International Conference on Interdisciplinary Research in Electronics and Instrumentation Engineering 2015 [ICIREIE 2015]

ISBN	978-81-929866-3-0
Website	www.icireie.org
Received	10 - July - 2015
Article ID	ICIREIE003

VOL	01
eMail	icireie@asdf.res.in
Accepted	31- July - 2015
eAID	ICIREIE.2015.003

DESIGN OF IONOFREE MICRO STRIP QUAD HELIX ANTENNA FOR GPS

Jesavath Kiran Naik[1], R.Dhanasekaran[2], S Muruganand[3], M P Rajesh[4]
[1]Research Scholar, Research and Development Centre, Bharathiar University, Coimbatore-641046, India
[2]Professor, Dept of Electical and Electronics, Syed Ammal Engineering College, Ramanathapuram
[3]Assistant Professor, Dept of Electronics and Instrumentation, Bharathiar University, Coimbatore-641046.
[4]Senior Lecturer, Dept of Electical and Electronics, Gmr Polytechnic, Srisailam-518102, India.

Abstract: *The quad filler helix antenna will furnish circular polarization. If thoughtfulness of micro strip technology the area postulated to place antenna is scaled down and it often furnishes the wide range of radiation and more bandwidth. The concept is enforced GPS receivers for L1/L2 applications. This will scale down ionosphere delays or refractions. L1/L2 designates it maneuvers at two frequencies to concurrently know the time and place of the particular object. One of the major problems with conventional quad filler helix antenna is hard to operate at multi frequencies. Several technologies have been depicted that would have some limitations and advantages with respective time and performance.*

Keywords: Micro strip Quad helix antenna, GPS, Ionosphere refraction.

I INTRODUCTION

Helix antenna is a basic type of radiator and perhaps it is the merest antenna to provide circularly polarized waves or nearly so which are used in extraterrestrial communications in which satellite relays etc. are involved. Helical antenna is broadband VHF and UHF antenna to provide circular polarization characteristics.

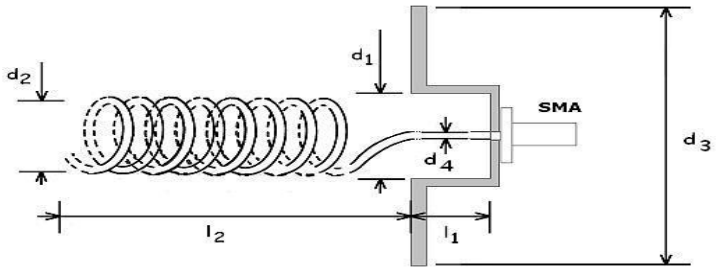

Fig 1.0 Helical antennas

Coaxial line is coincident with the helix axis and the feed wire lies in the plane through helix axis. A helical antenna may radiate in many modes, but prominent modes of radiations are two i.e. normal and axial mode of radiation. It permits you to record or create

Cite this article as: Jesavath Kiran Naik, R.Dhanasekaran, S Muruganand, M P Rajesh. "DESIGN OF IONOFREE MICRO STRIP QUAD HELIX ANTENNA FOR GPS." *International Conference on Interdisciplinary Research in Electronics and Instrumentation Engineering (2015)*: 12-17. Print.

locations from places on the earth and help you navigate to and from those places. The main deviation between micro strip antenna and helix antenna is its more sensitive in the direction along axis whereas helical is sensitive along the axis. By placing 4 helical antennas and design a single antenna is called "Quard filler Helix antenna". Here helical wire as a radiator and fabrication of monopolies which furnishes high performance. It is used for wireless communications [2]. If thoughtfulness of antenna is bent, then the wavelength is decreased. QHF also applicable for half duplex communication because it furnishes positive gain. It lies of 4 antennas conducting and these are offered primary resonant frequency. The first two antennas out of four which furnishes primary resonant frequency and remaining two provide secondary resonant frequency.

QHF maneuvers in different modes of axial, normal or a combination of both. To attain axial mode, the axial length of each antenna is quietly larger than the wavelength in which antenna is to operate and it furnishes a high gain radiation pattern so it says it is high direction. If it is operating in the normal mode helix is fed at the top and arms are of resonant length of 1/4 λ, 1/2 λ. To attain pattern of satellite communication it furnishes quasi-hemispherical radiation pattern. In QHF by honoring above modes of operation, it is limited by power transfer thoughtfulness. This total concept will depend on the voltage standing wave ratio.

The QHA is mere and solution ate to the problem of non geosynchronous satellite research and it is very mere to design particularly for GPS applications. Its provide good horizon overhead direction. Mainly QHA lies of 4 helical antennas which have equal amplitude and phase of 0, 90,180,270 degrees. Over a long reign, these antennas transmit and receives circularly polarized waves. The shape depends on pitch angle, diameter, and shape. These 4 antennas have a separate and different types of phase feeding systems. Phase quadrature that generates separate feeding network. Another alternative approach is a balance approach system with separate 90 degrees pattern. It permits low microwave bands which are L bands and X-bands. One to one type of helix antenna major deviation is back lobe radiation.

The antenna is exciting from the feeding point of ground plane. Below figure lies of patch antenna which is more preferable for GPS applications. It first starts with the ground plane, above ground plane owning a dielectric substrate on the below surface. By thoughtfulness of width and length rations the micro strip antenna or patch antenna is located. That is shown in dark in the figure. Below the micro strip antenna owning a measure of thickness. The directivity of patch antenna is approximately 5-7 dB. The fields are linearly polarized in a horizontal manner. Half wave long patch maneuvers in fundamental mode. By thoughtfulness of electric field is 0 in the center of patch antenna and maximum at one side of the patch and the minimum at the other ended of patch antenna. The phase of the RF signal will vary from taking the minima and maxima thoughtfulness with respect to micro strip antenna. It is often applied theory of TM10 mode.

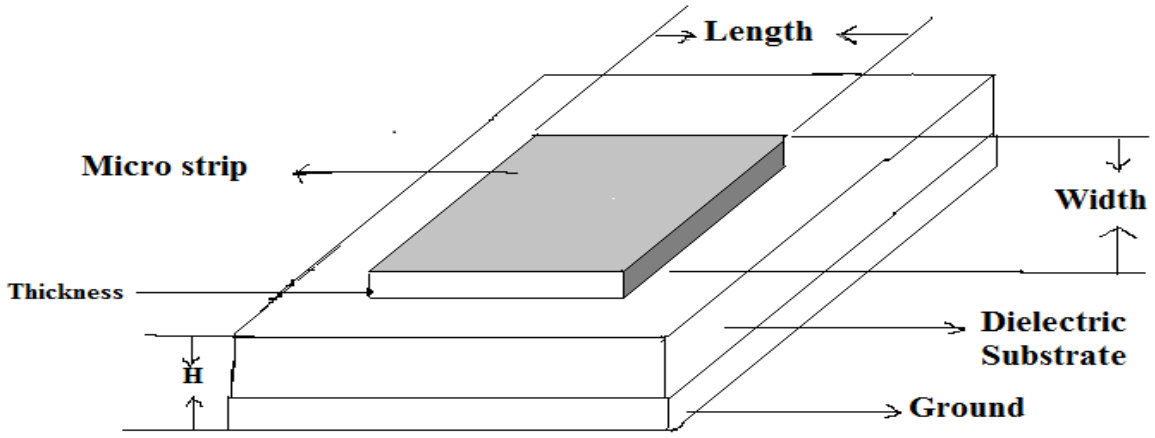

Fig 2.0 Patch antenna

Placing the micro strip or patch on a dielectric substrate above the ground plane. A good antenna furnishes better efficiency, large bandwidth and better radiation, which it is desirable by a thick dielectric substrate with a low dielectric constant. The micro strip antennas used in 10-30 GHz (microwave frequency). Because the size of micro strip antenna is directly tied with wavelength. This antenna generally used at microwave frequencies, these are also called patch antenna. It lies of a metallic patch with relative permittivity and permeability. The advantage is low profile, substrate is thin. If this is like, thin it is flexible to bent conform to bend it a curved surface. An important advantage of this antenna uses 4 helical antennas using the top and ridding of the disadvantage of bottom-fed antenna. Micro strip antenna length $L = \lambda/2\sqrt{\mathcal{E}r}$

Frequency of micro strip antenna $= c/2L\sqrt{\mathcal{E}r} = 1/2L\sqrt{\mathcal{E}r\,\mathcal{E}o\,\mu o}$. (1)

The microwave antenna furnishes narrow band and wide beam. A thicker substrate will increase the radiation power and the scale down conductor loss and improve bandwidth. The shape of micro strip antenna such as rectangular, square, triangular and circulated.

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	without cross dipole	cross dipole as director	cross dipole as reflector
R	11	11	11
Laz	52	52	52
P	138	138	138
L	-	50	70
H	-	15	15
85 degrees	0.14	-2.40	1.14
0 degrees	3.18	5.65	0.14

Table1 conventional QHA without cross dipole

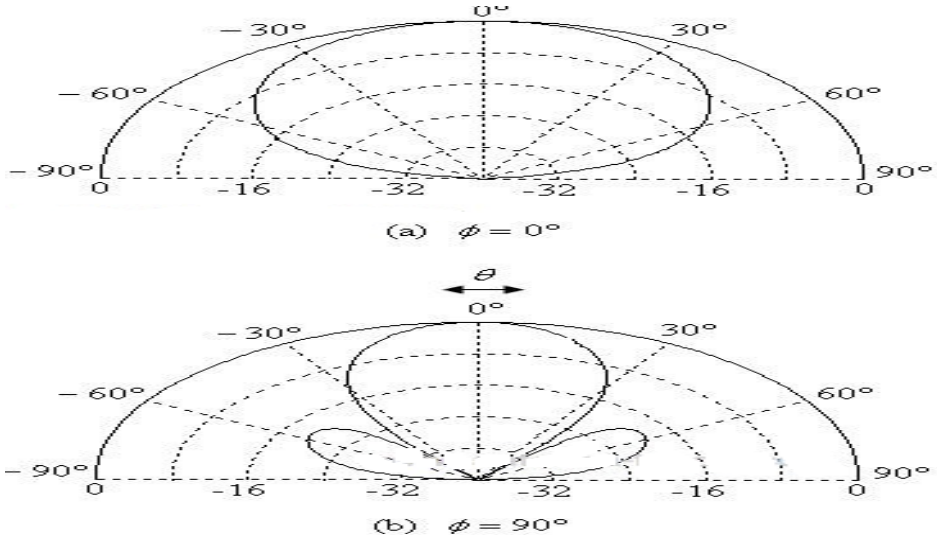

Fig 3.0 Micro strip Patch antenna

$$E\theta = \sin(kw\sin\theta\sin\phi/2)/kw\sin\theta\sin\phi/2\ \cos(kL/2\sin\theta\cos\phi)\cos\phi \quad (2)$$

$$E\phi = \sin(kw\sin\theta\sin\phi/2)/kw\sin\theta\sin\phi/2\ \cos(kL/2\sin\theta\cos\phi)\cos\phi\sin\phi \quad (3)$$

The wave frequency is refracted by ionized layer should depend upon the angle where the wave enters due to deviation in density.QHA utilizes a resonant structure. The first resonance occurs when a filer length is near a quarter wavelength at the center of the cylindrical structure length of helical and radius lengths are common. While calculating bandwidth of the antenna diameter plays a major role. QHA series is a omnidirectional and these are rugged all weather model, uses alloying. The compact size of omni permits transmitting, receiving, monitoring, handling, shipping. Without the requisite of multiple frequencies QHA furnishes communication between ground to air applications. According to technology of antenna theory by using circular polarization which minimizes the outcome of multipath interference. These commercial grade antenna plays a great performance as compared to other products. If thoughtfulness of patch antenna and helical antenna both will not be the same, application wise it is somewhat different. Small deviations between helical and the patch is in terms of aperture.

II Design Procedure

In GPS system the Electromagnetic waves are travelling in the ionosphere layer. When the signals are travelling in this that will pretend by the radiation of solar means the free electrons which is produced by X-rays and UV rays recombined with Electromagnetic signals [5]. Then the velocity of EM waves scale down due to the reduction of electron density. The delay will increase due to the signal refraction in ionosphere layer [4]. For GPS application, we cannot conclude that whether the patch antenna is better or helical is better? According to a survey of this project no one is better between two. But sincerely can say helix is better for GPS applications. Alternative can conclude is micro strip antenna or patch antenna. GPS owning a high gain towards the sky and gradually decrease towards the horizon. This is the best advantage if by taking thoughtfulness with unidirectional. The reason patch is more advantage than helical means it furnishes maximum gain towards the sky such that it is also very suits for GPS application. By thoughtfulness of isolation scenario, it is the coupling between two antennas. GPS is placed as long as placed by other antennas. Multipath occurs when the wave is emitted by the transmitter of a different line of sight path. This is called as signal fading. As shown in below figure when

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the signal is travelling towards the upper signal and lower signal by moving the signal isotropic delay is calculated using isotropic refraction. Finally by taking the above assumptions the delay will be calculated.

To Resolve

Now let us consider L1/L2 technique with two bands of frequencies. By thoughtfulness of first band

$D_{L1} = f_{L1}^2/f_{L1}^2-f_{L2}^2 (P_{L1}-P_{L2})$ (4)

Let's move to second band

$D_{L2} = f_{L2}^2/f_{L2}^2-f_{L1}^2 (P_{L2}-P_{L1})$ (5)

From these equations by calculating the phase by subtracting those two equations can observe or attain better accuracy and position of any object.

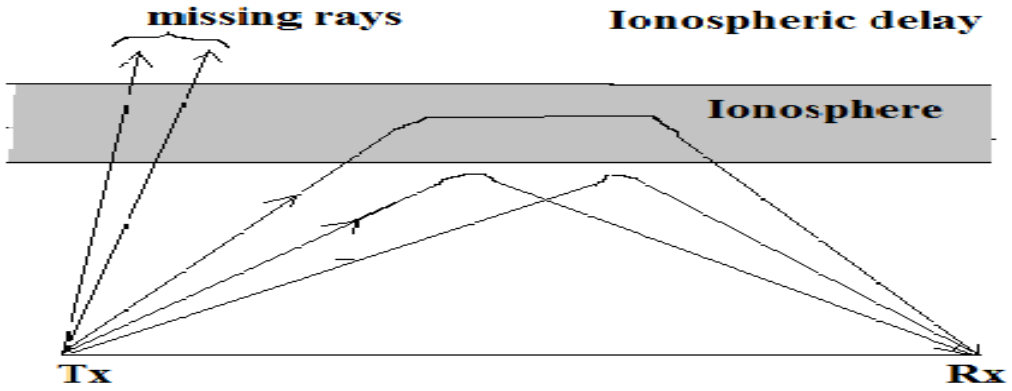

Fig 4.0 Ionosphere Refraction

In fig 3.0 by honoring the ionosphere delay are decreasing with thoughtfulness of upper and lower layers. From transmitting side the refracted rays are called missing rays. QFH furnishes circular polarization and reception completely which we need polar orbiting satellites and a 2m antenna will receive horizontal vertical and clockwise from all directions. The usual cross dipoles provide for satellite furnishes circular polarization. Quadrature of circular polarization is only for theoretical applications, but not in practice the QHA was in normal configuration operating in space mode. The Two current distributions are identical except in terrestrial mode. In fig 5.0 by honoring the current distribution process of a helical antenna owning with two types of modes, one is space mode and another one is terrestrial mode. Straight line represents the terrestrial mode and dotted line points to the space mode. In between these two modes owning a geometry QHA. In space mode the top and bottom sections it furnishes 90 degrees of circular polarization. In terrestrial 8 overlap helix sections will be formed in the current distribution process. This furnishes 180 degrees of circular polarization. The final upshot will become by subtracting the polarizations of space and terrestrial by canceling the radiation pattern upshot will provide 90 degrees.

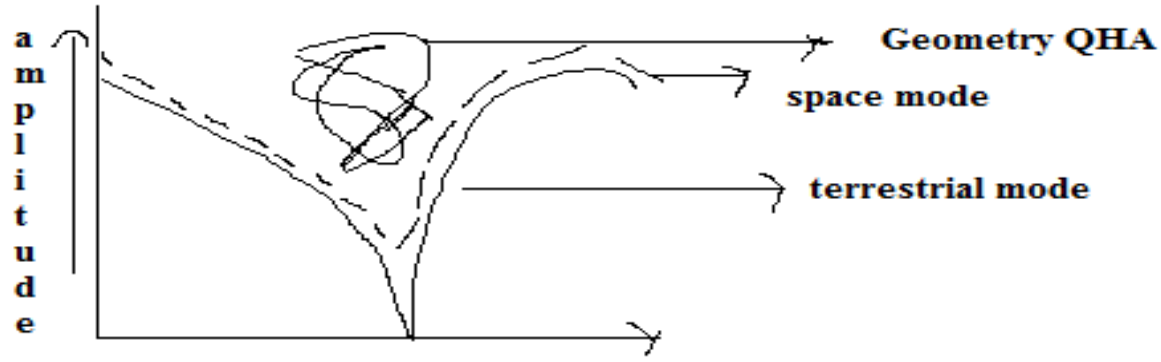

Fig 5.0 current distributions

III ANALYSIS AND UPSHOTS

The analysis of Propagation delay is proportional to the frequency of f1 of first band and f2 of the second band. Analyze the upshot of reducing the ionospheric delay of using two frequency bands as shown in fig 3.0.

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R	11.02
Laz	49
P	120
L	63.99
H	19.43

Table 2 Final Upshot

Four helical lines are manufactured with iron wires and coiled on the cardboard. The crossed dipoles and reflectors used for satellite reception to only provide circular polarization directly upwards when the strength is high. Upshot show that in QHA reducing the size of the antenna which causes input impedance is going to be decreases. Mutual coupling between helix is increasing. By decreasing input impedance radiation efficiency decreases. In order to increase the input impedance proposed folded inverted-F antenna. By splitting the patch into equal parts to exciting the circular polarization. And vary one of the phase angle by 180 degrees.

IV Conclusion

By thoughtfulness of micro strip technology the area postulated to place antenna has scaled down and it often furnishes the wide range of radiation and more bandwidth. The concept is enforced for GPS receivers for L1/L2 applications. This scale down ionosphere delays. L1/L2 designates its maneuvers on two frequencies to concurrently know the time and place of a particular object. Overcome the problem with conventional quad filler helix antenna is hard to operate at multifrequencies. Proved with it several technologies have been depicted that would have some limitations and advantages with respective time and performance.

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