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VHF Band Yagi-Uda Antenna with Additional Two Reflectors

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Abstract: ***In this paper, a VHF Band Yagi-Uda Antenna With additional two reflectors is present here to be used in VHF (146-174 MHz) band. This is very better compared to normal 3 element Yagi-Uda antenna with respect to Gain, Polar Plots, and Directivity. The antenna is designed using aluminum rods easily available in market and tested at frequency 158.6 MHz. All the results are taken physically using in vertical plane with help of wireless communication service monitor, Motorola GP339 (VHF) handset. h***

Keywords: Special Yagi-Uda antenna, wireless Communication Service Monitor, Motorola GP339 (VHF) Handheld set.

Index Items: Wireless communication, Special Yagi-Uda antenna design, Antenna testing using Communication Service, Monitor, Vertical polarization, Motorola GP339 (VHF) Handheld Set

1. Introduction

Three element Yagi-Uda antenna is extensively used for VHF (146-174 MHz) band. For its directivity and gain of about 3dbi. The signal behind the reflector (Backlobe) of Yagi-Uda antenna is very poor. There are many situations, where it is required that strong signal should present at a particular points or areas in the backlobe. and very weak signal should be at some points or areas in the backlobe. Hence backlobe should be modifiable as per requirement. In this paper, this is achived by using two additional relectors to basic 3 element yagi-Uda antenna. The basic design of three element yagi-uda antenna is not changed neighter their way of feeding.

2. Design and Principle

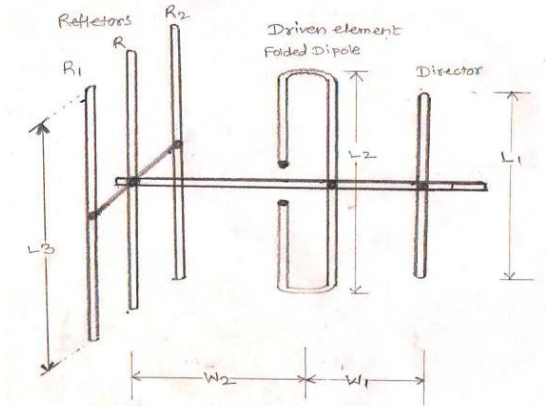

Figure-1

3. Antenna Parameters

1	Frequency Used	f	158.6 MHz
2	Length of Director	L1	81 cm
3	Length of Folded dipole	L2	88 cm
4	Length Reflectors	L3	97 cm
5	Separation between L1 & L2	W1	27 cm
6	Separation between L2 & L3	W2	29 cm
7	Horizontal Separation between Reflectors, R and R1, R and R2	Θ	30^0

The proposed antenna shown in fig-1 is designed at 158.6 MHz frequency. The signal is transmitted from Motorola make type GP339 VHF Handheld Transreceiver. The signal is collected at the proposed antenna and feed to communication service monitor. [Make & Type IFR-2945B]. The same setup is carried out for 3 element yagi, Dipole and results are compared. The same antenna is tested at field and lab results are confirmed.

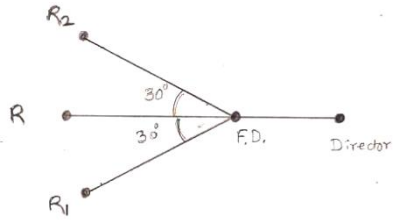

Figure2

Figure-2 shows top View of VHF Band Yagi-Uda Antenna With additional two reflectors

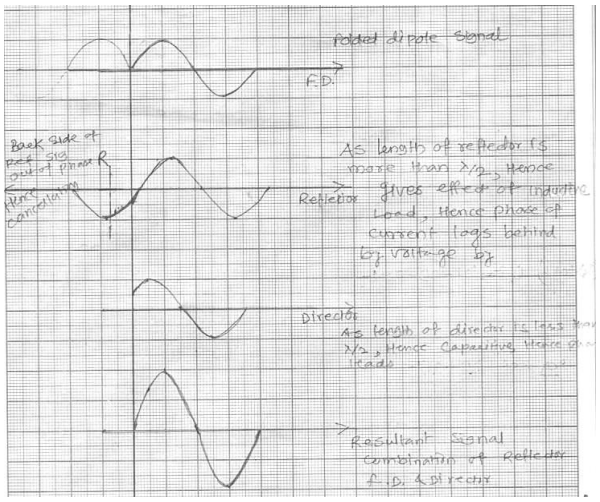

Figure 3

Figure 3 shows how the resultant signal of antenna is improved due to effect of reflector and director.

4. Results

Fig-4 shows radiation pattern of yagi-uda antenna with additional two reflectors. It shows approximate 3.5 db forward gain improvement compared to 3 element yagi, ie upto 10.56 dbm compared to isotropic antenna. This structure modifies backlobe & gives gain in backward direction also on specific area and angle.

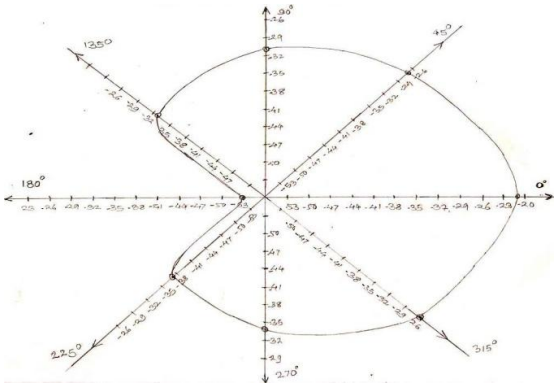

Figure 4

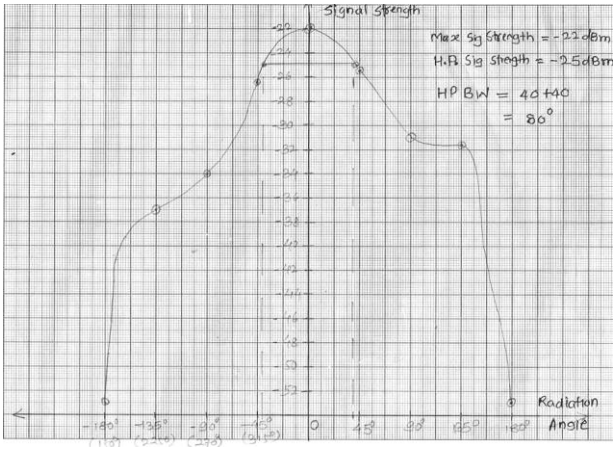

Figure 5

Figure-5 shows half power beamwidth of yagi-uda antenna with additional two reflectors.

5. Measured Parameters of Antenna

- Type:- Yagi-Uda antenna with additional two reflectors
- Input :-FM modulated signal of 158.6 MHz, with 2ppm
- Frequency stability
- Antenna polarization: Vertical
- Signal measured: Communication Service Monitor in dbm
- Coaxial cable: RG 8Au with BNC
- Radio used: Motorola GP339 Handheld Transreceiver.

Sr. No.	Parameter	3 Element Yagi-uda	Yagi-uda with additional two reflectors
1	Gain	7dbi	8.3 dbi
2	Directivity	7 dbi	10.56 dbi
3	Half Power Beamwidth	120^0	80^0
4	F/B ratio	16	31
5	Gain in backward lobe 135^0 , 225^0	--	7 to 8.5 db v/s yagi

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