International Conference on Systems, Science, Control, Communication, Engineering and Technology 2015 [ICSSCCET 2015]

ISBN	978-81-929866-1-6
Website	icssccet.org
Received	10 - July - 2015
Article ID	ICSSCCET030

VOL	01
eMail	icssccet@asdf.res.in
Accepted	31- July - 2015
eAID	ICSSCCET.2015.030

A COMPACT PRINTED QUASI YAGI ANTENNA FOR WIRELESS APPLICATIONS

R Neethu[1], A Manikandan[2], S Anbarasu[3]
[1, 2, 3] Assistant Professor, Department of ECE,
Karpagam Institute of Technology, Coimbatore,Tamilnadu,India

Abstract: *A compact planar printed quasi-Yagi antenna is presented. The proposed antenna consists of a microstrip line to slotline transition structure, a driver dipole and two parasitic strips. The driverdipole is connected to the slotline through coplanar stripline (CPS). A compact planar printed quasi-Yagi antenna is presented. The proposed antenna consists of a microstrip line to slot line transition structure, a driver dipole and two parasitic strips. The driver dipole is connected to the slotline through coplanar stripline (CPS). This "quasi-Yagi" antenna achieves a measured 48% bandwidth for VSWR<2, better than 12 dB front-to-back ratio, smaller than -15 dB cross polarization, 3–5 dB absolute gain and a nominal efficiency of 93% across the operating bandwidth.and a nominal efficiency of 95%.*

Key words: Quasi-Yagi antenna, size reduction, unidirectional radiation pattern, wideband antenna.microstrip antennas.

I. INTRODUCTION

Yagi antennas have been widely used to obtain unidirectional radiation and high gain due to their simple structures [1]. Since the microstrip-fed quasi-Yagi antenna was first introduced by Huang in 1991[2], the planar printed quasi-Yagi antenna has attracted much attention owing to the advantages such as low profile, light weight, ease of fabrication and installation, etc., [3], [4].In this paper, we report a new type of planar Yagi–Uda antenna that is well suited to microwave and millimeter wave frequencies. Recently, planar quasi-Yagi antenna have received renewed interest due to its suitability for a wide range of application such as wireless communication systems, power combining, phased arrays, active arrays as well as millimeter-wave imaging arrays. Aim to increase the bandwidth of planar printed quasi-Yagi antennas,many designs have been reported in [5]–[11]. A quasi-Yagi antenna based onmicrostrip-to-slotline transition structurewas presented in [5]. Typical feeding methods utilizedinclude a microstrip feed [1 - 2] or a coplanar waveguide (CPW) feed [3] each requiring a balun to transform the transmission line mode at the input port of the antenna to the coplanar stripline [3]. A modified broadband microstrip-to-coplanar stripline (CPS) balun was used in quasi-Yagi antenna designs for increasing the antenna bandwidth [6], [7]. Approximately 48% and 38.3% bandwidth were achieved by using the microstrip-to-coplanar stripline transition structures in [6] and [7], respectively. However the bandwidths of the antennas are still restricted by the delay line used in the balun structures.

Coplanar waveguide feeding or ultrawideband balun were presented to improve the bandwidth in some designs [8], [9]. A broad bandwidth of 44% was obtained in [8]. The remainder of the communication is organized as follows. The geometry and parameters of the quasi-Yagi antenna are given in Section II. Simulation and measurement results are shown in Section III to demonstrate the effectiveness of the proposed antenna. Conclusions are drawn in the final section.

Cite this article as: R Neethu, A Manikandan, S Anbarasu "A COMPACT PRINTED QUASI YAGI ANTENNA FOR WIRELESS APPLICATIONS." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 144-147. Print.

II.ANTENNA DESIGN

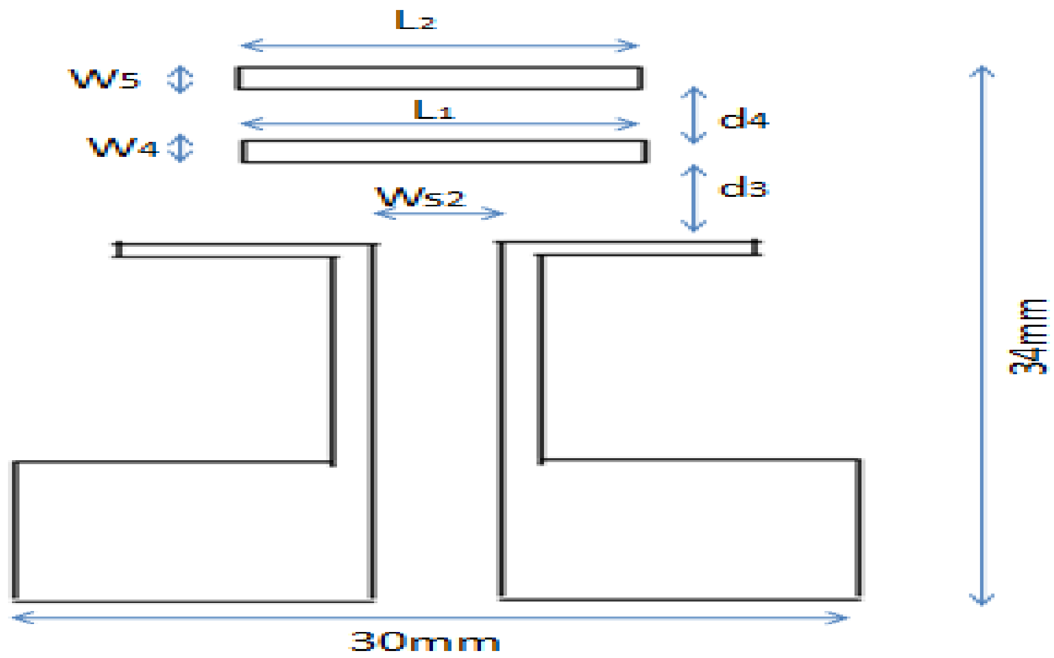

Fig. 1. Geometric structure and parameters of the proposed planar printed quasi-Yagi antenna

Fig. 1 shows the geometric structure and parameters of the proposed planar printed quasi-Yagi antenna. This antenna is printed on a FR-4 substrate with a dielectric constant of 4.4 and a thickness of 0.8 mm.The antenna is placed at xoy-plane. The xoy-plane is used as E-plane and the yoz-plane is set as H-plane. As can be seen from the figure, the antenna consists of two director elements, a driven element and a ground plane acting as a reflector. The antenna is fed by a CPW transmission line and as can be seen from Fig. 1 The top metallization consists of a microstrip feed, a broadband microstrip-to-coplanar stripline (CPS) balun and two dipole-elements, one of which is the driver element fed by CPS, and the second dipole being the parasitic director. The driver dipole is connected to the ground plane through coplanar stripline (CPS). The width of the ground plane equals to the lengthof the driver dipole. Compared with conventional planar quasi-Yagi antennas, the lateral size of the proposed antenna is reduced by modifying the ground plane. It is achieved by symmetrically adding two extended stubs to a flat ground plane. The microstrip line to slotline transition between the MS line and the CPS line is used to match the input impedance of the antenna to a 50- feeding line. In order to get agood impedancematching, a steppedmicrostrip feeding line is adopted. The width of the microstrip feeding line is fixed at 1.5 mm to achieve 50- characteristic impedance. The metallization on the bottom plane is a truncated microstrip ground, which serves as the reflector element for the antenna. The parasitic director element on the top plane simultaneously directs the antenna propagation toward the endfire direction, and acts as an impedance matching element.

Antenna Dimensions:
L=19.2 mm
W=29 mm
Ldir=3.73 mm
Sdirl=Sdir2=0.96 mm
Wdri Wdirl=Wdir2=0.96 mm
Ldir=11.5 mm
w=1 mm
L1=7.61 mm
L2=8.61 mm
Srd=9.69 mm
Sref=5.69 mm.

Cite this article as: R Neethu, A Manikandan, S Anbarasu "A COMPACT PRINTED QUASI YAGI ANTENNA FOR WIRELESS APPLICATIONS." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 144-147. Print.

III.EXPERIMENTAL RESULTS

The designed antenna was fabricated with the optimized parameters. The difference between the simulated and the measured results is due to the effect of the SMA connector and fabrication imperfections. In order to demonstrate the radiation characteristics of the quasi-Yagi antenna, its radiation patterns are measured.

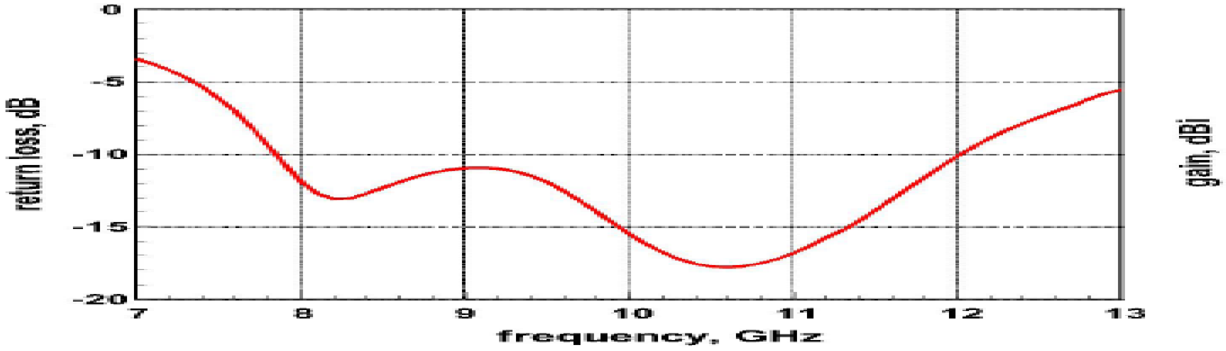

Figure 3:Return loss performance of the antenna

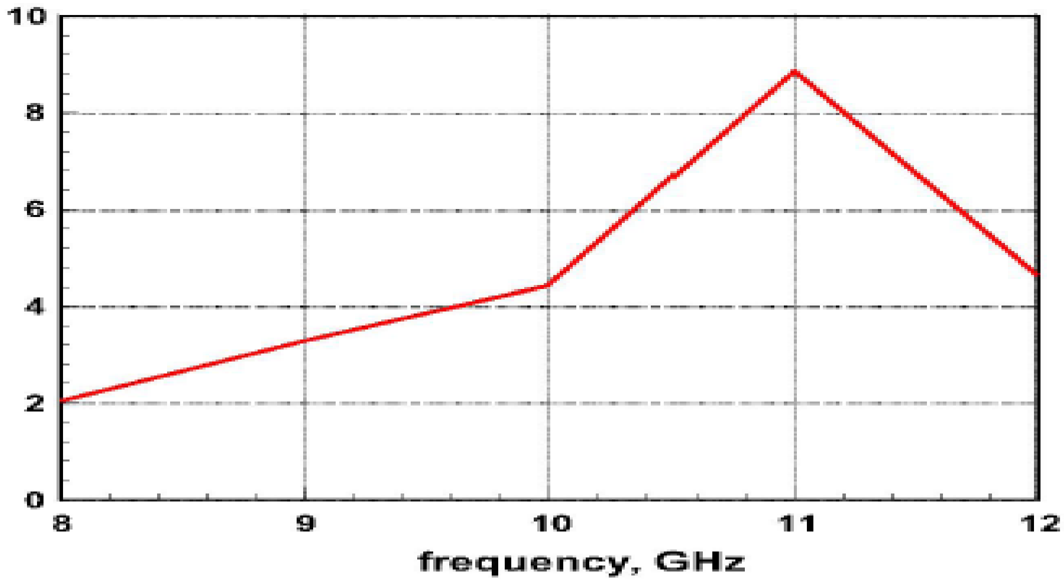

Figure 4:Gain of the antenna

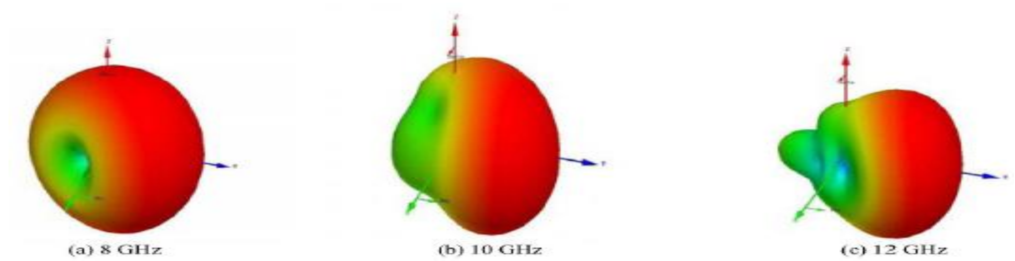

Figure 5:Three dimensional radiation pattern

IV.CONCLUSION

A planar printed quasi-Yagi antenna with size reduction is designed and experimentally studied in this communication. The antenna consists of a microstrip line to slotline transition structure, a driver dipole and two parasitic strips. Two extended stubs are symmetrically added to the ground plane. A coplanar waveguide-fed antenna has been presented. The antenna is the simplest form of a planar quasi-Yagi and it does not require any complicated balun structure and is unipolar. The 10 dB return loss bandwidth of the antenna is 40 % and showed directive radiation properties. In addition, the measured group delay of the antenna shows that this planar

Cite this article as: R Neethu, A Manikandan, S Anbarasu "A COMPACT PRINTED QUASI YAGI ANTENNA FOR WIRELESS APPLICATIONS." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 144-147. Print.

quasi-Yagi antenna has a good time-domain characteristic, which means that a transmitted signal will not be seriously distorted by using this printed quasi-Yagi antenna.

V REFERENCES

[1] K. Han, Y. Park, H. Choo, and I. Park, "Broadband CPS-fed Yagi-Uda antenna," *Electron. Lett.*, vol. 45, no. 24, Nov. 2009.
[2] R. A. Alhalabi and G. M. Rebeiz, "Differentially-fed millimeter-waveNYagi-Uda antennas with folded dipole feed," *IEEE Trans. Antennas Propag.*, vol. 58, no. 3, pp. 966–969, Mar. 2010.
[3] S. X. Ta, S. Kang, and I. Park, "Closely spaced two-element foldeddipole- driven quasi-Yagi array," *J. Electromagn. Engrg. Sci.*, vol. 12, no. 4, pp. 254–259, Dec. 2012.
[4] P. T. Nguyen, A. Abbosh, and S. Crozier, "Wideband quasi-Yagi antenna with tapered driver," in *Proc. Asia-Pacific Conf. on Antennas and Propagation*, Singapore, Aug. 2012, pp. 138–139.
[5] K. Jiang, Q. G. Guo, and K. M. Huang, "Design of a wideband quasi- Yagi microstrip antenna with bowtie active elements," in *Proc. Int. Conf. onMicrowave andMillimeterWave Technology (ICMMT)*, 2010, pp. 1122–1124

Cite this article as: R Neethu, A Manikandan, S Anbarasu "A COMPACT PRINTED QUASI YAGI ANTENNA FOR WIRELESS APPLICATIONS." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 144-147. Print.