The Design of Circular Dielectric Resonator Antenna (CDRA) for Ku Band

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Abstract
In this paper, we propose a design of Circular Dielectric Resonator Antenna (CDRA) with a rectangular slot etched ground plane as DGS. The defected ground structure concept is used to improve the bandwidth and impedance matching. The bandwidth 3020MHz with respect to center frequency 16.48GHz. The percentage bandwidth of 18.32% and the average gain of 3.17dBi are achieved.

Keywords
CDRA, DGS, Ku Band

I. Introduction

Antennas for wireless applications are mainly based on planar and monopole radiators; however the Dielectric Resonator Antennas (DRAs) can play an increasingly important role in this field. This belief is based on the many intrinsic advantages introduced by DRAs over more traditional implementations. An interesting account supporting this point of view can be found in. Since their first appearance, DRAs have been found attractive in reason of their reduced losses (virtually no metal loss), ease of fabrication, broadside radiation patterns, wide frequency band of operation, ease of integration with planar circuitry and the possibility that they offer of achieving high radiation efficiency.

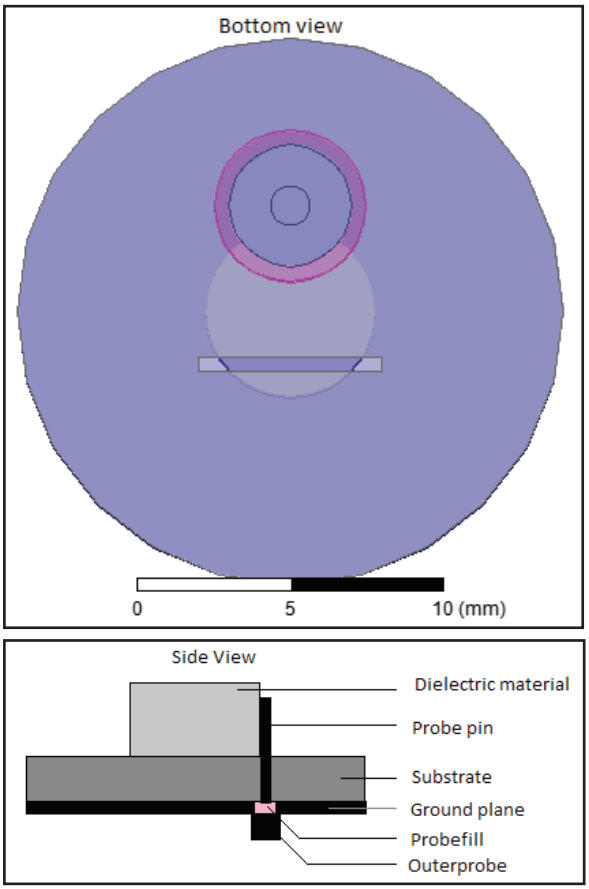

Fig. 1(a): The Top View of CDRA, (b) Bottom view of CDRA (ground plane).

Circular Dielectric Resonator Antenna is been designed by drilling suitable slots on the ground plane as DGS (Defected ground Structure). Ground plane consists of a rectangular slot of length 6mm and width 0.5mm.

II. Antenna Design

The antenna is fabricated on substrate of FR4_epoxy with relative permittivity (ε_r) is 4.4 and the thickness of 1.6mm. The radius and height of the DRA is calculated using the formulas given in [1]. The dimensions are DRA height is 2mm and radius is 2.8mm with relative permittivity (ε_r) is 8.

III. Simulated Results

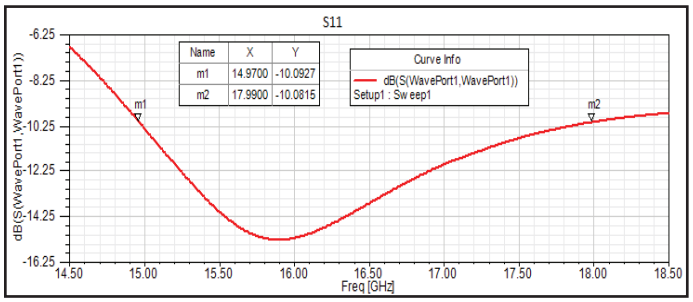

Fig. 2: Simulated Return Loss Versus Frequency

Simulated s11 can be seen from fig. 2 refection co-efficient is very less at resonance return loss of the antenna is less than -10dB from 14.97GHz to 17.99GHz with 3020MHz bandwidth and minimum of -16dB reflection co-efficient which satisfies the Ku band.

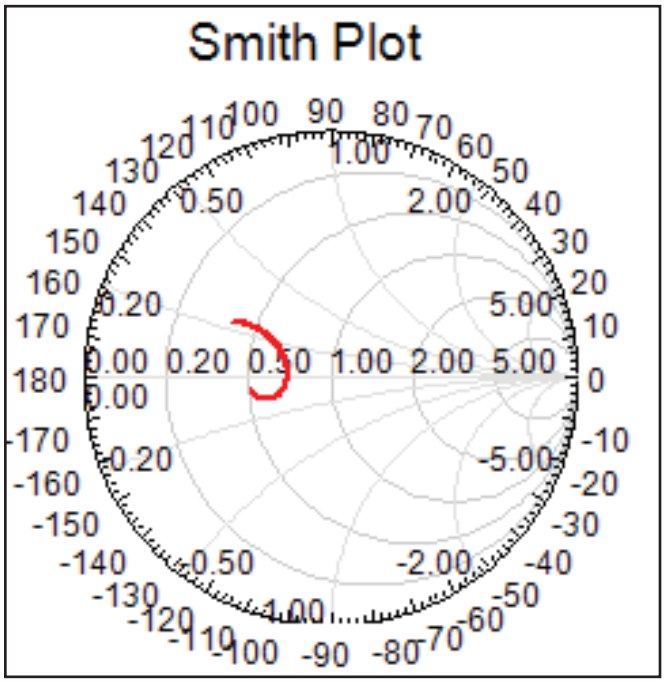

Fig. 3: Impedance Match

Impedance match of this antenna can be seen in fig.3, this clearly illustrating that the frequency of the interest is very near to point

1. Which is due to the DGS the impedance matching increased, this reduces the loss.
The radiation pattern of the proposed antenna showing the Gain total at 16GHz is 3dBi

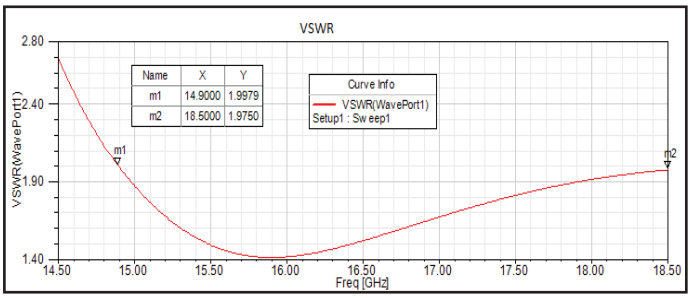

Fig. 4: Gain total at 16GHz

The important property of any antenna is VSWR in our proposed antenna we have achieved VSWR < 2 over the operating frequency. This can be seen in fig. 5.

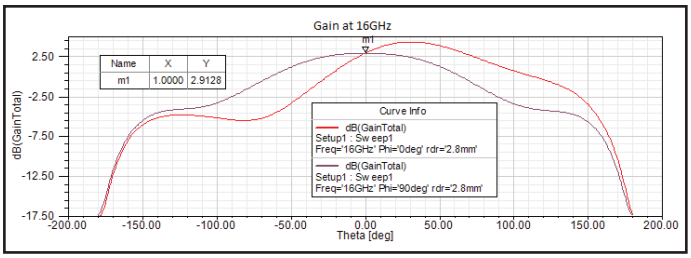

Fig. 5: VSWR of Proposed Antenna

IV. Conclusion

In this design we used effectively the DGS to improve the bandwidth and s11. The CDRA with DGS is has yielded 3020MHz bandwidth and average gain of 3dBi.

V. Acknowledgement

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