ISSN 2582-2659
DOI:https://doi.org/10.31838/NJAP/03.01.01

Research Article

Wideband Rectangular Patch Antenna With DGS For 5G Communications

SADULLA SHAIK
Professor, Department of Electronics and Communication Engineering, KKR and KSR Institute of Technology and Sciences, Vinjanampadu, Guntur-522017, A.P, India.
Email: sadulla09@gmail.com.
Received: 10.01.21, Revised: 16.02.21, Accepted: 11.03.21

ABSTRACT
A antenna with DGS and a rectangular radiator intended for Wideband applications with a working recurrence scope of 4GHz to 6.22GHz covering a transfer speed of 2.2GHz. Ground has been carved with a space in an occasional way which drove for the wideband transmission capacity. Fire resistant Glass epoxy substrate with a 50ω exciter is used to energize the antenna. Damaged Ground structure method has been executed to achieve the wideband of activity. The general component of the antenna is 25mm×10mm×1.6mm and is having wideband covering the C band recurrence from 4GHz to 6.22GHz covering a data transfer capacity of 2.2GHz with an arrival misfortune esteem not exactly - 10dB for whole transmission capacity. Economically accessible 3D test system software programming has been utilized to plan the antenna.

Keywords: Wideband, Defective Ground, C band.

Introduction

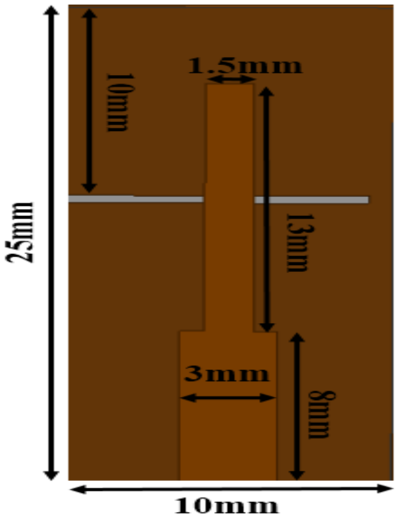
Prerequisite of the advanced correspondence frameworks includes the requirement of antenna having a reduced size with different frequency of activity is expanding step by step and is a testing case for originators to accomplish various reverberation in a conservative antenna along with keeping up the vital impedance data transfer capacity with out a decrease in gain value of the antenna. Basic requirement of Navic application is antenna minimization and it is a basic requirement with the goal conveyed effectively so as to be easy to be incorporated into any framework utilized for the navigational purposes.
A antenna shown in [1] have double reverberation has patch shorted with the ground utilizing a by means double reverberation yet it has been taken care of with a microstrip feed productivity on account of surface waves created by feed as both the feed line and the transmitting patch are on a similar surface. A antenna in [2] with two transmitting components set on a similar surface, the creators utilized two feeds to energize both patches for accomplishing double reverberation. In any case, this method requires two modules of transceivers which will influence the expense of framework and furthermore the size. A antenna in [3] with a slanting opening at the middle has been proposed to accomplish double reverberation however by including space in transmitting radiator the problem arises in the power distribution pattern, with the introduction of the space in the radiator there will be a unequal distribution of currents in the radiator will indeed develop a power distribution pattern which is also not equally distributed.
In [4] a triangular-ring opening antenna took care of by coplanar waveguide with projected stub used for tuning and a ground at the base of the substrate for scaling down and it is discovered that the thunderous antenna can be essentially decreased as contrasted and CPW took care of customary ring-space reception apparatuses. A tale responsive impedance substrate for reception apparatus scaling down with improved transmission capacity execution is introduced in [5]. The techniques for scaling down spirals and different antenna utilizing dielectric stacking, counterfeit lumped loads, finished dielectrics and different methodologies is introduced in [6]. They accomplished scaling down absent a lot of contortion in addition and transmission capacity.
The scaling back strategy of antennas for handsets is introduced in [7]. The creators used an attractive antenna for the ISM band in P band frequency of 900MHz and at the frequency of 2GHz. Here a well known antenna for the mobile handsets, Planar Inverted-F Antenna was utilized for the examination. The impact of space stacking on microstrip antenna in [8]. The Koch island fractal and H-shape openings are acquainted with microstrip antenna and their impact on decrease of the thunderous antenna is resolved. Extra openings of increasingly complex geometry are executed on the H-formed fix to

additionally cut down its reverberation antenna. Right now, minimal double captivated ring space antenna has been intended for the Navic applications in the S group with a working antenna of 4.5GHz and 5.5GHz. Persuade feed has been utilized to energize the antenna and a straight forward system of stacking patch with ring space has been executed to accomplish the double frequency of activity.

Development Of Proposed Antenna

A antenna with DGS and a rectangular radiator intended for Wideband applications with a working recurrence scope of 4GHz to 6.22GHz covering a transfer speed of 2.2GHz. Ground has been carved with a space in an occasional way which drove for the wideband transmission capacity. Fire resistant Glass epoxy substrate with a 50ω exciter is used to energize the antenna. Damaged Ground structure method has been executed to achieve the wideband of activity.

(a) Top View of proposed antenna (b) Bottom View of proposed antenna



(c) Schematic Diagram of ground

Fig. 1: Proposed antenna

Results And Discussion

Antenna performance parameters are demonstrated & examined utilizing the test system programming software. Which are utilized to check the exhibition of the antenna and are contemplated and introduced in this sestion. Figure 2 underneath is impedance coordinating plot, The picture delineates that antenna is emanating at the frequency of 4GHz to 6.22GHz covering a bandwidth of 2.2GHz. We can likewise see that the loss at antenna arrival at the working frequency of 4.5GHz is - 15dB and at 5GHz is -14.18dB. Which speaks about a decent matching and impedance coordinating at the necessary working frequency of the antenna.

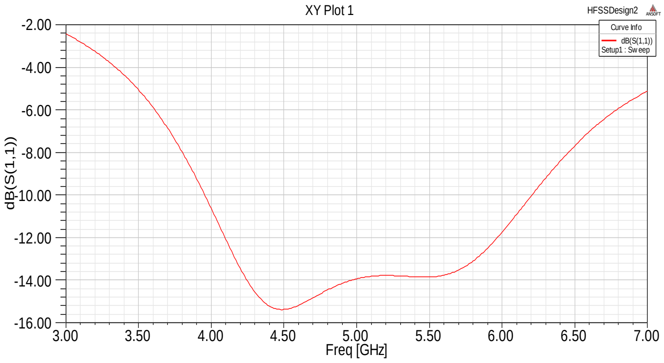


Fig. 2: Return loss

Figure 3 underneath is VSWR plot, The picture portrays that the VSWR estimation is under 2dB at the frequency of 4GHz to 6.22GHz covering a bandwidth of 2.2GHz. We can likewise see that the VSWR at 4.5GHz is 1.35dB and at 5GHz is 1.4dB. Which speaks about a decent matching and impedance coordinating at the necessary working frequency of the antenna.

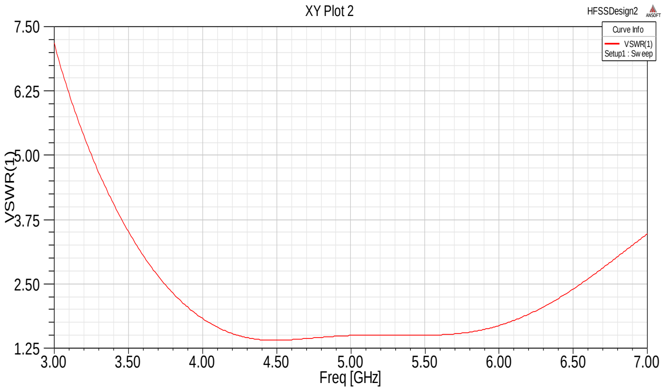


Fig. 3: VSWR

Figures 4 and 5 underneath is gain plot at the two working frequencies of 4.5GHz and 5.5GHz, The picture delineates that the increase estimation of the antenna at the working frequency of 4.5GHz is 6.11dB and at 5.5GHz is 3.56dB. From the two gain plots of the antenna a equal distribution of the power dissemination force at various edges with no inequalities is found and this is a fundamental requirement for Navic appliances.

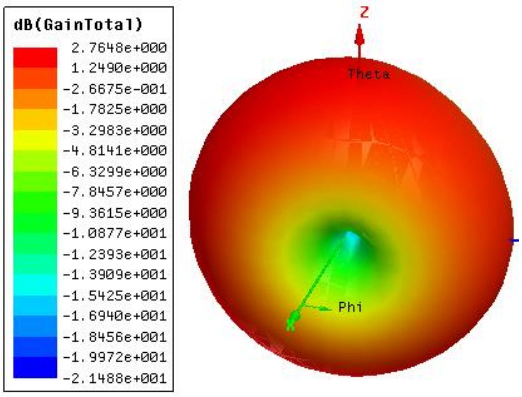


Fig.4: Gain at 4.5GHz

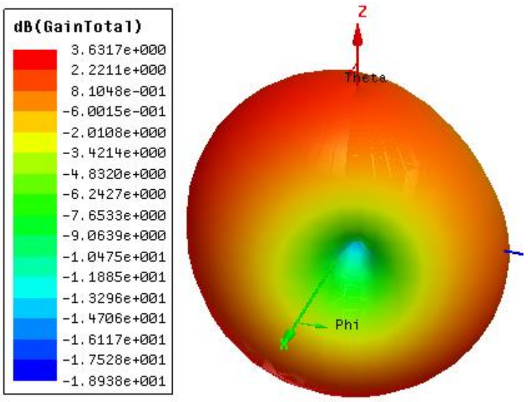
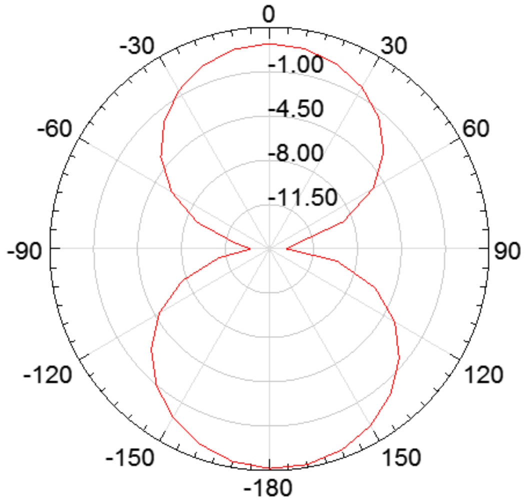
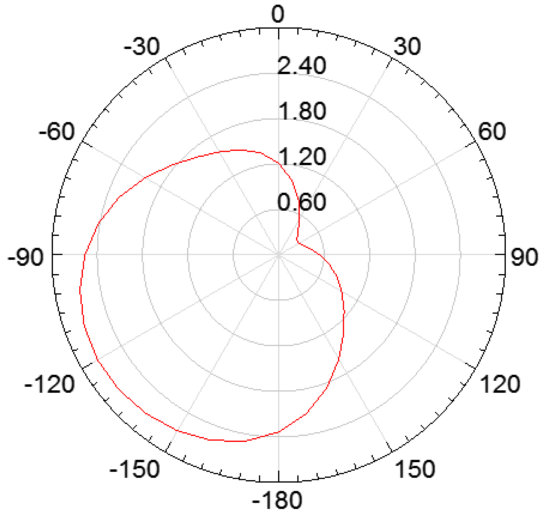


Fig. 5: Gain at 5.5GHz

Examples of power distribution patterns at the two working frequencies of 4.5GHz and 5.5GHz are appeared beneath in Figures 6 and 7. A equal distribution of currents in the radiator will indeed develop a power distribution pattern which is also equally distributed and this is a fundamental requirement for Navic appliances.

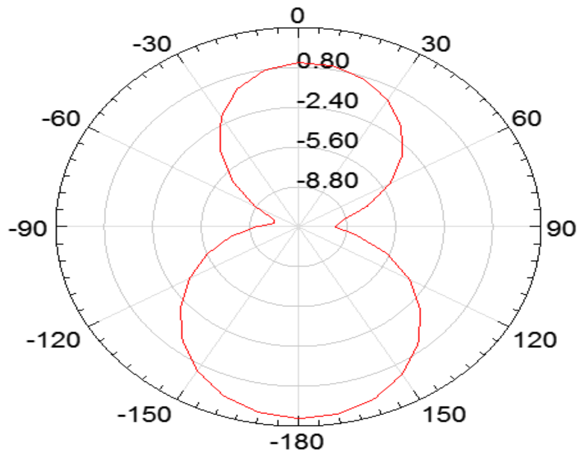


(a) Elevation Plane

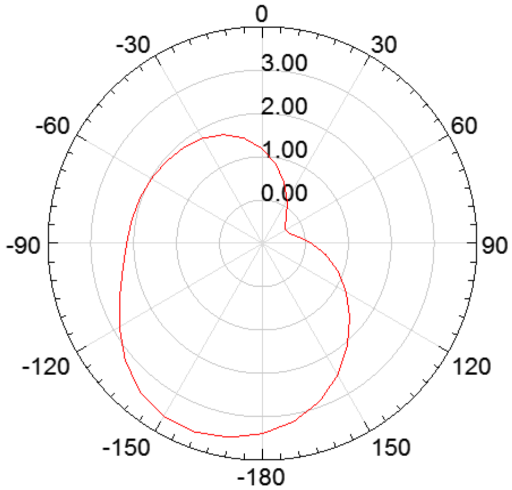


(b) Azimuthal Plane

Fig. 6: power distribution Pattern at 4.5GHz



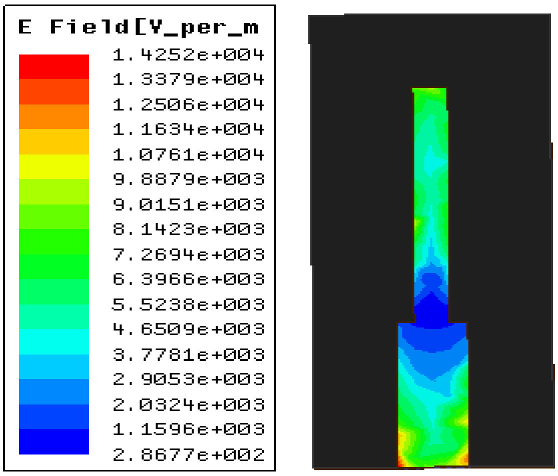
(a) Elevation Plane



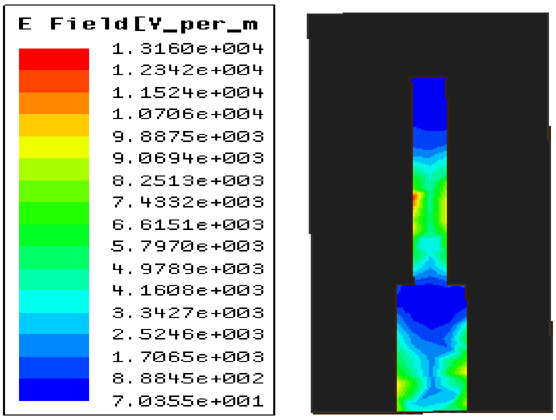
(b) Azimuthal Plane

Fig.7: power distribution at 5.5GHz

Figure 8 underneath shows the example of spreading of current field at the working frequency of 4.5GHz and 5.5GHz. The hub proportion esteem is 1.35V/m at both the frequencies which speaks to that the antenna is having proper spread of current fields at the working frequency.



(a) lower patch at 4.5GHz



(b) Upper patch at 5.5GHz

Fig. 9: Current distributions of the patch

Conclusion

A antenna with DGS and a rectangular radiator intended for Wideband applications with a working recurrence scope of 4GHz to 6.22GHz covering a transfer speed of 2.2GHz. Ground has been carved with a space in an occasional way which drove for the wideband transmission capacity. Fire resistant Glass epoxy substrate with a 50ω exciter is used to energize the antenna. Damaged Ground structure method has been executed to achieve the wideband of activity. The general component of the antenna is 25mm×10mm×1.6mm and is having wideband covering the C band recurrence from 4GHz to 6.22GHz covering a data transfer capacity of 2.2GHz with an arrival misfortune esteem not exactly - 10dB for whole transmission capacity. Economically accessible 3D test system software programming has been utilized to plan the antenna.

References

1. M. Kiranmai “A Compact Circular Polarized Antenna for Deep Space Applications” International Journal of Recent Technology and Engineering (IJRTE), Volume-9 Issue-1S5, December, 2019.
2. K.Alekya “A 2×2 Antenna Array for X Band Phased Array RADAR Applications” International Journal of Recent Technology and Engineering (IJRTE), Volume-9 Issue-1S5, December, 2019.
3. Ananda Rao. Nelapati “Wideband High Gain Antenna Array with Electromagnetic Band Gap Structures for Mutual Coupling Reduction” Test Engineering and Management, Volume 82, January - February 2020, Page No. 1559 - 1564
4. E. Kusuma Kumari “Compact Circular Polarized Stacked Patch Antenna for IRNSS and GLONASS Applications” Test Engineering and Management, Volume 82, January - February 2020, Page No. 1565 – 1571.
5. Rama Devi “Wideband Reconfigurable Polarization and Beam Sweeping Antenna for Satellite Applications” Test Engineering and Management, Volume 82, January - February 2020, Page No. 1572 – 1581.
6. E. Kusuma Kumari “Printed Monopole UWB Antenna with Dual Notch Bands” International Journal of Recent Technology and Engineering, Volume-7, Issue-5S4, February 2019.
7. K. Satish “A 2×2 Antenna Array for L Band Phased Array RADAR Applications” International Journal of Recent Technology and Engineering (IJRTE), Volume-9 Issue-1S5, December, 2019.
8. N. Ananda Rao “A Dual Frequency Dielectric Resonator Antenna for Wireless Communication Applications” International Journal of Recent Technlogy and Engineering (IJRTE), Volume-9 Issue-1S5, December, 2019.
9. N. Ananda Rao “1×4 Dielectric Resonator Antenna Array with Corporate Feed for C-Band RADAR” International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-8 Issue-9, July 2019.
10. Anil Kumar Karra, Arsavelli Janardhana “Design of a Novel Wide Stopband Common Mode Filter with Slotted Ground” International Journal of Recent Technology and Engineering, Volume-7, Issue-5S4, February 2019.
11. Mohan Kumar D “Circular Polarized Ring Slot Antenna with Filtering Characteristics” International Journal of Recent Technology and Engineering, Volume-7, Issue-5S4, February 2019.
12. E. Kusuma Kumari, A.N.V.Ravi Kumar. (2017). Development of an L Band Beam Steering Cuboid Antenna Array. IEEE International Conference on Computational Intelligence And Computing Research, Tamilnadu College of Engineering. Tamil Nadu.