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A Multiband Microstrip Yagi Antenna for C band Applications

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***Abstract**: In this paper, the design of microstrip yagi uda antenna for multi bandwidth applications is proposed. The designed microstrip yagi uda antenna consists of double dipole, the pair of reflector and three parasitic elements that improve the results of antenna. The design antenna is simulated on substrate with dielectric constant of 4.4, loss tangent of 0.02 and height of 1.6 mm. The antenna has achieved directivity of 7.45 dBi, gain of 5.74 dB, return loss of -29.70 dB and high efficiency.*

Keywords: Yagi Uda antenna, Advanced Design System (ADS)

I. INTRODUCTION

The most common antenna used for the communication system is yagi uda antenna, it is preferred because of it's, low cost and directivity[2]. With the growth in communication system they are used in many applications such as in radar, medical, industrial and wireless communication, where there is a need of an antenna which provides a directional beam in particular direction, which is obtained by the yagi- uda antenna[3].In order to enhance the antenna characteristics, the driven element, reflector and parasitic element of microstrip yagi uda antenna are arranged on the same substrate[4]. To increase the gain of antenna the director is placed near the driven element[5]. The simple yagi uda antenna has, One reflector, one driven element and one or more parasitic elements, in which reflector reflects the power forward and highest gain is achieved at the axis of director and on its side. Most yagi uda antenna consists of large ground plane that act as the reflector which is not perfect for the radiation pattern optimization of yagi uda antenna. So, the proposed antenna consists of a pair of reflector, three directors and small ground plane[4]. The small ground plane is used as reflector for the suitable optimization of radiation pattern and the three directors are used to increase the gain of antenna. Compare to one and two director the gain had increase by the use of three directors. The small ground plane had increases the antenna efficiency compares to large ground plane. The designed antenna is simulated by Advanced Design System. The antenna has achieved good radiation pattern, high efficiency, gain and proper impedance matching with load. It yields better results at different bandwidth.

II. CONFIGURATTION AND DESIGN STRATEGY

The proposed microstrip yagi uda antenna is shown in figure 1. It is fabricated on FR-4 substrate with $\varepsilon r = 4.4$ with loss tangent of 0.02, thickness of 1.6 mm, the length and width of 100mm. The antenna consists of double dipole which is parallel to each other but different in length, and it is also designed with three directors each of different length and width placed above one another with

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different distance from each other and the dipole, the distance between the dipole and the first director is more when compared to the distance between the consecutive directors .It has very thin feed line[8]. The feeding technique used here is microstrip feed technique. Moreover thin feed line will tend to give better return loss when compared to thick ones. Due to absence of large ground plane it is easy to place the pair of reflectors which optimizes the radiation pattern[6]. The dimensions of proposed antenna given in table 1.

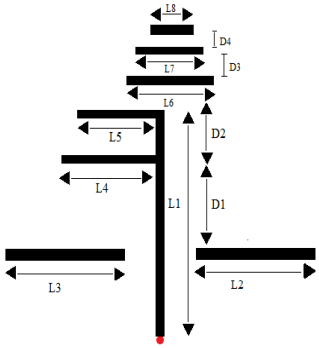

Figure 1: Schematic configuration of proposed Yagi uda antenna

Table1
Design Parameters of the proposed yagi uda antenna shown in Figure 1

Parameter	Dimension (mm)	Parameter	Dimension (mm)
L1	67	L9	103
L2	34	D1	10
L3	34	D2	12
L4	20.79	D3	5
L5	18	D4	4
L6	20	W1	2
L7	18	W2	22
L8	16		

L1 = length of microstrip connected to both dipole and fed point.
L2 & L3 = length of reflectors.
L4 & L5 = length of dipoles.
L6, L7 & L8 = length of parasitic element.

D1 = distance between reflector and second dipole.
D2 = distance between dipoles.
D3 & D4 = distance between parasitic element.
W1 = width of microstrip.
L9 & W2 = length and width of ground plane.

III. RESULTS AND DISCUSSIONS The proposed yagi uda antenna is simulated by using Advanced Design System(ADS) . As can be seen from the plot, the antenna operates from 4 GHz - to 8 GHz covering the required C band. The simulated result shows that the antenna is well matched using the Microstrip-fed structure whilst still achieving the required bandwidth covering the C-band .The gain of the antenna for frequencies from 4 GHz to 8 GHz is shown in

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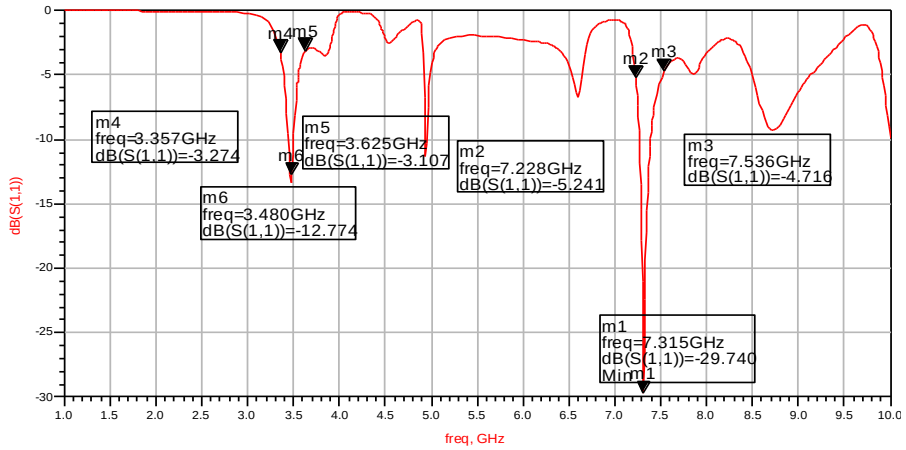

Figure2: Return loss performance of the antenna

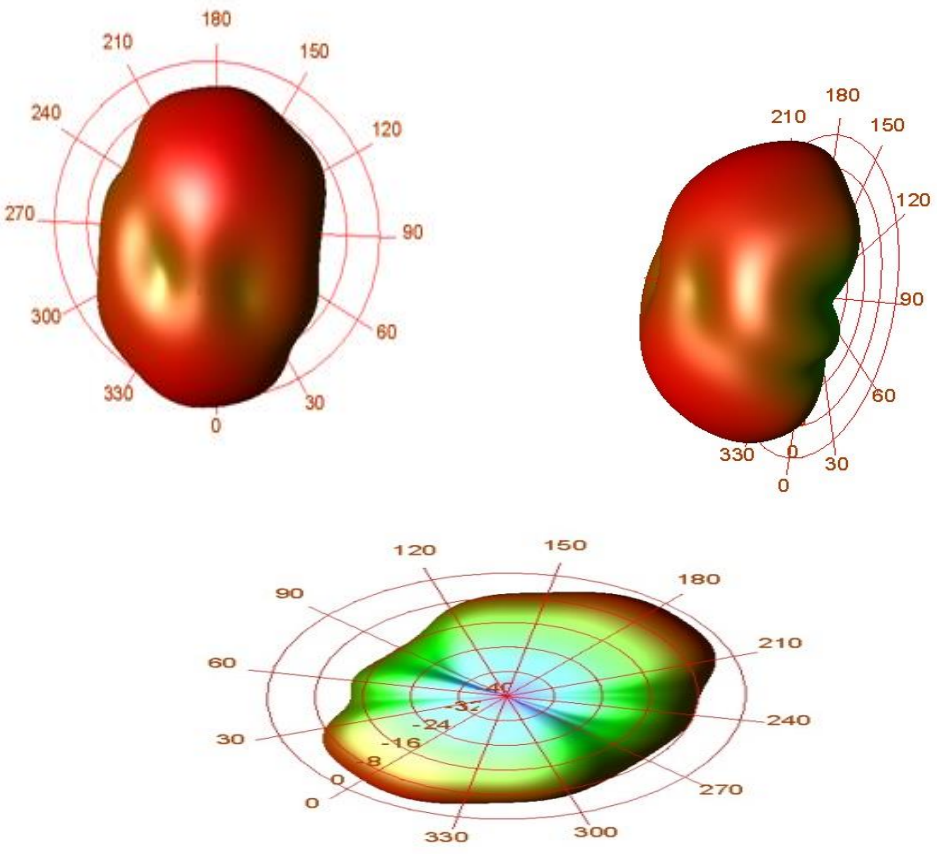

Figure3: Three Dimensional Radiation pattern

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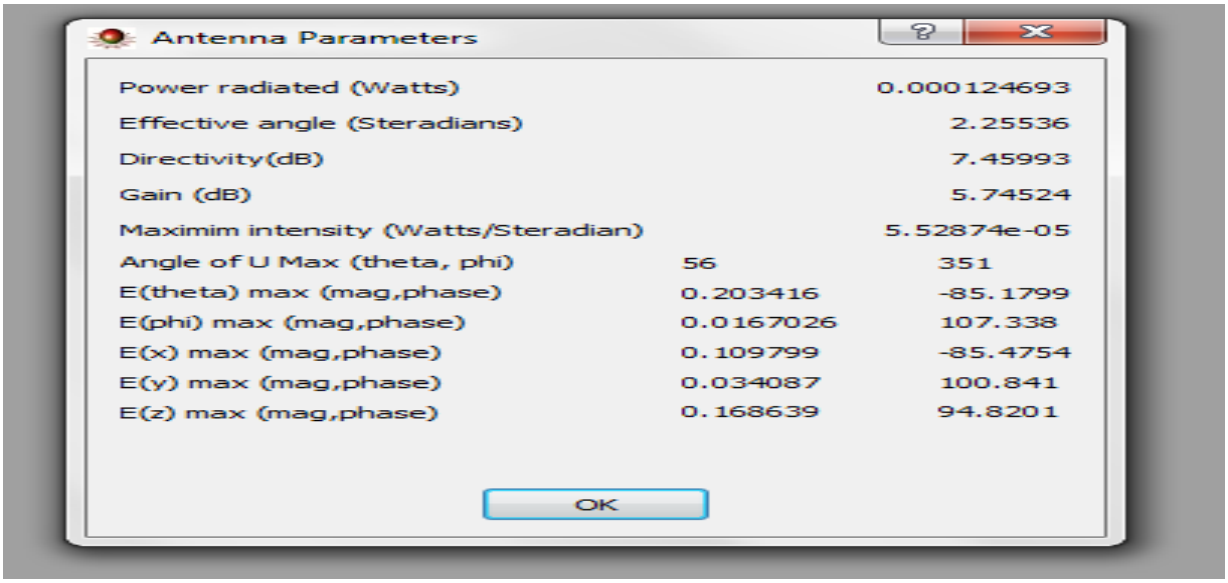

Figure 4: Antenna Parameters

IV.CONCLUSION

A Microstrip-fed antenna has been presented with two dipoles and three directors of different length has been simulated .The radiation pattern, return loss ,frequency, gain ,directivity of the antenna is measured and shown in the figure 2,3,4.This antenna operates in the C band frequency and has a wide range of applications .This antenna is small in size indicating that it is a good candidate for phased arrays.

V.REFERENCES

1. Sun, B.-H., S.-G. Zhou,Y.-F.Wei, and Q.-Z. Liu, "Modified two-element Yagi-Uda antenna with tunable beams," *Progress In Electromagnetics Research*, Vol. 100, 175-87, 2010.
2. Bemani, M. and S. Nikmeh, "A novel wide-band microstrip Yagi-Uda array antenna for WLAN applications," *Progress In Electromagnetics Research B*, Vol. 16, 389-406, 2009.
3. Misra, I. S., R. S. Chakrabarty, and B. B. Mangaraj, "Design,analysis and optimization of *V* -dipole and its three-element Yagi-Uda array," *Progress In Electromagnetics Research*, PIER 66, 137-156, 2006.
4. S.K. Padhi and M.E. Bialkowski, "Parametric Study of a Microstrip Yagi Antenna", Proceedings of the Asia-
5. Pacific Microwave Conference, PP: 715-718, Dec. 2000.
6. Lee, K. F., et al., "Microstrip antenna array with parasitic elements," *IEEE Antennas and Propagation Society Symposium Dig.*, 794-797, Jun. 1987.
7. Chen, C. A. and D. K Cheng, "Optimum element lengths for Yagi-Uda arrays," *IEEE Trans. Antennas and Propagation*, Vol. 23, Jan. 1975.
8. K.D.Prasad,"Antenna & Wave Propagation", 3rd Edition, Satya Prakashan, 2005.
9. David M. Pozar, "Microwave Engineering", 3rd Edition, John Wiley & Sons, 2004.

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