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Design & Simulation of MHD Antenna for Wireless Applications

Kuldeep Lakra *, Amit Kumar*, Gyanender Kumar**

*ECE Department, SITM, Sonipat

**ECE Department, MVSIT, Sonipat

Abstract:
This paper investigate stacked cylindrical DRA,s placed on concentric annular rings . These hybrid nature of structure is operating under controlled electric fields and magnetic fields. Higher gain has been reported in this work when electric bias is given under magnetic bias bandwidth of the antenna is enhanced by making little bit compromise on the Gain. Frequency shift has also been notice during magnetic and electric bias condition .This can be wisely used for getting reconfigureabilty.

Key Words: **Cylindrical DRA , Annular ring , circular patch, Dc bias**

I. INTRODUCTION

Single feed dual frequency patch antenna fed by coaxial probe to circular patch as working principle on concentric [2]-[3]. Circular patch embedded in concentric stacked dual annular ring with stacked Dra's [4]-[5], Dra have received lot of attention. The DRA has several advantages such as radiation efficiency, low conducting loss, ease of fabrication [1]. The concentric stacked annular ring working on shorted circular patch and inner annular ring with Dra's. Gain achieved 1.5 dB before biasing, after d.c. biasing gain increased to 11 - 7.9 dB .To make MHD antenna with electric and magnetic bias adding in this structure

II. ANTENNA CONFIGURATION

Here we have design 3 different antennas Circular Patch, Copper annular ring , DRA of high gain and high bandwidth with ε_r =5.7,10. The single layer antenna with two copper annular ring concentrically located around a circular patch with dra's .It is printed on FR4 substrate of thickness 1.52 mm ,relative permittivity is 4.2, loss tangent 0.018 and 50Ω impedance .Dimension of our antenna.

Sr. No.	Parameter	Antenna
1.	R_1	22.7
2.	R_2	16.4
3.	R_3	6
4.	W_1	0.8
5.	W_2	5
6.	Feed Point	-4.5,-4.5

Make a design to given parameters and embedding DRA in circular patch of height 12.5 mm and inner annular of height 25 mm.

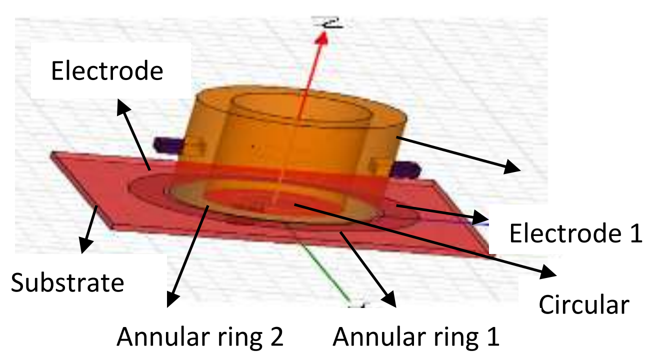

Fig.1 Front View of Antenna

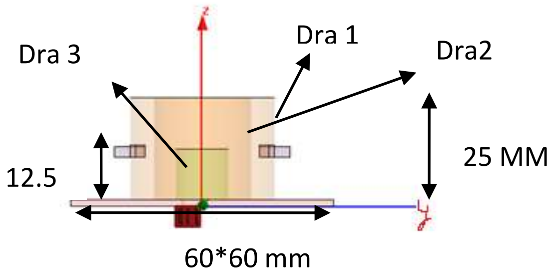

Fig 2 Side view of MHD antenna

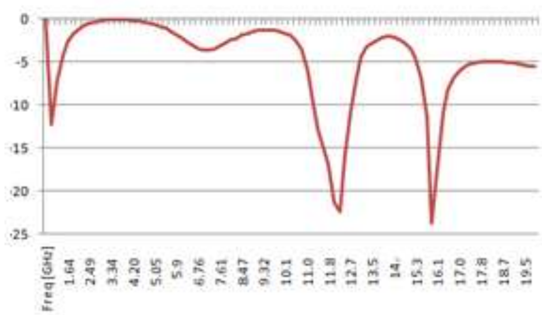

Fig. 3 s11 Without using Stacked DRA

My design of antenna working as multiband type antenna their s11 present in the fig. 3.

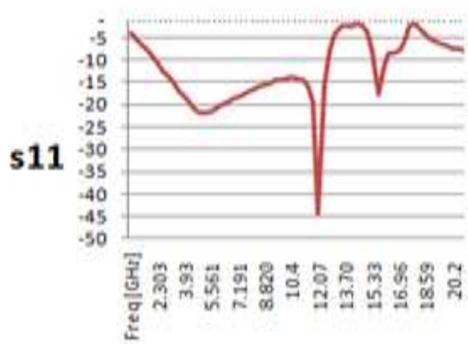

Fig. 4

Return loss without using stacked DRA

In this structure when DRA adding with ε_r =5.7, 10 achieved the bandwidth of this antenna 2.5 to 12.9 GHz and return loss is -45 dB fig. 4.

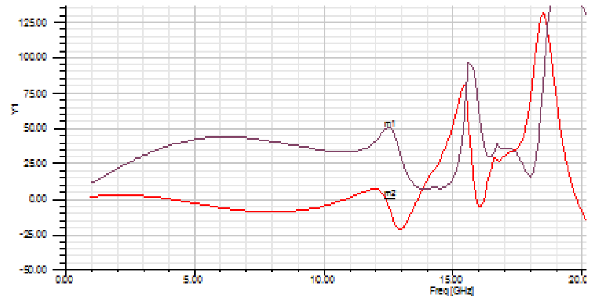

Fig. 5 Impedance matching

Impedance matching in fig.5 real part m1 is 49.93 and imaginary part m2 is 0.785 so proper impedance matching on 12.4 GHz of resonant frequency.

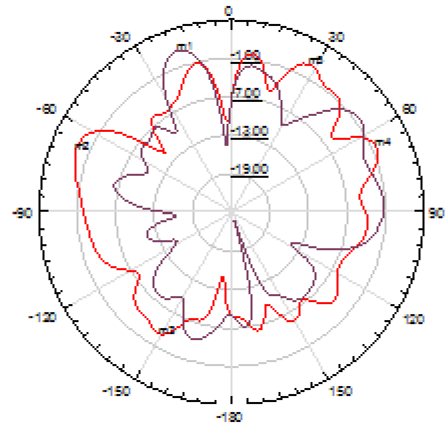

Fig. 6 Radiation pattern

When complete the structure concentric annular rings embedded DRA then achieve the gain 1.5 dB. Show in figure 6.

D.C. bias using in this structure then s11

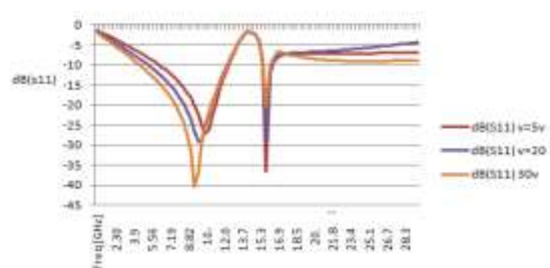

Fig. 7 Return loss using D.C biasing

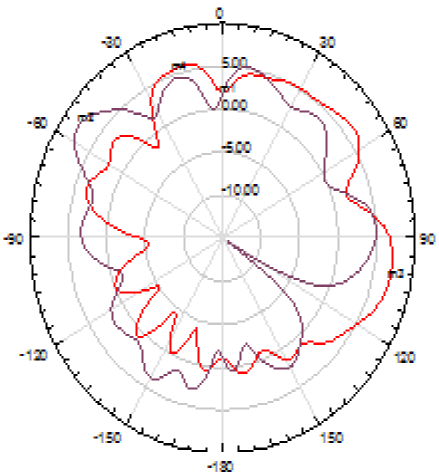

Fig. 8 Radiation pattern using D.C biasing

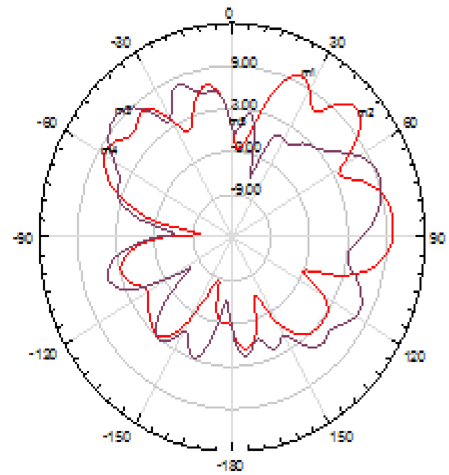

Fig. 10 Radiation pattern using 30v D.C biasing

In this figure 8 gain is achieved **7.79 dB.** After ground doing negative and both of electrode assign positive voltage 20v then gain is 9.67 dB in fig. 9.

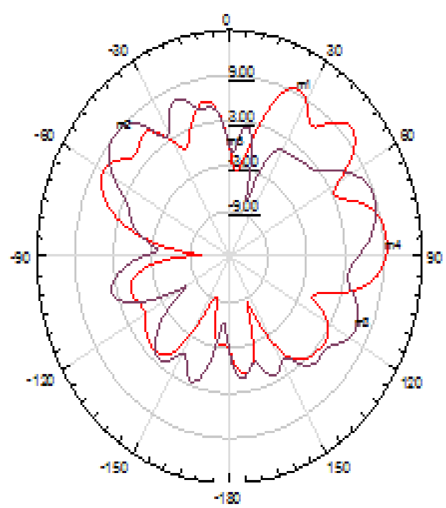

Fig. 9 Radiation pattern using 20v D.C biasing

When applying 30v dc bias then gain also increased 11.09 dB shows in figure 10.

When applying 30v then gain will be increased as 11 dB but s11 is same. After in this experiment I apply 5v D.C. Bias then s11 is given below in fig 7.

Adding magnetic bias of 2500 T magnetic saturation in this structure then s11 show in figure 11.

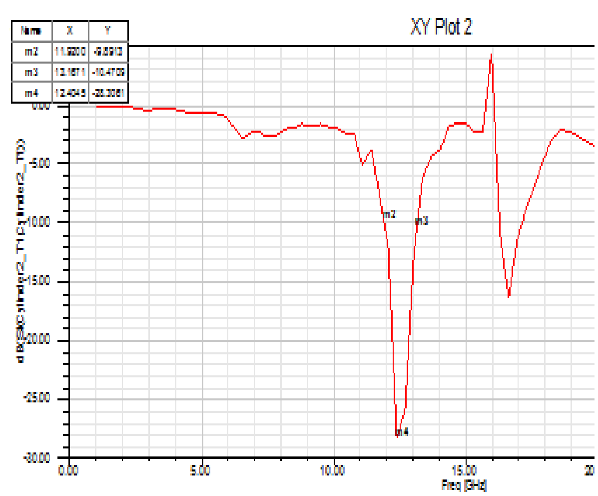

Fig. 11 Return Loss

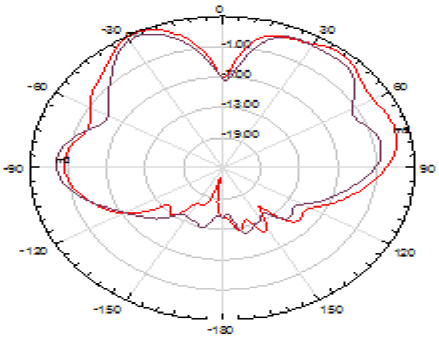

Fig. 12 Radiation pattern with electric and magnetic field

IV. CONCLUTION

In this paper impedance, bandwidth higher 10GHZ and with d.c. bias this bandwidth is 8 GHz but gain improve of 75%.when I given magnetic bias with different magnetic saturation ,they decreases return loss and given effective radiation pattern .Widely application for wireless communication and military, naval, air force applications.

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AUTHORS

First Author –

Kuldeep Lakra, M.tech , South point institute technology & management, Sonipat kuldeep.lakra19@gmail.com

Second Author –

Amit Kumar, Assistant Professor, South point institute technology & management, Sonipat

Third Author –

Gyanender Kumar, Assistant Professor, Mahavir Swami Institute of Technology, Sonipat

Correspondence Author –

Kuldeep Lakra kuldeep.lakra19@gmail.com , +91-9992908274