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Design of Omni directional Antenna Array for Millimeter-wave communication system

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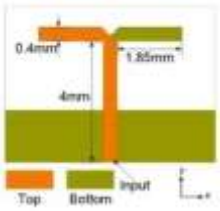
Abstract A millimeter-wave printed Quadra pole antenna is proposed. The designed antenna is excited using a 50ohm micro-strip line, where the power is equally divided & distributed to the array using two way power divider. It consists of two symmetric printed dipoles that make the Quadra pole radiating power Omni directionally. The design of the Quadra pole antenna includes an integrated feed network, making it compact. The proposed model is novel, an Omni directional antenna array was designed, simulated, exhibiting enhanced features like broad bandwidth, high gain, high efficiency, low cross-polarization

Introduction Wireless Communications are becoming as a part of day-to-day life of human beings. So, in order to achieve efficient and affordable communication, compact and efficient radiators required. Micro strip Antenna of different dielectric material which acts as resonator or slots for radio waves generally used in microwave and millimetre wave bands. Rectangular antenna has ubiquitous attention because of their advantages such as high radiation efficiency, low dissipation loss, small size, low cost etc. The antennas are used for polarization diversity, to increase the channel capacity and to enhance the data rate. Over the decade the research is focussing on bandwidth enhancement.

I. EXISTING METHOD

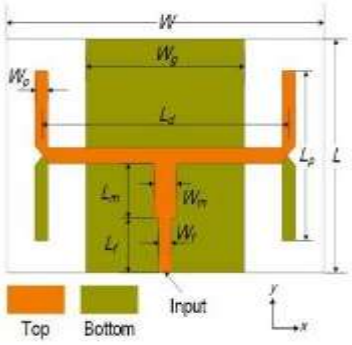
TheMillimeter-wave (mm-wave) communication technique, which can use enormous beyond the traditional licensed bands to overcome the challenge of global bandwidth shortage, has been recognized as a key technology for In the existing model a conventional half-wavelength

dipole antenna operating at 26 GHz printed on substrate. Half-wavelength dipoles, are a type of Omni directional in H Plane and directional in E Plane antennas

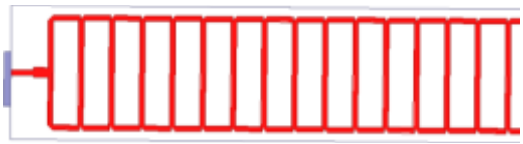


II. PROPOSED METHOD

To achieve an Omni directional radiation pattern, a second dipole was added symmetrically, such that the reflector is actually "inside" the antenna and the antenna can radiate power towards all the directions at H-plane. Previously the dipole can only radiate power toward one direction because of the existence of the ground. However, the ground is located inside the Quadra pole such that it has no impact on the expected Omni directional radiation pattern. Compared to existing designs, this antenna is of low profile, cost effective, and can be easily fabricated due to its simple fabrication process and planar structure.



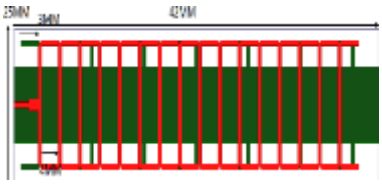
To achieve an Omni directional radiation pattern, an array of such a Quadra pole antenna must be arranged along the current flow direction on dipoles. However, to feed it, we need to use a proper feed network.



Half-wavelength dipoles, are a type of Omni directional in H Plane and directional in E Plane

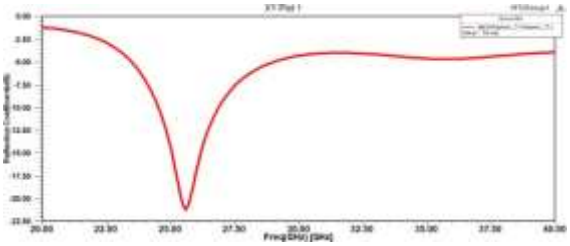
III. CONCLUSION

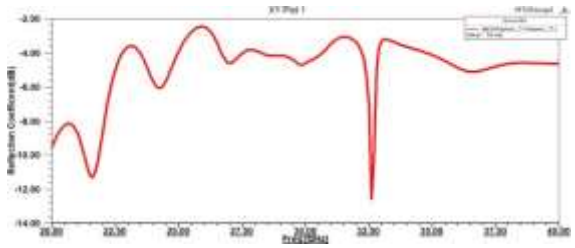
The designed antenna is excited using a 50ohm micro-strip line, where the power is equally divided & distributed to the array using two way power divider



REFLECTION COEFFICENT

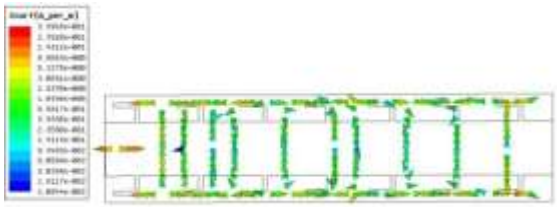
Radiation is the term used to represent the emission or reception of wave front at the antenna, specifying its strength. In any illustration, the sketch drawn to represent the radiation of an antenna is its radiation pattern. One can simply understand the function and directivity of an antenna by having a look at its radiation pattern





CURRENT DISTRIBUTIONS

The primary current distribution represents the distribution resulting solely from resistance to current flow in the electrolyte. Since temperature and concentration variations as well as overpotential are neglected, this type of current distribution is usually easy to calculate.



RADIATION PATTERN

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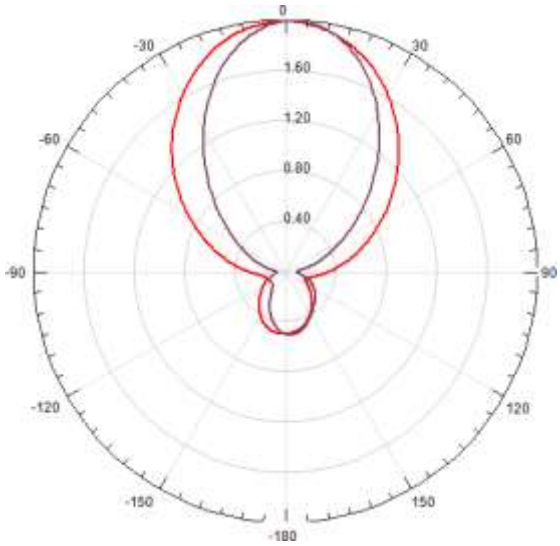
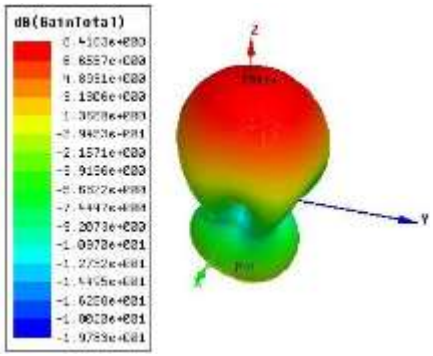


GAIN AND IMPEDENCE

A gain of factor 1 (equivalent to 0 dB) where both input and output are at the same voltage level and impedance is also known as unity gain.



Impedance, represented by the symbol Z, is a measure of the opposition to electrical flow. It is measured in ohms. For DC systems, impedance and resistance are the same, defined as the voltage across an element divided by the current

- The array antenna has been designed and analysed in this paper.
- A monopole Array antenna, class of radio antenna consisting of a straight rod-shaped conductor, often mounted perpendicularly over some type of conductive surface, called a ground plane.
- Planar monopole antennas have been used in wireless communication systems for a long time due to
    - their simple structures,
    - feeding mechanisms,
    - low fabrication costs.
- Wireless Communications are becoming as a part of day-to-day life of human beings. So, in order to achieve efficient and affordable wireless communication, compact and efficient radiators required. Indeed, one of the efficient radiators is microstrip antenna (MA).
- Antenna of different dielectric material which acts as resonator or slots for radio waves generally in microwave and millimetre wave bands.

IV. APPLICATIONS

- AMC ANTENNATECHNIQUE
- HIGH GAIN
- Vehicular communication
- K BAND APPLICATION
- WLAN(IEEE 802.11ad)
- Military communication
- Inter satellite communication
- Super widebandapplications
- WIMAX
- 5g communications

V. DESIGN EQUATIONSW=Width L=Length

$$W = \frac{v_o}{2f_r}\sqrt{\frac{2}{\varepsilon_r + 1}}$$

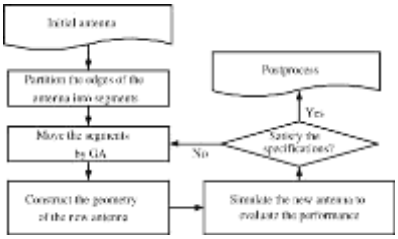
$$L = \frac{v_o}{2f_r\sqrt{\varepsilon_{reff}}} - 2\Delta L$$

$$\varepsilon_{reff} = \frac{\varepsilon_r + 1}{2} + \frac{\varepsilon_r - 1}{2}\left[1 + 12\frac{h}{W}\right]^{-1/2}$$

$$\Delta L = 0.412h\frac{(\varepsilon_{reff} + 0.3)(W/h + 0.264)}{(\varepsilon_{reff} - 0.258)(W/h + 0.8)}$$

W=Width
L=Length
H=Height

VI. METHODOLOGY



- This work presents the design of 5G array rectangular antenna. The designed antenna excited using coplanar waveguide feeding with rectangular rectangular shaped slots placed on the ground plane and it was characterised using ANSYS
- Gain of antenna is noticed high
- Relative permittivity is 4.4
- Dielectric loss tangent is 0.008
- The reRogers is used as substrate material
- Wireless Communications are becoming as a part of day-to-day life of human beings. So, in order to achieve efficient and affordable wireless communication, compact and efficient radiators required. Indeed, one of the efficient radiators is microstrip antenna (MA).
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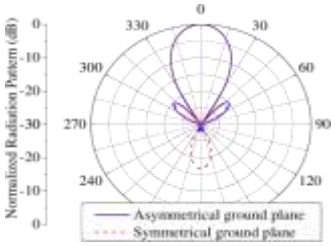

- Gain of antenna is noticed high
- Relative permittivity is 4.4
- Dielectric loss tangent is 0.008
- The reRogers is used as substrate material
- sistivity of Rogers is 500(ohm.cm)
- The dielectric was excited using the cpw feed line of 50(ohm).
- The ground plane is excited with perfect electric field.

VII. REFERENCE

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