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# Analyzing Planar Dipole Antenna with Different Arm Widths Operating at 1 GHz

Ranga rao Orugu, K. Srinivas, V. Rama Raju, Ch. Rama Krishna, D. N. Bhushan Babu
[1]Assistant Professor, ECE, Vishnu institute of Technology, Bhimavaram, Andhrapradesh, India
[2]Professor, ECE, Vishnu institute of Technology, Bhimavaram, Andhrapradesh, India
[3,4]Associate Professor, ECE, Vishnu institute of Technology, Bhimavaram, Andhrapradesh, India
[5]Assistant Professor, ECE, ALIET, Vijayawada, Andhrapradesh, India

***Abstract:*** ***The planar dipole antenna which is having high compactness is used mainly for UWB. In this paper we consider the dipole antenna having different arms widths and the comparative analysis were illustrated. Here by taking 0.25cm, 0.5cm, 0.75cm and 1cm the proposed antenna analyzed and simulated by using HFSS and antenna parameters like return loss, band width, gain, radiation pattern, directivity and efficiency are compared for different arms widths of dipole.***

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***Index Terms*— Planar Dipole, better compactness, change in Arm width, improving parameters.**

## I. INTRODUCTION

The planar dipole antenna is very useful in antenna applications because of its ease of fabrication and better compactness. In this paper the antenna designed to work at 1 GHz frequency. And the proposed antenna is analyzed at 0.25cm, 0.5cm, 0.75cm and 1cm arm widths and the antenna parameters like return loss, gain, radiation patterns, efficiency etc were compared for these arm widths and the simulation is done by using HFSS software. Here by changing the arm width 0.25cm every time the change in its operating frequency and return loss and some other parameters were illustrated for clear understanding and finally the suitable antenna with better results is obtained through the comparison.

## II. ANTENNA DESIGN

The design of proposed antenna is presented in the following figure [1]. This antenna design having compactness.

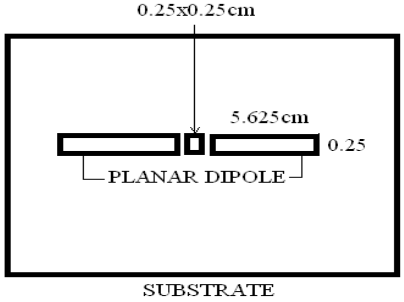


**Fig [1] Antenna design**

## III .SIMULATION RESULTS

### *A. Return loss*

The below figure[2] shows comparison of return loss curves for arms widths 0.25cm, 0.5cm, 0.75cm and 1cm respectively and the comparative values are listed in table [1].

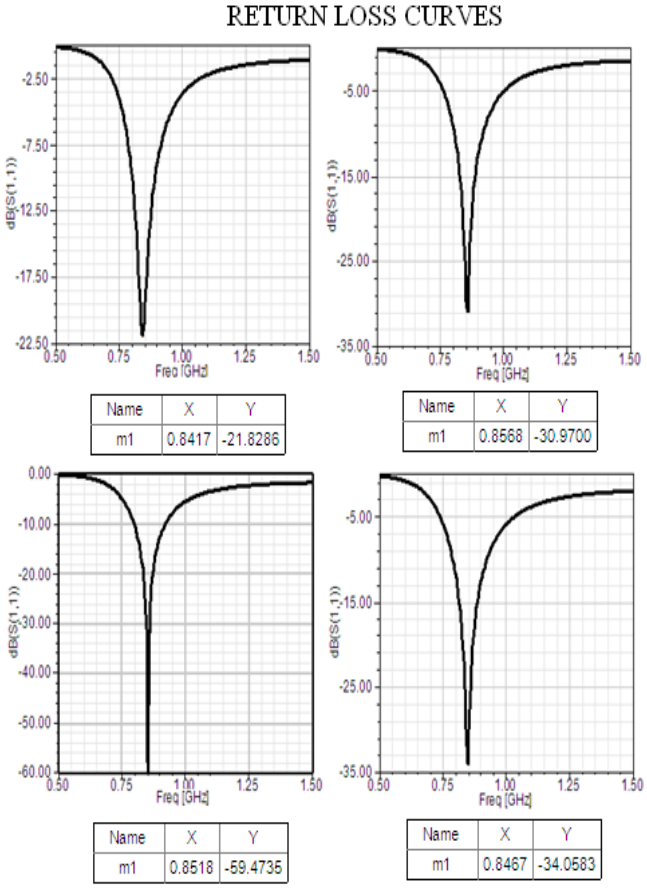


**Fig [2] return loss vs Frequency curves: a) 0.25cm arm width b) 0.5cm arm width c) 0.75cm arm width d )1cm arm width**

### *B. Gain in 2D*

The figure [3] shows the comparison of 2D gain for the proposed antenna with arms width 0.25cm, 0.5cm, 0.75cm and 1cm.

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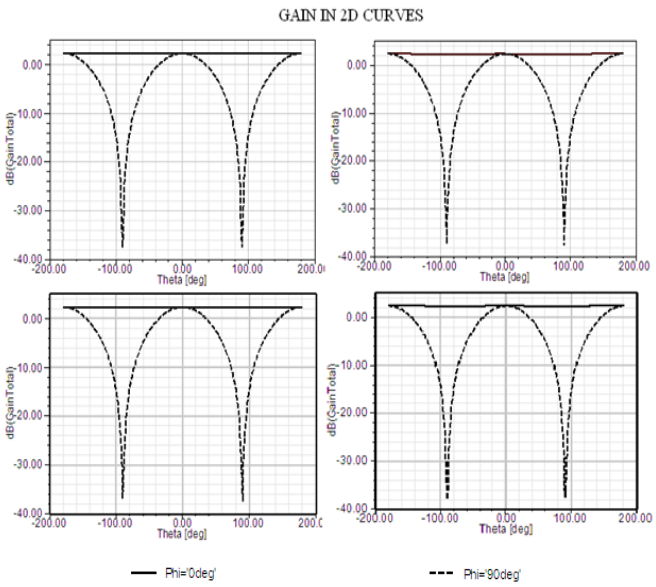


**Fig [3] 2D gain curves a) 0.25cm arm width b) 0.5cm arm width c) 0.75cm arm width d) 1cm arm width**

### C. *Gain in 3D*

The below figure[4] shows the comparative analysis of gain in 3D for proposed antenna with different arms widths and the maximum values of gain are 2.1434, 2.1884, 2.2112 and 2.1858 for 0.25cm, 0.5cm, 0.75cm and 1cm arm widths respectively.

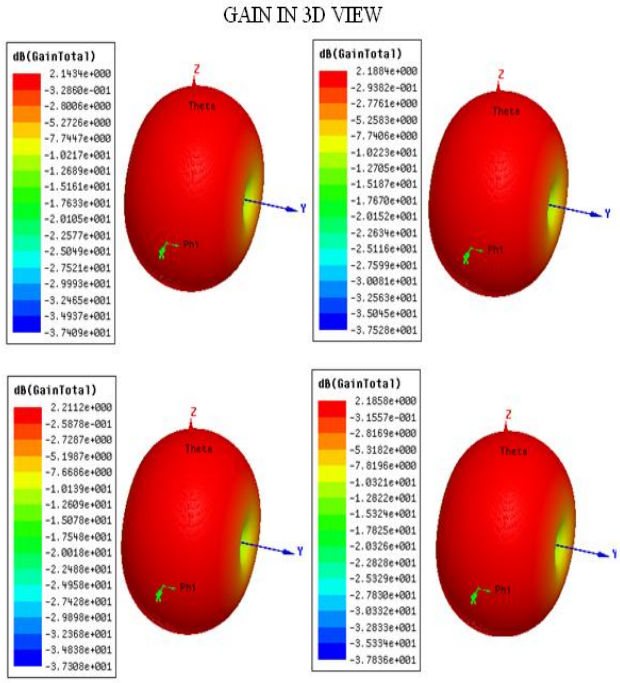


**Fig [4] gain in 3D Curves a) 0.25cm arm width b) 0.5cm arm width c) 0.75cm arm width d) 1cm arm width**

### D. *Gain in Top view*

For easy understanding the total gain is represented in top view in the following figure [5].

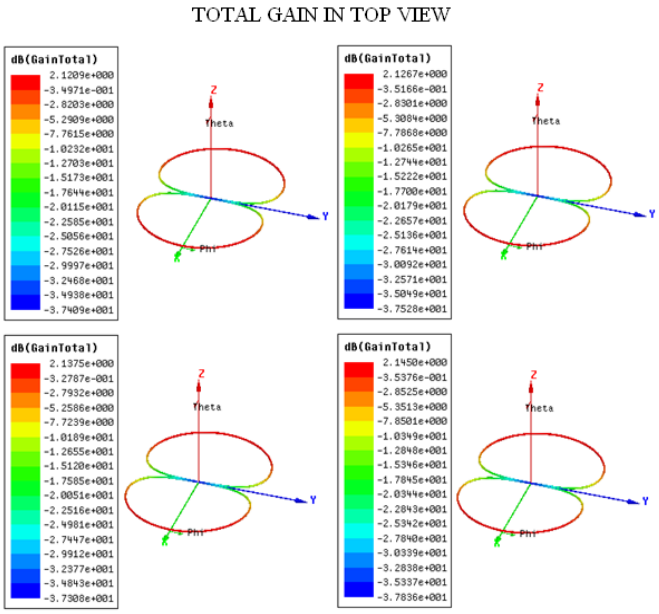


**Fig [5] Total gain in top view a) 0.25cm arm width b) 0.5cm arm width c) 0.75cm arm width d) 1cm arm width**

### E. *Radiation Pattern*

The comparison or radiation pattern curves is illustrated in the figure [] and there is only slight variations in the radiation pattern curves when the arm width is increased gradually from 0.25cm to 1cm.

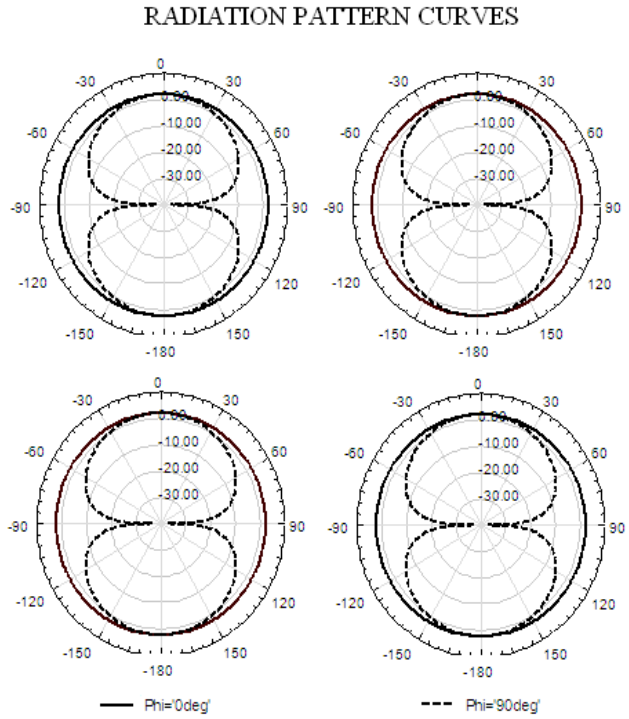


**Fig [6] Radiation pattern curves a) 0.25cm arm width b) 0.5cm arm width c) 0.75cm arm width d) 1cm arm width**

### F. *Mesh Analysis*

The below figure [7] shows mesh analysis report in other words the current distribution in radiating element and substrate from the figure [1] we can observe that the

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distribution is thick or very concentrated at radiating elements for 0.25cm with arm but the distribution gradually decreases at radiating element for 0.5cm, 0.75cm and finally it become less for 1cm arm width.

MESH ANALYSIS FOR ANTENNA

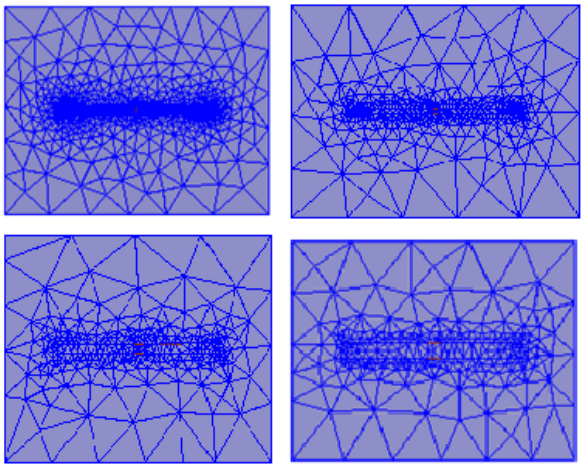

**Fig [7] Mesh analysis a) 0.25cm arm width b) 0.5cm arm width c) 0.75cm arm width d) 1cm arm width**

**Table I: Antenna Specifications**

| S.NO | Width of the arm | Operating freq | Return loss |
|---|---|---|---|
| 1 | 0.25 cm | 0.8417 GHz | -21.8286 dB |
| 2 | 0.5 cm | 0.8568 GHz | -30.9700 dB |
| 3 | 0.75 cm | 0.8518 GHz | -59.4736 dB |
| 4 | 1 cm | 0.8467 GHz | -34.0583 dB |

The above table [1] shows the operating frequency and return loss values for arms width 0.25cm, 0.5cm, 0.75cm and 1cm from the table we can say that for the arm width of 0.75cm which is operating at 0.8518 GHz the return loss is very low and is -59.4736dB.

**Table II: Antenna Parameters**

| Quantity | At 0.25 cm width | At 0.5 cm width | At 0.75 cm width | At 1 cm width |
|---|---|---|---|---|
| Max U | 0.129496 (W/sr) | 0.131606 (W/sr) | 0.132402 (W/sr) | 0.131579 (W/sr) |
| Peak Directivity | 1.64752 | 1.66295 | 1.66834 | 1.66221 |
| Peak Gain | 1.63811 | 1.65517 | 1.66386 | 1.65416 |
| Peak Realized Gain | 1.62734 | 1.65384 | 1.66386 | 1.65351 |
| Radiated Power | 0.987748 (W) | 0.994522 (W) | 0.997312 (W) | 0.994769 (W) |
| Accepted Power | 0.993424 (W) | 0.999198 (W) | 0.999999 (W) | 0.999609 (W) |
| Incident Power | 1(W) | 1(W) | 1(W) | 1(W) |
| Radiation Efficiency | 0.994286 | 0.99532 | 0.997314 | 0.99515 |
| Front to Back Ratio | 1.00527 | 1.00591 | 1.00568 | 1.00423 |

The table [2] shows the comparative analysis of antenna parameters for the proposed antenna with different arm width by observing the table we can say that the antenna parameter values are better for the antenna having 0.75cm arm width.

## IV. Conclusion

From this analysis we can see that as the width of the Dipole arm increases the antenna parameters changes but out of the four analysis the antenna gives better results for 0.75cm arm width so that it is most suitable antenna and also the best thing is that antenna with 0.75cm Dipole arm width gives least loss which is of -59dB so that its more reliable to design the Planar Dipole antenna at 1GHz frequency with 0.75cm arm width.

## REFERENCES

[1] Sasaki, Daisuke, A planar folded dipole antenna for handset .IWAT 2005. IEEE International Workshop.

[2] R. Zhang, G. Fu, Z.-Y. Zhang, and Q.-X. Wang, "A wideband planar dipole antenna with parasitic patches," Progress In Electromagnetic Research Letters, Vol. 20, 137-145, 2011.

[3] Farahiyah Mustafa, RF Characteristics of Planar Dipole Antenna for Direct Integration with AlGaAs/GaAsSchottky Diode. October 20-23, 2009, Bangkok, THAILAND.

[4] S. A-Sa, P. Krachodnok, A Planar Resonator Antenna Using Folded Dipole with Re°ective Walls PIERS Proceedings, Kuala Lumpur, MALAYSIA, March 27{30, 2012.

[5] K. Gosalia, M. S. Humayun, and G. Lazzi, "Impedance matching and implementation of planar space-filling dipoles as intraocular implanted antennas in a retinal prosthesis," IEEE Trans. Antennas Propag. vo 53, no. 8, pp. 2365–2373, Aug. 2005.

[6] Steven R. Best, Optimization of the Bandwidth of Electrically Small Planar Antennas, The MITRE Corporation.

[7] Md. Maruf Ahamed, Rectangular Microstrip Patch Antenna at 2GHZ on Different Dielectric Constant for Pervasive Wireless Communication, (IJECE) Vol.2, No.3, June 2012, pp. 417 ~ 424.

[8] K.V. Rop, D.B.O. Konditi, PERFORMANCE ANALYSIS OF A RECTANGULAR MICROSTRIP PATCH ANTENNA ON DIFFERENT DIELECTRIC SUBSTRATES,IISTE Vol 3, No 8 (2012) .

[9] Ali A. Dheyab Al-Sajee and Karim A. Hamad, IMPROVING BANDWIDTH RECTANGULAR PATCH ANTENNA USING DIFFERENT THICKNESS OF DIELECTRIC SUBSTRATE, ARPN Journal of Engineering and Applied Sciences, VOL. 6, NO. 4, APRIL 2011.

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## AUTHOR BIOGRAPHY

**Ranga Rao Orugu**, was born in A.P,India, Completed M.Tech in Communication Systems at C.R.Reddy engineering College, Eluru and B.Tech from Sri Sarathi Institute of engineering and technology in the year 2009 in Electronics &Communication engineering. Worked as Assistant professor in SVSE and ALIET. And presently he is working as Asst.Professor in Vishnu Institute of Technology, Bhimavaram, A.P, India.His research interests in communications.

**Prof. K. Srinivas** was born in A.p,India. He has 22 years of experience in different colleges and presently working as Vice principal and HOD of the ECE dept in Vishnu Institute of Technology, Bhimavaram his area of research interest in VLSi and wireless communications.

**V.Rama raju.** Was born in A.P India. He completed his M.Tech in Vellore Institute Of Technology, Specialization in Communication Systems. And he has Teaching Experience of 9 years and presently working as Associate Professor in VIT, Bimavaram, his area of research is Wireless Communications.

**Ch. Rama Krishna** was born in A.P, India. And he completed his M.Tech in JNTUK in 2008. and he has totally 11 years experience. Presently he is working as Associate professor in VIT, Bimavaram. His area of research is Antenna and wave propagation.

**D.N. BHUSHAN BABU** was born in A.P,India, Completed M.Tech in Remote Sensing at ANDHRA UNIVERSITY College of engineering, Vishakhapanam and B.Tech from Nimra College of engineering and technology in the year 2008 in Electronics &Communication engineering. Presently he is Working as Asst.Professor in ANDHRA LOYOLA college of Engg.& Technology, Vijayawada,A.P,India.His research interests in communications and Image Processing.