International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 07 | July 2021 www.irjet.net p-ISSN: 2395-0072

Study on Different Structure of Dielectric Resonator Antenna gain

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Abstract-*Dielectric Resonator antennas has word for several applications alike microwave circuits, filter and oscillator is broadly utilized antenna in the wireless communication. The primary objective of this paper is to investigate gain for different structure and features of a new dielectric resonator antenna strategy to overthrow the defiance's brought via the evolution Framework the Wireless communication.*

Keyword: DRA, Voltage standing wave ratio, frequency, gain, Renovate performance.

1. INTRODUCTION

If ceramic material with different shapes consists at the metal surface and ground plane is commonly known as dielectric resonator antenna which is very useful for higher or microwave frequencies. Size of dielectric resonator antenna and relative permittivity for a given material correlated with each other inversely. The conduction losses are got minimized when DRA is properly excited and has higher radiation characteristics [1-3]. When full length lower permittivity introduced between ground plane and dielectric resonator antenna then voltage standing wave ratio bandwidth getting enhanced [4]. With the help of six DRA for feed with single probe and having circular polarization, which is used for excitation purpose of double near degenerate orthogonal resonate mode results fundamental mode splitting of circular or rectangular Dielectric resonator. The impedance bandwidth which obtain by six DRA is got enhanced two times more in order to compare with conventional circular DR or rectangular DR [5]. Based on edge grounding and perforation, a wideband compact resonant dielectric resonator antenna has been designed for wider bandwidth of fifty-six percent among all possible families, which is based on metallization or edge grounding [6]. At 2.4 GHZ the ring disk dielectric resonator is very useful for wideband LAN application [7]. If four corporate type feed segment array operated between 5 GHZ to 6.1 GHZ provides reasonable directivity, gain, bandwidth and radiation characteristics and has capabilities to operate in c band frequency [8]. Various techniques which are practically effective towards a dielectric resonator in a circular polarization for generating dielectric resonator antenna. DRA has several feeding configurations, like, one and various feed points [9]. Designer can manage size of antenna along with bandwidth after integrating various existing modes excitation and technologies which produce broadside radiation to cover wideband frequency applications [10]. The reason behind the development of the squeezed wideband DR antenna is the requirement of higher frequency bands for multifunction application.

It is the review paper, in recent times established Dielectric Resonator antennas has illustrated. Part 2nd demonstrations the different type of Dielectric Resonator antenna. Part 3rd indications the literature review of several antennas if beforehand is proposed. Part 4th in given is the paper of Conclusion.

2. DIELECTRIC RESONATOR

By merging two resonance frequency, different structure of Dielectric resonator can be a radiator at a define frequency with two separate band. By considering and tuning a proper aspect ratio, the antenna radiation characteristic could be easily controlled and also better results obtained after doing structural changement inside DRA [11-12]. The majority two possible disseminate DR is ones the rectangular and cylindrical. These are studied in that part.

2.1 Cylindrical DRA

Different specification exists in the Cylindrical dielectric resonator antenna like dielectric constants,

height and radius. cylindrical DRA generally kept on the top of the ground and feed with coaxial type connectors. Important advantage of C type dielectric resonator antenna is fabrication process. Fabrication is very easy and has capability to excite different modes. The resonant frequency got varies if height or radius increased or decreased.

Rectangular DRA

Rectangular dielectric resonator antenna has a resonator with Dielectric relative constant (ϵr). The major benefits of the rectangular DRA are it has three different independent geometrically dimension which provides more flexibility in order to compare with cylindrical dielectric resonator antenna. It provides lower cross polarization level [13]. For designing a Dielectric Resonator antenna, Different feeding techniques followed for exciting the different radiating modes of DR. There are some feeding techniques-

2.1.1 Probe-Fed DRA

In this technique excitation probe placed adjacent which is achieved by reducing manufacturing complexity. This feed technique is cost effective and has smaller coupling to the dielectric resonator [14]. By optimizing position and length of dielectric resonator, the input impedance and feed probe could be tuned. It provides controlling over resonance frequency [15].

2.2.2 Micro strip Transmission Line-Fed DRA

In this method printed substrate transmission line directly contains dielectric resonator. Radiation mechanism of dielectric resonator antenna got affected due to non-isolating of feeding lines of DR, this is the major disadvantage of micro strip lines. This type of drawback affects the radiation mechanism of dielectric resonator antenna. After directly placing resonator antenna at the uppermost surface of the transmission line then a gap is generated in the middle of substrate of PCB and resonator which is not required [16].

2.2.3 Coplanar-Waveguide-Fed DRA.

A circular loop network represented by coplanar waveguide and used to feed to cylindrical dielectric resonator antenna. The major advantage of coplanar waveguide is coupling slots, which are lower the DR, which can modify and optimize the working performance of dielectric resonator antenna. When dielectric resonator antenna integrated with system on chip then millimeter wave application broadly use coplanar waveguide feeding structure [17].

2.2.4 Slot-Fed DRA.

This technique is very popular due to feeding done through slots inside earth plane. Such type of excitations methods are commonly termed as aperture coupling. Resonant mode of dielectric resonator coupled with wave which guided over transmission line through a slot. The main disadvantage of this process is that it's slot length must be half wavelength, which creates a major challenge for designer to understand circuits at low frequency [18].

3. LITERATURE SURVEY

In the recent years, lots of development and advancement completed in the area of microwave circuits and antenna. Many parameters of antenna like gain, bandwidth, polarization, directivity analyzed by the authors and they have reported numerous development. These developments done after changing their structural geometry. Length of dipole, material of the substrate etc. Due to variation in dimension operation frequency increased or decreased and this define dielectric resonator antenna frequency range. In this literature survey gain for different dielectric resonator has been analyzed for different proposed models in recent few years.

3.1 Gain

High gain requirement for free space communication, Dielectric Resonator antenna is very useful for radar and high frequency application [4]. The antenna is furthermore added to decrease the substrate loss and to improve the antenna gain. In simple on chip antennas are an array of physical length without disturbing patch of the electrical length with increase in slots. it reduces the EM wave toward the substrate loss and increases the antenna gain [20]. A printed dielectric resonator antenna is set alternately before the center line to guarantee the at millimeter wave

(MMW) arms to make its resonant frequencies, close to the desired frequency. [21] A novel microstrip hybrid antenna is utilized as taking care of source of a parasitic printed loop by resources of circular polarization to get DRAs is a magnet for on such as low loss and simple excitation. [22]. By high gain cylindrical DRA redirecting a folded dipole just as high conducting silicon substrate.

Table-1: GAIN OF DIELECTRIC RESONATOR ANTENNAS WITH ITS FEATURES AND PROPOSED STRUCTURE

Ref.	Proposed structure	Features	Gain
[24]	Centrally probe-fed DRA with a cone ground	Return loss is lesser and complete coverage of WLAN band	2.8 dBi (2.45 GHz)
[25]	DRA reflectarray and transmitarray integrated with solar cell for small satellite and clean energy	The reflectarray phase distribution is achieved by changing both the DRA and the solar cell sizes	27 .I8 dB (1-dB gain bandwidth of 1 GHz)
[26]	DRA with double layer	Good return loss	5.48 dBi
	hemispherical which is coupled to the circular waveguide via an annular slot	characteristics with enhanced bandwidth	(8.2 GHz)
[27]	DRA with series fed parasitic array	Maximum gain and broadside beam	12 dBi (3 GHz)
[28]	a rectangular (DRA) is integrated with backed cavity	enhanced measured gain	17.2 dBi (67 GHz)

4. Conclusion

Gain for different proposed structures with their features investigated in this paper. For center feeding of probe Dielectric resonator having cone ground provides lower return loss and gives maximum coverage of WLAN frequency band. When double layer hemispherical Dielectric resonator antenna coupled with circular waveguide via annular slots then improved bandwidth occur with better return loss characteristics. If DRA is integrated with backed cavity then it also provides improved gain.

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