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Design of Frequency Reconfigurable Antenna Array Element for Wireless Applications

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Abstract: A recurrence reconfigurable space ring receiving wire exchanging among L and C groups is exhibited. Opening of a L-band space ring reception apparatus can be reconfigured to a 2x2 C-band opening ring receiving wire exhibit by changing the conditions of 16 PIN diode switches. This receiving wire works at 1.76/5.71 GHz in L/C band working states separately. The deliberate acknowledged addition and radiation effectiveness are 0.1/4.2dB. Estimated results demonstrate that the PIN diode switches make them load impacts on the receiving wire. Parametric investigation of each circuit component is likewise reenacted and given in this paper. programming utilized is HFSS for reproduction. The proposed receiving wire is intended to emanate and transmit measure up to measures of intensity. The arrival loss of the proposed reception apparatus is higher than that ideal for one-port receiving wire application at the ideal double band frequencies.

Keywords: C band, HFSS, L band, PIN diode.

I. Introduction

Antennas are interface between radio waves propagation through space and electric current moving in a metal conductors using with transmitter or receiver. An antenna may include parasitic elements, parabolic reflector which serves to direct the radio waves into a beam or other desired radiation pattern [1].

- *L band:* Operating frequency of the L band is 1-2GHZ in the radio spectrum. The wavelength range of L band is 30-15cm. The L band had been used in various applications such as radars, global positioning system, Telecommunications and aircraft surveance.
- *C band:* A conservative double band receiving wire for C band 5 applications. Recurrence scope of C band is 4.5GHZ and 7.8GHZ recurrence groups. The radio wire fulfilled the 10dB impedance data transfer capacity is 64MHZ. The C band had been utilized in the different application are radar framework, earthbound microwave joins, 802.11 an adaptation of wifi gadgets.
- *Reconfigurable Antenna:* Antenna is capable of transmitting and receiving EM waves. Reconfigurable antenna are modifiable structures. The reconfigurable and different from the smart antenna [2]-[7]. Properties that can be reconfigured in the antenna can be achieved by frequency, pattern, polarization and compound. The way in which the reconfiguration achieved electrically by the use of the RF, pin diode, varactor. Optical is based on the use of type of photo conduction. Physically it can be achieved by structural alteration and use of the material desired.
- *FR4:* FR4 is a glass reinforced epoxy laminate terminal. It is composite material component of woven fiberglass cloth with an epoxy resin binder that is flame resistant. The material is known for its high mechanical value and electrical insulating qualities in both dry and humid conditions. FR4 self extinguishing flammability characteristics [8]-[11].

RT/duroid surface might not be smooth for the difference of warpage between you metal patch and substrate. FR4 is the cheapest and nearly hardest materials that can be found. So may be when applying the FR4 the surface of you antenna might be more smooth. The dielectric constant is a material property so when you use FR4 as a substrate. When the use a teflon substrate it will more consistant properties for microwave but reduce mechanical properties. Dielectric constant 2.2. When we used ceramic we got good electric and mechanical properties [12]-[16].

II. Literature Survey

In paper [1] Double band are taken L and X band. Fundamental Vision to plan a will give including low mass, high proficiency and restricted beam filtering. For L band 2*2 and 12*6 array for X band. This design is mainly used for L/X band for

synthetic aperture radar system. The frequency for L is 1.21 to 1.29GHZ and X is 9.5 to 9.8GHZ. The substrate made up of rogers 5880 (Permittivity = 2.2) and two layers of rohacell IG-51 (Permittivity = 1.06). The X band subarray 2*2 largest is used for scanning desired range 4*4 not scanning bandwidth subarray decrease in length increase. 12*1 – it can be done by sufficient bandwidth. Return loss = -10db Very good radiation pattern return loss is achieved appendant efficiency 40%.

In paper [2] on and off condition will be provided by the switches in the equivalent circuit. The MEMS switches have favorable position of low misfortune and high Q contrasted with stick diode and varactor. Numerical simulation using HFSS is verified by measurements. Reconfigurable Antenna using pin diode switch are easy to fabricate operating fz 2.18 to 7GHZ. Roger RT/duroid 5880 (permittivity = 2.2) thickness h = 0.79mm [17].

In paper [3] The folded dipole designed to resonance separated frequency band 1 and 2GHZ and inkjet printed on photo Graphic paper is used. The measured element gain 5.3 to 7dB in two band Cross polarization less than -25db the large array containing 39 Printed dipoles on the fabricated paper. For the low cross polarization the gain will be 12 to 17db. VSWR is less than or equal to 2 and the operating frequency is 1 to 2GHZ. And the dimension is 200mm*160mm*0.5mm. Dielectric constant - 3.1, Return loss is – 10db. Cross polarization better than -25db. The advantage of inkjet printing on paper high conductive and dielectric glass. The Peak gain measured approximately 12db to 16db at 1GHZ -2GHZ.

III. Antenna Geometry

The dimension of the designed antenna 3.5mm*12mm and the thickness of the circle shape 1.6mm. The radius of the antenna 4.2mm. The operating frequency of the antenna 2GHZ-10GHZ. The substrate made up of FR4. Three frequencies are taken 3,6,8. The VSWR for three frequencies 3 will be 1.8GHZ, 6 will be 1.4GHZ, 8 will be 1.2GHZ. The return loss is for 3 will be -11.5 GHZ, 6 will be -20.5GHZ, 8 will be -18.5GHZ. The antenna design is simulated by using ANSYS-HFSS software.

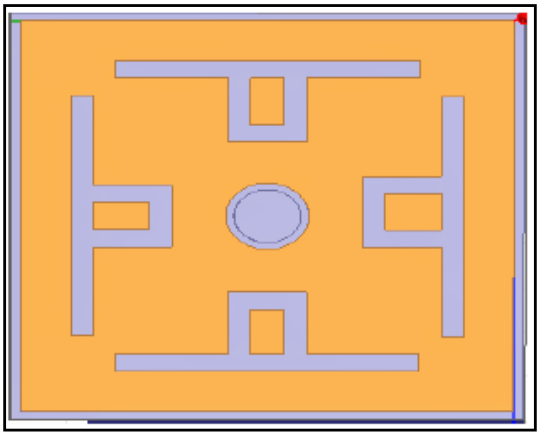

Fig. 1: Design of Frequency Reconfigurable Antenna

IV. Results and Discussion

A. Radiation Pattern

Radiation pattern of designed antenna is good and provide good frequency reconfiguration. Size of the antenna had provide good radiation pattern.

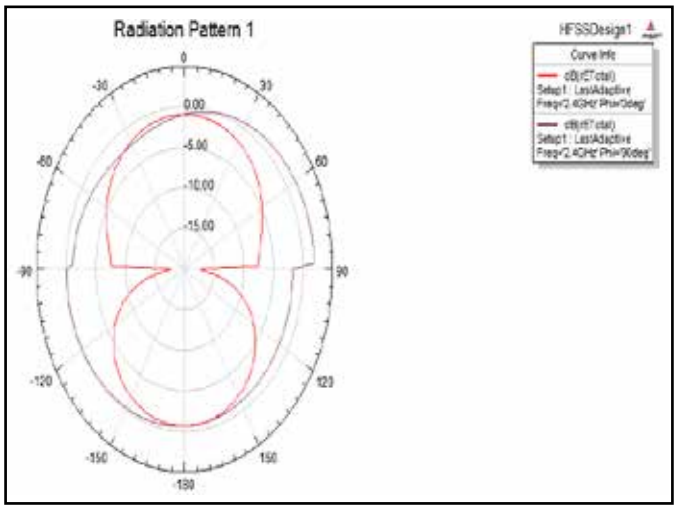

Fig. 2: Radiation Pattern

An omni directional antenna which radiates equal radio power in all direction s perpendicular to axis it will help to achieve frequency reconfiguration.

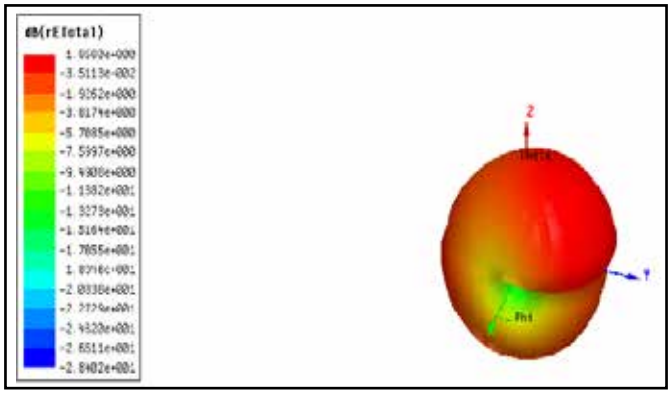

Fig. 3: 3D Polar Plot

B. Return Loss

Return loss for three frequency 3 is -11.5GHZ, 6 is -20.5GHZ, 8 is -18.5GHZ. Graph for this antenna had been plotted in this graph.

C. Voltage Standing Wave Ratio

VSWR for three frequencies 3 is 1.8GHZ, 6 is 1.4GHZ, 8 is 1.2GHZ Graph for this antenna had been plotted in this graph.

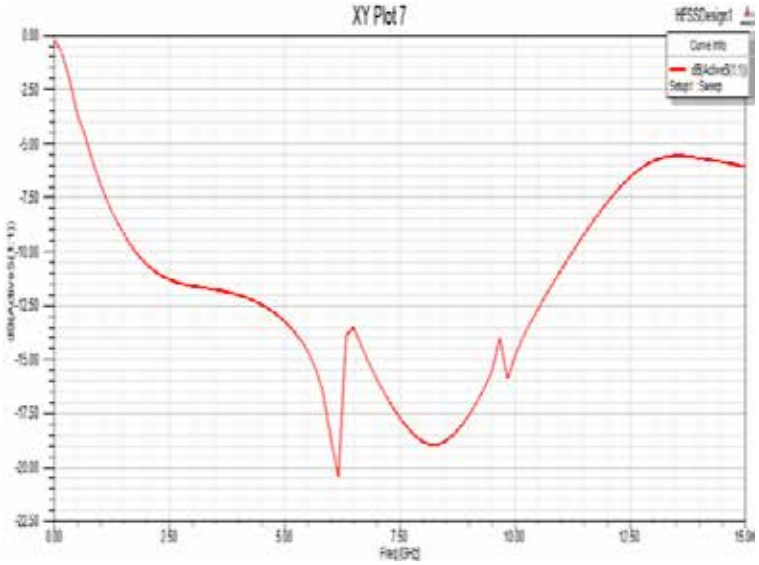

Fig. 4: Return Loss

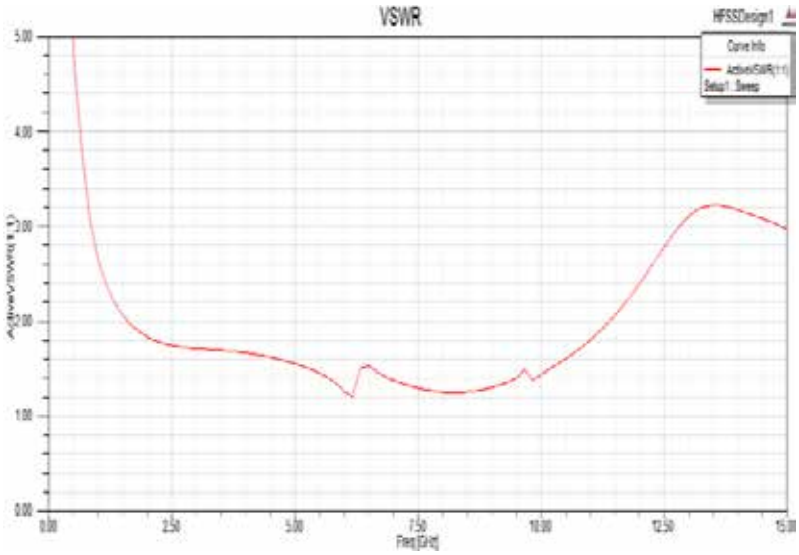

Fig. 5: VSWR

V. Conclusion

An epic reconfigurable opening ring radio wire that can be utilized as a component of a vast exhibit has been introduced. This reception apparatus can work at two recurrence groups dependent on the province of PIN diode switches. It is clear to keep up the component dividing around $\lambda_0/2$ at each working recurrence. Furthermore, because of the different encouraging for each band, just thin band T/R modules are required. This specific multi-port radio wire is intended to display a 3.2:1 working recurrence proportion. Be that as it may, this proportion can be adjusted by just differing the measure of the littler space ring radio wire. The receiving wire addition and examples are near recreations. The arrival loss of the radio wire can be additionally improved by joining increasingly exact varactor models in future plans.

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