ELP 725

Wireless Communication Lab

Experiment 1
Study of Basic Antennas

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Submitted By : Group Number 8

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1 OBJECTIVES

To plot the radiation pattern of simple antenna - Dipole, Monopole, Folded, dipole antenna etc, in E and H planes on log and linear scales on polar plots.

2 OBSERVATIONS

2.1 Observation Table

2.1.1 Observations for Dipole Antenna

S. No.	Phase Difference between Receiver and Transmitter (in degrees)	Received Power (dB)
1	0°	58
2	15°	58
3	30°	60
4	45°	69
5	60°	63
6	75°	72
7	90°	76
8	105°	68
9	120°	62
10	135°	60
11	150°	59
12	165°	59
13	180°	58
14	195°	60
15	210°	61
16	225°	63
17	240°	64
18	255°	65
19	270°	69
20	285°	67
21	300°	73
22	315°	64
23	330°	62
24	345°	59

2.1.2 Observations for Folded Dipole Antenna

S. No.	Phase Difference between Receiver and Transmitter (in degrees)	Received Power (dB)
1	0°	44
2	30°	43
3	60°	39.9
4	90°	33
5	120°	34.5
6	150°	54.5
7	180°	56
8	210°	52.5
9	240°	49.3
10	270°	45.9
11	300°	49.1
12	330°	51.5
13	360°	54.2

2.1.3 Observations for Monopole Antenna

S. No.	Phase Difference between Receiver and Transmitter (in degrees)	Received Power (dB)
1	0°	69
2	15°	67.4
3	30°	66
4	45°	57.9
5	60°	55.7
6	75°	45.9
7	90°	56.4
8	105°	61.7
9	120°	59.4
10	135°	64.7
11	150°	65.6
12	165°	63.2
13	180°	62.6
14	195°	64.7
15	210°	63.9
16	225°	42.9
17	240°	47
18	255°	62.2
19	270°	66.8
20	285°	69
21	300°	70
22	315°	69.9
23	330°	71.1
24	345°	70.9
25	360°	72

2.1.4 Observations for Yagi Uda Antenna

S. No.	Phase Difference between Receiver and Transmitter (in degrees)	Received Power (dB)
1	0°	59
2	30°	58
3	60°	54.8
4	90°	55.3
5	120°	55.8
6	150°	56.4
7	180°	55.6
8	210°	53.1
9	240°	53.5
10	270°	54
11	300°	55.1
12	330°	58.2
13	360°	58.8

2.2 Radiation Pattern Plot

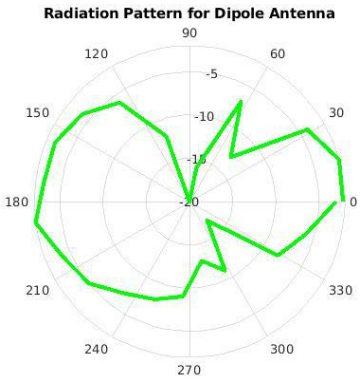


Figure 1 - Dipole Antenna

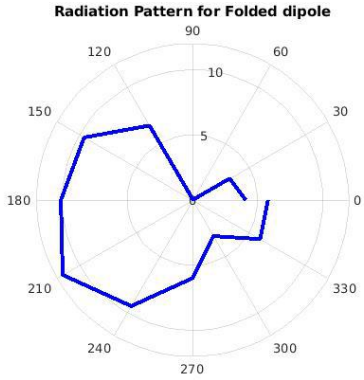


Figure 2 - Folded Dipole Antenna

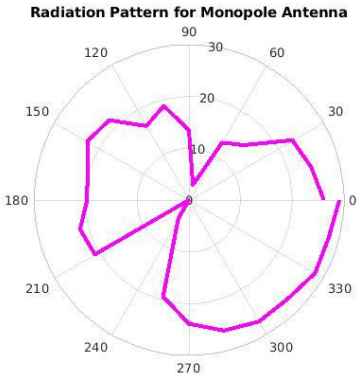


Figure 3 - Monopole Antenna

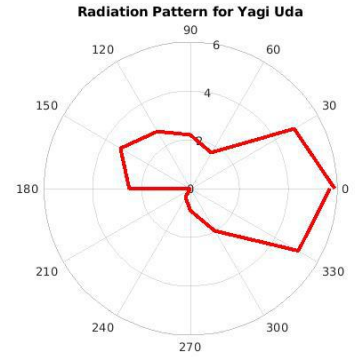


Figure 4 - Yagi Uda Antenna

3 Analysis

1.	Antenna Test frequency (f)	600 MHz
2.	Antenna Test Wavelength (λ)	25 cm
3.	Rayleigh Distance, near field-Far field boundary (L is the maximum dimension of the antenna in m.)	196cm
4.	Distance between the two antennas R	1 m
5.	Power fed to the transmitting antenna (Pt)	27.35 dBμ
6.	E-plane –3dB bandwidth of the antenna ($\theta°_{HP}$)	
	• Dipole Antenna	85°
	• Folded Dipole Antenna	103°
	• Monopole Antenna	75°
	• Yadi Uda	84.19°

4 Conclusions

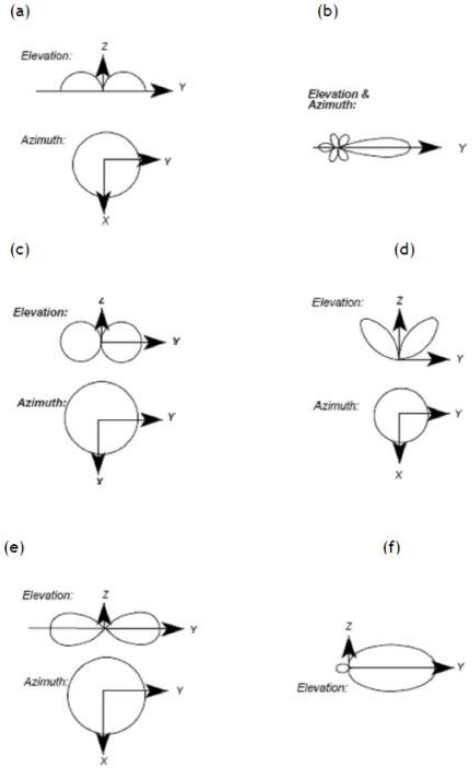
The observed readings helped us plot the radiation pattern of Dipole, Monopole, Folded Dipole and Yagi Uda Antenna. The pattern thus obtained approximates the actual radiation pattern of these antennas. This completes the study of basic antennas.

5 Quiz

1. What will happen if a conducting plate is placed behind the dipole?

Ans. The dipole antenna starts behaving as a monopole antenna as the plates reflect back all the radiation coming towards it.

2. Identify the type of antenna associated with following radiation pattern?



Ans. The antenna shown are as following :

a) Monopole
b) Yagi Uda
c) Half Wave Vertical Dipole
d) Small Loop Antenna
e) Quarter Wave Vertical Dipole
f) Folded Dipole

3. List the factors on which the shape of overall pattern of an antenna array depends?

Ans. The shape of overall pattern of an antenna array will depend on following factors like, separating distance between elements of antenna array, amplitude, phase shift of feed in each elements, numbers of elements in array.

4. What will happen if a folded dipole is attached to 5V AC, 50 MHZ signal?

Ans. The antenna will start radiating a strong electromagnetic wave than before.

5. What will happen if a folded dipole is attached to 230V AC,50 Hz main supply?

Ans. The antenna will start radiating a very weak electromagnetic wave than before.

6. When a 5V DC is applied across a folded dipole antenna, will it radiate energy? Justify your answer.

Ans. There will be no electromagnetic radiation from the antenna. It can be understood by above equation also. As for DC w=0 Hence no radiation can take palce. Also a time varying current waveform is needed to set up an alternating electromagnetic field. Since DC current sets up a static field, the antenna will not radiate.

7. "The Dipole antenna is extremely flexible". Justify the statement?

Ans.

1. Dipole antennas are symmetric about their axis. Hence they are naturally balanced antennas.Due to the symmetric nature this antenna can get signals from a variety of frequency types and minimizes problems relating to unbalanced signals or conflicting signals.

2. Dipole antennas can move, which allows antennas to pick up more signals. Any dipole antenna can move horizontally, vertically and at a slant to pick up a wide variety of radio signals, which provides more options.

8. A Hertz half wave dipole antenna is aligned along X-axis. Where radiation peak will occur.

Ans. As Hertzian dipole has radiation null towards it aligned position and maxima at orthogonal position hence the peak will occur along the Y-axis.

9. How does a radiation pattern depend upon the radius on antenna element?

Ans. As gain of any antenna in any direction directly defines the radiation pattern for that antenna and for any antenna gain is given by $G = 4\pi A_e = \lambda 2$, where A_e is effective area which is further given by $A_e = k \times A$, where k = radiation efficiency and $A = \pi r^2$. Hence as the radius of any antenna increases its gain increases resulting in giving higher strength radiation pattern.

10. What will be radiation pattern of dipole antenna, if it will put on ground?

Ans. If dipole antenna will be put on ground,it will be short circuited and as ground works as a perfect reflector. Hence, the antenna radiation will be same as that of a Monopole.