A CONICAL SHAPED DIELECTRIC RESONATOR ANTENNA IN X-BAND

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Abstract: Here we have Designed a Conical shaped dielectric resonator (DRA) using HFSS which is radiating at X-band, Assigning the materials with Arlon, Tarconic. By taking solution frequency 4.3GHz, Maximum number of passes 20, Max delta per S 0.02,Frequency setup type as Linear Step ,Starting frequency set to 1GHz and End Frequency 20 GHz we have simulated our project. From the result it can be observed that the antenna resonates at nearly 11.788 GHz which comes under X-band and the antenna is useful in different applicant VSAT [very small aperture terminal].

1. INTRODUCTION

The first Dielectric Resonator Antenna was proposed by Eng Hock Lim and kwok wa leung in 2008.significant developments have been done in the field of dielectric resonator antenna over the last three decades the investigations performed by researchers on dielectric resonator antenna dielectric resonators are made of high dielectric constant materials and have been used efficiently as microwave components in filter design because of their high quality factor. Therefore, many engineers have doubted their usefulness as radiators, thinking that they would not be efficient radiators and that they would have very small radiation bandwidth. It has been shown, however that some modes have a small radiation Q-factor.

DRAs geometries are cylinders of rectangular, circular, and elliptical cross-sections, and also, hemispherical shapes. Their resonance frequencies depend on the dimensions, geometry, and permittivity/losses of those ceramics. Moreover, the DRAs exhibit interesting characteristics for the design of antennas, such as reduced dimensions, low losses, low profile, high density of integration, and high radiation efficiency. Furthermore, it has low sensitivity at resonance.

It was believed that the bandwidth of the dielectric resonator antenna would be small because of the high dielectric quality factor but it was found that the radiation -factor is low for some low order modes. Several techniques have been proposed to further increase the bandwidth of the dielectric resonator antennas. An annular arrangement of the dielectric resonators can also increase the bandwidth [9]. It was found that when a tiny air gap (or equivalent very thin layer of very low dielectric constant material) exists between the ground plane and the high dielectric constant resonator, the resonant frequency shifts and the impedance bandwidth increases [9], [10]. This observation is also used to make a dielectric resonator of multi-layers of different dielectric materials that can also increase the bandwidth. This technique, however, requires a composite structure for the dielectric resonator that may not be easy to fabricate and control its accuracy.

2. CONICAL DRA USING HFSS

The Conical Dielectric Resonator Antenna is designed using High Frequency structured Simulator(HFSS) software and the antenna is made up of " TACONIC" and it's parameter proves that it is a best solution at these frequency compare to other shapes conical Dielectric resonator antenna is more efficient than micro-strip antenna.

As our Design is a mode based problem, we have taken the solution type as Driven model. All units in our project has taken in "mm" and it is fixed throughout the project we are sure that rescale to new units is cleared i:e the spacing between grids is constant.

Object name	Dimensions1	Dimensions 2	Material
Air volume	120mm(x-size)	120mm(y-size)	air
DRA	35mm	Height of 2mm	Taconic
Conical cavity	1.825(upper radius)&5.045(lower radius)	Height of 5.01mm	Arlon(1000)tm
Feed gap	3mm	Height of -1	
Annular ring	3mm		

Table1: parameters of Conical DRA

Our Proposed antenna resonates at 11.788 GHZ which can be ideally useful for communication application operates at X-Band.

3. SIMULTATION AND EXPERIMENTAL RESULTS

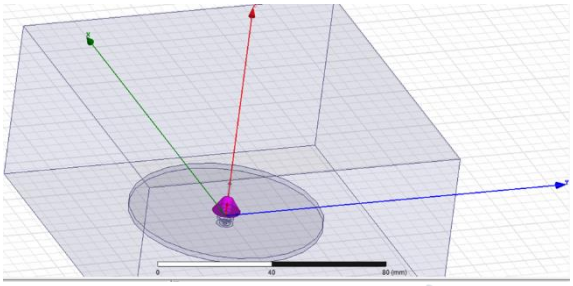

Fig 1: Design of conical design

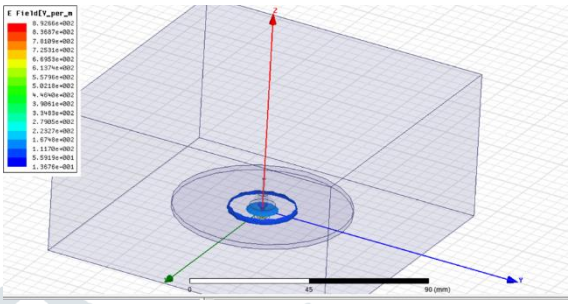

Fig 2: E-Field of conical DRA

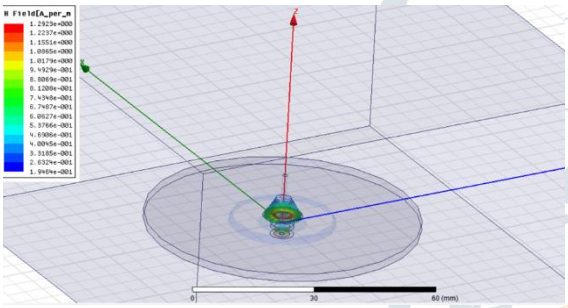

Fig 3: H-Field of conical DRA

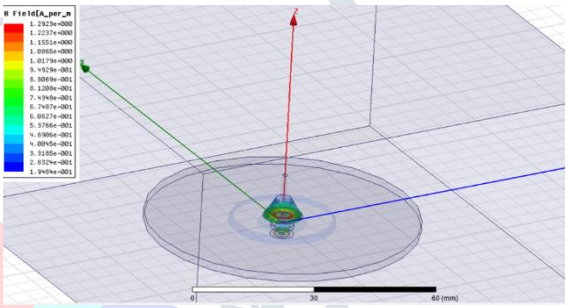

Fig 4: S-Parameter of conical DRA

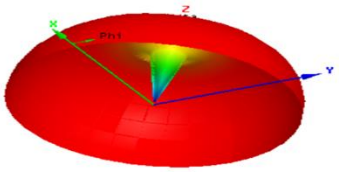

Fig 5: D-Polar plot of conical DRA

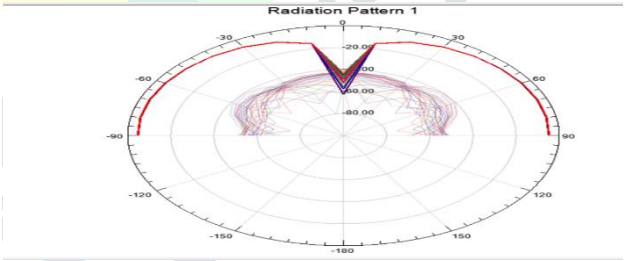

Fig 6: Radiation pattern of conical DRA

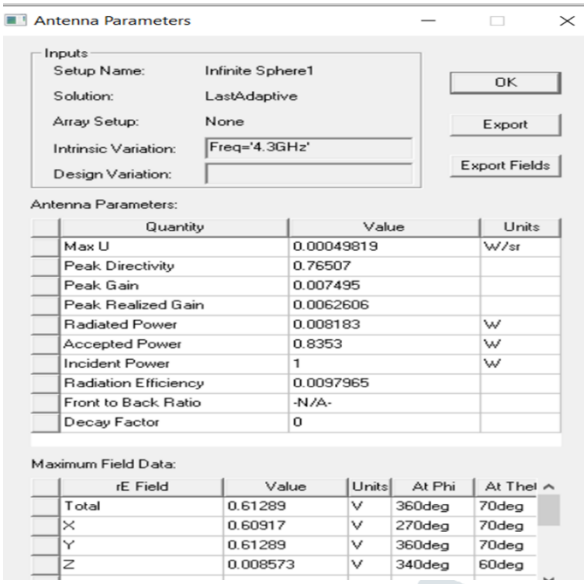

Fig 7: Antenna parameters of conical DRA

4. CONCLUSION

The successful implementation and simulation of conical shaped Dielectric Resonator Antenna is done by using HFSS software. HFSS is a useful tool for better 2D and 3D analysis and design of antenna structure within small time. By using HFSS simulation results, we have designed our antenna of Radiation efficiency 0.0097 with solution frequency of 4.3GHZ, S-parameter of 11.788GHZ which comes under X-Band.

5. REFERENCES

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