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Antenna

ANALYSIS OF 5.8GHZ HELICAL ANTENNA FOR THE APPLICATION OF UNMANNED AERIAL VEHICLE

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ABSTRACT An Unmanned Aerial Vehicle (UAV) is an aircraft with practically no human pilot. The real life utilizations of UAV are payload conveyance, traffic checking, moving items in apparently perilous climate and with the end goal of observation in armed force, naval force and flying corps. The parts utilized in UAV's are Radome, Antenna, Antenna handset regulator, Modulation and recurrence transformation unit, Data interface unit, Power control module, Lithium battery and Solar power band. The antenna are the main electronic parts of UAV. The antenna utilized in UAV are Patch antenna, Spiral antenna, SATCOM antenna, MFC antenna, Array antenna, Blade antenna and L-C Sector antenna and Helical antenna. Helical antenna is planned in the recurrence of 10GHz and its exhibition attributes are examined for the compelling correspondence in UAV.

KEYWORDS : Unmanned Aerial Vehicle, Helical antenna, frequency, gain and Directivity

INTRODUCTION

Unmanned Aerial Vehicle (UAV) is normally called as Drones that can access without human pilot. Inflatables are the primary robot that was created in the year 1849 that is during First World War with the assistance of the researcher A.M Low's. During First and Second World conflict, there was a gigantic changes in the advancement of Pilotless robots. The greater part of the pilotless robots assume a significant part in Military purposes[2]. Toward the early phase, UAV's are constrained by utilizing transmitter which was utilized to convey radio messages and the beneficiary in the plane. At first, the elevations and the distance covered by Drones were small[1]. The UAV's are like the monitored aircraft yet there is a few distinctions in the functional necessities. The fundamental parts utilized in UAV's are payloads, control stations, aircraft send off and sub-frameworks like recuperation, correspondence, transport and backing.

The correspondence frameworks in UAV is to give the information joins (all over) between the CS and the aircraft[4]. It is generally ordinarily at radio recurrence.

Uplink:

- Communicate flight way entrusting which is then put away in the aircraft Automatic Flight Control System (AFCS).
- Send constant flight control orders to the AFCS when man-tuned in flight is required.
- Send control orders to the aircraft mounted payloads and ancillaries. Transmit updated positional information to the aircraft INS/AFCS where relevant

Downlink

- Send aircraft positional information to the CS where important.
- Send payload symbolism as well as information to the CS.
- Send aircraft housekeeping information, for example fuel state, motor temperature, and so on to the CS.

Antennas are the main important component of UAV's[5]. The following antennas are used in UAV.

- Patch Antenna
- Spiral Antenna
- SATCOM Antenna
- MFC Antenna
- Array Antennas
- ISR Antenna
- Blade Antenna
- Communication Antenna
- L-C Sector Antenna

An antenna is a metallic construction that catches and sends radio electromagnetic waves. Radio wire comes in all shapes and size from little ones that can be found on your rooftop to stare at the TV to huge ones that catch signals from satellites a huge number of miles away. In PC and web remote applications, the most well-known sort of radio wire is the dish antenna utilized for satellite interchanges. The most straight forward is the length of wire associated toward one side to a transmitter or getting component is set a ways off from the communicated or collector and AC is conveyed to or from the antenna through a RF transmission line, likewise called a feed line or feeder. The antennas that space correspondence and route utilizes are a unique bowl formed radio wire that centre transmissions at a solitary guide called an illustrative radio wire toward both catch and communicate electromagnetic waves. These radio wire move evenly estimated in hour point and in an upward direction estimated in azimuth to catch and send the transmission. Antenna exhibit a property known as correspondence, and that implies that a radio wire will keep up with similar qualities notwithstanding assuming it is communicating or getting.

In Helical antenna it works in two principle modes
1.Normal mode.
2.Axial mode.

In the typical mode the width and the pitch of the helix are little in contrast with the wavelength[6]. The hub mode helical antenna utilized in the field of UAV which is having high directivity and round polarization. The recurrence utilized for the pivotal mode helix antenna is 10GHz.

METHODS:

HELICALANTENNA:

Helical antenna is also called Helix antenna, it goes under the classification of Wire antenna. The recurrence scope of activity of Helical antenna is around 300MHz to 3GHz. Helical antenna works in Very High Frequency (VHF) and Ultra High Frequency (UHF) ranges.

The Helical antenna is a voyaging wave radio wire, the current goes along the radio wire and the stage shifts ceaselessly [7]. Helical radio wire is a specific antenna that is viewed as a cross breed between a circle radio wire and a dipole antenna.

Design Equations

- Directivity (D) = 12Cλ^2nSλ^2 ------(1)

Where
,C=Circumference

n= Number of turns
S= Spacing between them

Gain (G) = η * 12Cλ^2nSλ^2 ------ (2)

Where,
η = Efficiency.

Impedance (Z) = $\frac{150}{\sqrt{\frac{C}{\lambda}}}$ Ω ------(3)

S= $\frac{C}{4}$ ------(4)

R= $\frac{150}{\sqrt{C\lambda}}$ -------(5)

h= $\frac{w}{[377/(\sqrt{\varepsilon r}Zo)]-2}$ -------(6)

hence,
w= Width of conductor at termination
h= Height of conductor above ground plane
□r = relative permittivity of dielectric sheet
Zo = characteristic impedance of dielectric sheet

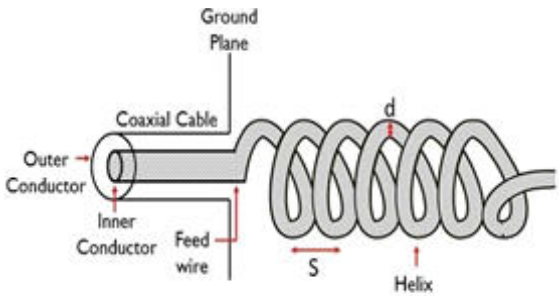
- Half-Power Beamwidth,

HPBW ~ $\frac{52}{C\lambda\sqrt{nS\lambda}}$ (deg) ------(7)

.

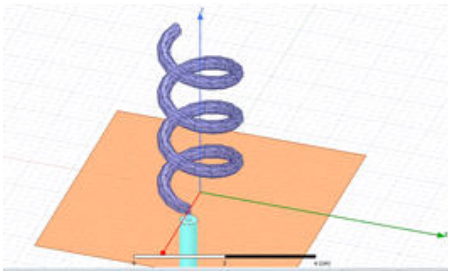
- Beamwidth Between First Nulls,

BWFN≅ $\frac{115}{C\lambda\sqrt{nS\lambda}}$ (deg) ------(8)



Helical Antenna

RESULT AND ANALYSIS



Peak Directivity:
x=5.8000 y=13.9753

- For 5.8GHz the directivity is 13.9753. Due to high directivity the signal strength is more efficient.

Peak Gain:
x=5.8000 y=14.3908

- The gain obtained for 5.8GHz frequency is 14.3908, the gain is inversely proportional to efficiency.

Radiated Power:
x=5.8000 y=0.0100

Accepted Power:
x=5.8000 y=0.0097

Incident Power:
x=5.8000 y=0.0101

Radiation Efficiency:
x=5.8000 y=1.0207

- The efficiency obtained for 5.8GHz frequency is 1.0207, by increasing the frequency the efficiency also increases.

Array Factor:
x=5.8000 y=1.0000

Max U:
x=5.8000 y=0.0111

- The Intensity of the antenna obtained for 5.8GHz frequency is 0.0111, if the intensity decreases the signal is travelling faster in a linear way.

CONCLUSION

Many antennas are used to transmit and receive the signals in UAV. Here to improve the performance of UAV, Helical Antenna is designed in the frequency of 5.8GHZ and the performance characters are analysed. From the result, the gain and directivity values are approximately 14 and it shows that sufficient gain value is achieved for transmitting a signal through Helical antenna. The output of the antenna is more directive in nature with a very low radiated power which will not produce harm to the environment.

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