the performance characteristics of both loop and dipole antennas will be observed and compare the return losses of both antennas by using with and without AMC surface .At last the loop Antenna with dipole Antenna are compared.

Keywords **-** *AMC surface, EBG surface, polarization*

I. INTRODUCTION

RF sources which are, broadly available and stable are digital TV broad casting and Mobile phone services. As power flux density of those ambient radio waves is very low, it is preferable to capture both frequencies so as to obtain as much RF energy as possible. In UHF band, loop and dipole antennas for digital TV's and cellular bands were designed. For the 500MHZ and 875MHZ bands, loop antennas and dipole antennas may be considered appropriate because these antennas are used for transmitting and which have high input impudence. These antennas with AMC (Artificial Magnetic Conductor) surface is mainly used for RF energy harvesting in dual band. To achieve efficient reception, a reflector is used which is AMC surface is used which is similar to EBG (Electromagnetic Band Gap) in order to achieve low return losses and low profile structure. The AMC surface is two-dimensional artificial ground plane that comprises of a metal ground plan and periodically arranged metal patches on top as shown in the Figure 1.1.Each patch is connected to the ground plane with a metal post ,and is so called a mushroom structure .The surface has been researched in many ways .

Due to the periodic nature, surface waves on the structure are forbidden to propagate at
frequencies with the electromagnetic band gap .Another important feature is the property that radio waves incident on the surface are reflected without any phase change, at a frequency with the band gap, as if the surface were a magnetic conduction .Therefore it is also called an Artificial Magnetic Conductor (AMC). AMC surfaces can be much closer to antennas because the phase of the reflected waves do not change .Therefore a low profile of the antenna structure can be achieved while retaining high radiation efficiency .from the view point of fabrication simplicity ,it is important to note that the AMC property can be exist without a metal post via the printed circuit board architecture .However ,the EBG property which forbids surface waves and prevents degradation of the radiation pattern, is known to move away from the exhibiting the AMC property when the metal posts are removed. From the view point of designing an antenna over an AMC surface, driving-point impedance of the antenna is a very important parameter for impedance matching with the load or source

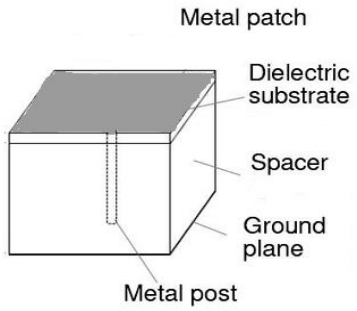

Figure 1.1 AMC unit cell

II. EXISTING SYSTEM

In this loop antenna and dipole antenna is designed without any surface due to this there are many losses for instance return losses are more in the case of loop antenna and dipole antenna without AMC surface due to more return losses the Voltage Standing Wave Ratio (VSWR) is greater than unity. Due this there are more ground losses. Due to this an antenna has the same radiation pattern over perfect ground in free

space with the twice the voltage An image antenna is an electrical mirror image of an antenna element formed by the reflecting from a conductive surface called a ground plane , such as the surface of the earth .It is used as geometrical technique in calculating the radiation pattern of the antenna .

III. PROPOSED SYSTEM AND IMPLEMENTATION

Here we placed the loop and dipole antenna over polarized AMC surface , by placing an AMC surface the waves incident on this surface reflect without any phase changes as shown in the below Figure 3.1 and Figure 3.2. Hence reflections will be less, therefore there will be less return losses as shown in the Figure 4.1 and Figure 4.2.

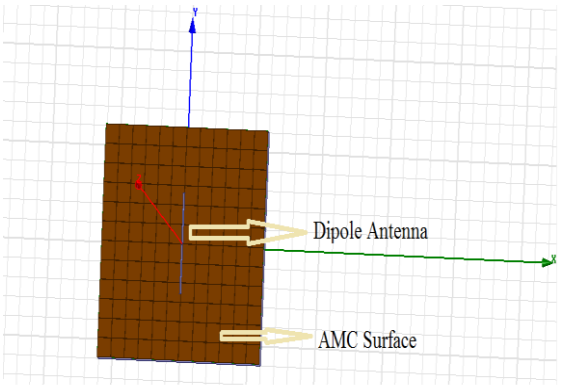

Figure 3.1.Dipole antenna over AMC surface

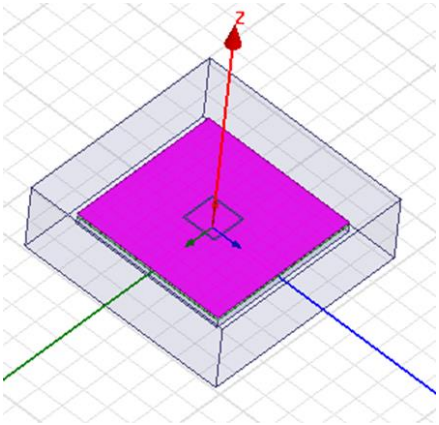

Figure 3.2 Loop antenna over AMC surface

IV. PERFORMANCE & DIFFERENCE BETWEEN EXISTING AND PROPOSED SYSTEM

In existing method, the reflections will be more. Due to more reflections, the return losses will be more. It is one of the main disadvantage. The another disadvantage was that the value of VSWR ranges greater than 1. So we placed an AMC surface instead of normal surface. The main advantage of the AMC surfaces is there will be less reflection. Hence there will be low return losses.

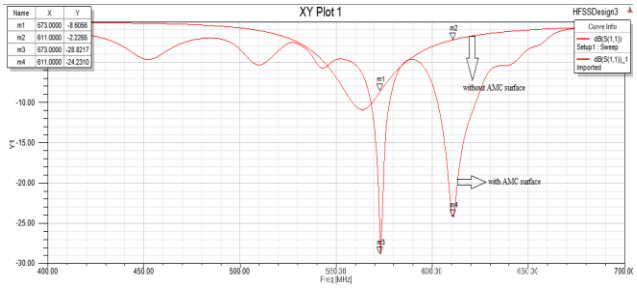

Figure 4.1 Return losses for loop antenna with and without AMC surface

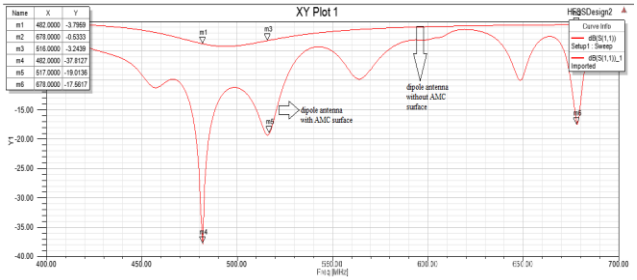

Figure 4.2 Return losses for dipole antenna with and without AMC surface

V. RESULTS

Finally, the return losses have reduced by using an AMC surface. Hence loop antenna is used for narrow band applications and dipole antenna is used for broad band applications is as shown in the Table 5.1 and Table 5.2. The main application of this design is dual band RF energy harvesting which is used to retrieve more power and store the energy for long time.

Table: 5.1 comparison of dipole antenna with and without AMC surface

PARAMETER	DIPOLE ANTENNA WITHOUT AMC SURFACE		DIPOLE ANTENNA WITH AMC SURFACE	
	482MHz	678MHz	482MHz	678MHz
RETURN LOSSES(dB)	-3.79	-0.53	-37.81	-17.56
VSWR	4.64	5.41	1.02	1.24
REFLECTION COFFICIENT	0.645	0.68	0.009	0.107

Table 5.2 comparison of loop antenna with and without AMC surface

PARAMETER	LOOP ANTENNA WITHOUT AMC SURFACE		LOOP ANTENNA WITH AMC SURFACE	
	573 MHZ	611 MHZ	573MHZ	611MHZ
RETURN LOSSES (dB)	-8.60	-2.22	-28.82	-24.23
VSWR	2.18	7.84	1.07	1.13
Reflection Coefficient	0.37	0.77	0.03	0.06

VI. CONCLUSION

Finally, with a view to applying the loop antenna and dipole antenna over an AMC surface for dual-band RF energy harvesting applications, a polarization dependent AMC surface (rectangular unit cell) was studied. The experimental results proved the dual-band operation of the polarization dependent AMC surface with loop and dipole antennas and also the validity of the simulations. Therefore the performance characteristics of both loop and dipole antennas will be observed and compare the return losses of both antennas by using with and without AMC surface. Hence we can conclude that loop antenna is used for only narrow band whereas dipole antenna is used for broad band.

VII. REFERENCES

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