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Performance Analysis of Helical Antenna for Different Physical Structure

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Abstract: *Wireless technology is such of the potent areas of scan in the presence of communication systems today and a design of communication systems is incomplete without a perspective of the activity and fabrication of antennas. Helical antenna is used as easily done and shrewd radiators completely the get by few decades, this antenna can be utilized as an encourage for an explanatory dish for higher additions.. So in this we have varied various parameters of helical antenna. Manipulations for this helical antenna antenna have been done with the assist of Matlab softwar*

Keywords: *helical antennas, Antenna gain, Directivity*.

1. INTRODUCTION

In 1946 Kraus invented the helix form of antenna that is helical antenna. For longer period of time this helical antenna gets famous. [1] Helical antennas are further called as unfiled helix. By the all of diameter D in large helical antenna is revitalizing by a coaxial line along the little ground plane. In communication system helical antenna have a very large approach, so there is a foist of broadband circular polarized antennas [2].This antenna is most significantly used nowadays in point communications, telephone, and television and Information communication. The normal mode helical antenna is particularly attractive for mobile communication and adaptable equipment [3].The shape of helix antenna is a cross breed of two straightforward emanating essentials, the dipole and circle reception apparatuses. A spiral form of this antenna becomes a directly antenna while its distance throughout methods invalid. Alternatively, a helix of suit diameter can be seen as an arc antenna when the spacing mid of the turns vanishes [4]. There are two modes for helical antenna that are regular mode and axial mode. Axial mode helical antenna is big development in space stations and space based radars seeing that supply roundabout polarization on extensive transfer speed without the approach of any for all intents and functions polarizer. [2]

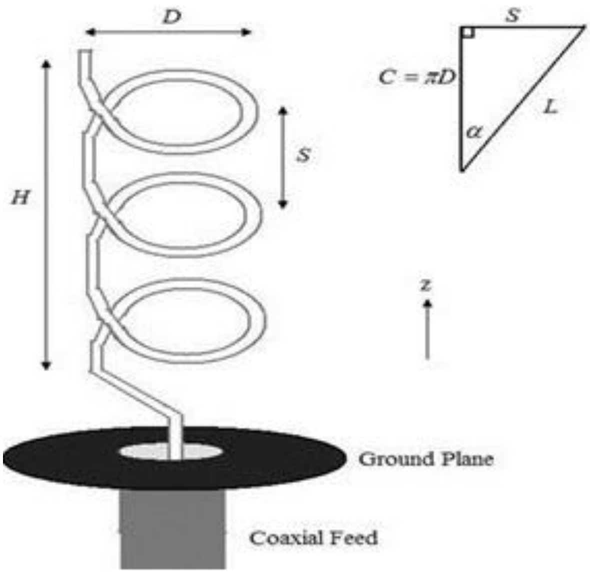

Fig1. *Structure of helix*

The helix in Figure 1 is defined :

D = helix diameter

S = helix turn spacing

N = helix turns

C (=πD)= helix circumference

A(NS)= axial length

α= helix pitch angle

The relationships between the above parameters are obtained as:

$S = L \sin \alpha = C \tan \alpha$

$L = (S 2 + C 2) ^1/2 = (S 2 + \pi 2 D 2)$

2. METHODOLOGY

Matlab simulation of helix antenna is done by antenna toolbox available in Matlab.

The designing specification of helical antenna is given as an input. Radius, ground plane radius, width, spacing, turns is specified as a input. The frequency of operation for helical antenna is determined the command hx = helix ('Radius' parameter, 'Width', parameter, 'Turns', parameter, 'Spacing', parameter, 'Ground Plane Radius', parameter); is used to give input.

Patterns are generated after Matlab simulation whose results are shown below.

3. SIMULATION

To relate the process of this helix antenna (we are more concerned in radiation patterns and antenna parameters like gain, directivity..), we will fabricate an Antenna design, and require the similar frequency range at which the antenna operates. In an antenna simulation, radiation boundaries which are specific features of such a simulation must be situated the radiation surfaces. These surfaces trim the air surrounding the antenna and simulate and anechoic chamber.[5] Computations of directivity and the axial ratio (ar) are presented in this section. The directivity and axial ratio are obtained by varying the radius, spacing, turns, ground plane radius and width of the helical antenna. The following section shows the comparison between the simulation six helical antennas with different parameters. Various patterns of these antennas were produced based on the above given parameter.

Helix can be used as antenna when it is restrictive in size .Normal mode and Axial modes are two type of radiation modes in general applications A Helical antenna commonly measurements essentially littler than wavelength, the advanced may be guessing to be of familiar magnitude and mutually a continuous phase adjoining the helix. The plane perpendicular to helix axis has the maximum radiation. This method is specified as the "normal mode". This field is generally an elliptically polarisable in all direction. At certain conditions the radiation field also be a circular, as the comparison between size and wavelength the size is smaller. There is reticent efficiency and abort bandwidth for normal mode of helical antenna. [4]

When the helical antenna circumference is of the order of a wavelength, then energy of antenna radiates with maximum power density in the direction towards its axis. The axial mode can be determined as the radiation mode of an antenna. The radiation field of axial mode is virtually circularly polarized. The concept of polarization is in the terms of the winding of helix. In fundamental principle to circular polarization, axial mode operates at wide frequency ranges. The radiation characteristics that are circumference and the pitch angle are relatively constant for axial mode. The axial-mode helix possesses a number of restless properties, including wide bandwidth and circularly polarized radiation. The axial mode of operation of helix antenna is found in many devoted applications in communication systems. [4]

Table1. *Input parameters*

Antenna name	Radius	Ground Plane Radius	Width
a.	0.028	0.075	1.2e^-3
b.	0.05	0.075	1.2e^-3
c.	0.06	0.075	1.2e^-3
d.	0.05	0.095	1.7e^-3
e.	0.05	0.10	2.5e^-3
f.	0.05	0.45	2.7e^-3

Table2. *Output Parameters*

Antenna name	Directivity	Axial Ratio(ar)
a.	10.091	25.416
b.	-17.273	2.65
c.	-18.380	8.997
d.	-17.526	2.536
e.	-18.384	2.339
f.	-15.9880	2.559

4. SIMULATION RESULTS

Radiation pattern is the power radiated by an antenna in a field of the crossing position and radial distance from the antenna. Radiation pattern describes the antenna energy. fig. 2 shows the radiation pattern of a directional antenna. The radiation pattern have a dominant lobe and several minor lobes [7]. The antenna radiation pattern is a graphical representation of the radiation properties of the antenna. Generally, the radiation pattern is determined in the far-field division.

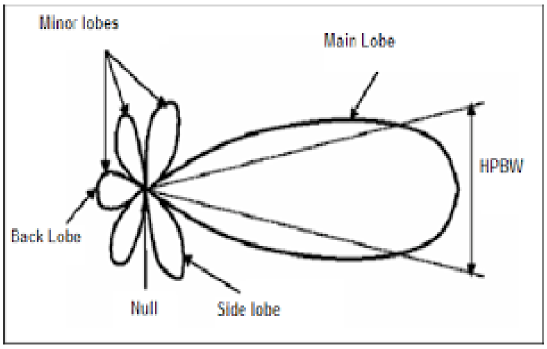

Fig2. *Radiation Pattern*

The two- or three-dimensional partial distribution of radiated energy in the coordinate is of approaching concern In seek after, few plots of example at certain and θ values are utilized to make the set up data. For a linearly polarized antenna, performance is steadily described in terms of its leading E-plane and H-plane patterns. The E-plane is expected as "the plane containing the electric field vector and the direction of maximum radiation," and the H-plane as "the plane containing the magnetic-field vector and the direction of maximum radiation".[8]

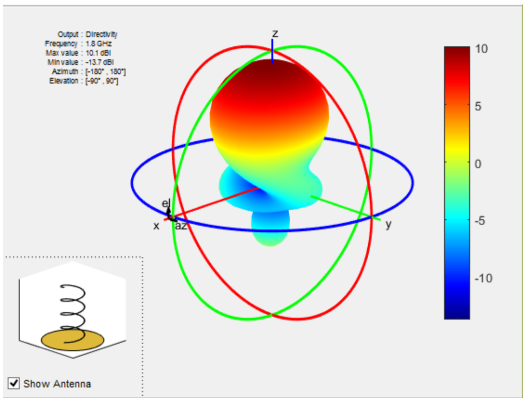

Fig3. *Directivity of Antenna a*

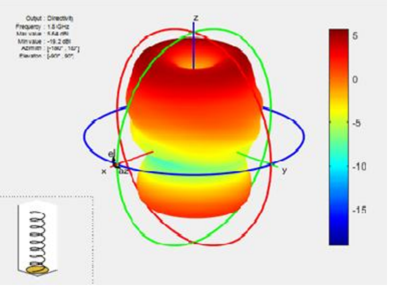

Fig4. *Directivity of Antenna b*

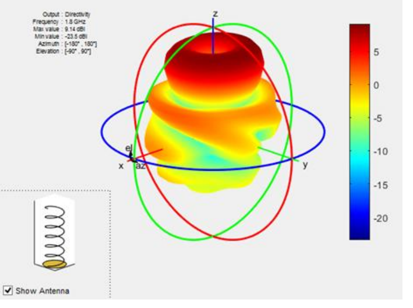

Fig5. *Directivity of Antenna c*

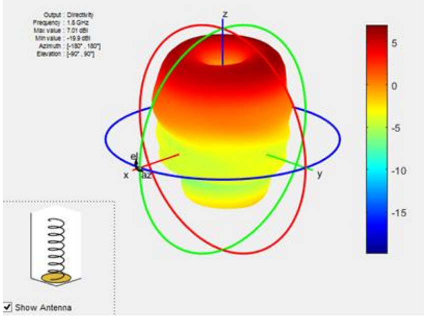

Fig6. *Directivity of Antenna d*

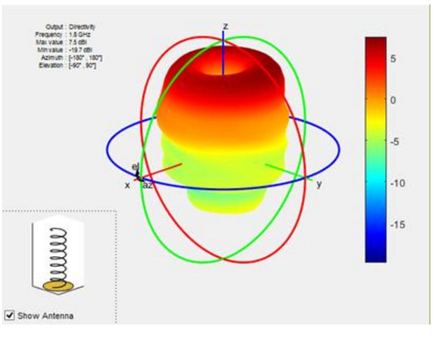

Fig7. *Directivity of Antenna e*

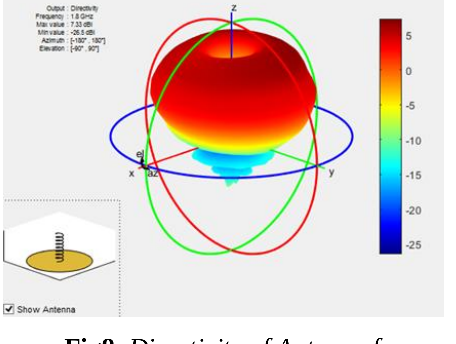

Fig8. *Directivity of Antenna f*

5. CONCLUSION

To expand the gain of helix antenna, from this point forward we lessened the turn dividing between the helix turn. As the turn spacing diminishes then the gain of antenna increments. Likewise the length of conductor and length of antenna diminishes with the abate in spacing. As summarized in Tables when the ground plane radius is 0.075 the radius should not be greater than or equal to 0.065,Further we can say that the width of Helical antenna should be smaller than 0.01 and Greater than 0.0002.

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