M.KUMARASAMY
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Thalavapalayam, Karur – 639 113.

# DESIGN AND SIMULATION OF RF ANTENNA FOR UAV APPLICATION

## A MINOR PROJECT-II REPORT

***Submitted by***


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**BACHELOR OF ENGINEERING**

in

**DEPARTMENTOF ELECTRONICS AND COMMUNICATION ENGINEERING**

**M.KUMARASAMY COLLEGE OF ENGINEERING**

(Autonomous)

**KARUR – 639 113**

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# M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR

## BONAFIDE CERTIFICATE

Certified that this **18ECP104L - Minor Project II** report "**DESIGN AND SIMULATION OF RF ANTENNA FOR UAV APPLICATION**" is the bonafide work of "KESAVI.R(927621BEC087),KIRUTHIKA.V.R(927621BEC091),MONIKA.G(927621 BEC127) who carried out the project work under my supervision in the academic year 2022-2023 EVEN.

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**PROJECT COORDINATOR**

## Vision of the Institution

To emerge as a leader among the top institutions in the field of technical education.

## Mission of the Institution

**M1:** Produce smart technocrats with empirical knowledge who can surmount the global challenges.

**M2:** Create a diverse, fully engaged, learner-centric campus environment to provide quality education to the students.

**M3:** Maintain mutually beneficial partnerships with our alumni, industry, and Professional associations.

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To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research, and social responsibility.

## Mission of the Department

**M1:** Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

**M2:** Inculcate the students in problem solving and lifelong learning ability.

**M3:** Provide entrepreneurial skills and leadership qualities.

**M4:** Render the technical knowledge and skills of faculty members.

## Program Educational Objectives (PEOs):

**PEO1: Core Competence:** Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering.

**PEO2: Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

**PEO3: Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

## Program Outcomes (POs):

**PO 1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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**PO 4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO 5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO 6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

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**PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO 9: Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO 10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO 11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO 12: Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Program Specific Outcomes (PSOs):**

**PSO1:** Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

**PSO2:** Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations

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| Abstract | Matching with POs, PSOs |
|---|---|
| UAV, RF, Duroid | PO1, PO3, PO9, PSO1, PSO2. |

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# ABSTRACT

Owing to remote control and independent flying, commercial usage of unmanned aerial vehicles (UAVs) has recently been progressively extending from military use. Considering drones could be employed for remote sensing, communications broadcast. RF antenna is compact, lightweight, aeronautical design, and high penetration are essential due to the peculiarities of the operating conditions in UAVs. The main purpose of implementing Radio frequency (RF) is for high frequency antenna.

This paper is focused on the design of an ultra-wideband antenna for use with Unmanned Aerial Vehicles (UAVs). This antenna eliminates the problem of aerial vehicle drag. Low-profile construction is created by the RF Antenna. This antenna is designed to be light weight and compact. This antenna is manufactured of Rogers Duroid 5880LZ material and has dimensions of 29 mm × 39 mm. The thickness of the material is 1.6mm. The feed used for the Roger Duroid material is inset feed. The antenna generates the VSWR 6.3. The antenna study reveals that the ultra-wideband productivity of S11< - 10dB from 2.4 GHz to 6.5 GHz. Radiation pattern performance is satisfactory up to 5.8 GHz. The antenna generates a gain of 1.48. The highest radiation is provided by the RF antenna. Using a UAV model, the novel unique antenna was simulated and evaluated to assess its performance.

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# ACRONYMS/LIST OF ABBREVIATIONS

| ACRONYM | ABBREVIATIONS |
|---|---|
| UAV | Unmanned aerial vehicle |
| UWB | Ultra-Wide Band |

# CHAPTER 1

# INTRODUCTION

Unmanned aerial vehicles (UAV) have been continuously used for many applications because of rapid and cost-effective deployment. UAV applications are mostly used in the field of reconnaissance and been applied for communication platform. As we compare with satellitecommunication platform, reconnaissance has simple and easy construction. As an has simple and easy construction, no lag for communication capability and has high-speed using UAV application. Here, auxiliary plays a vital role for communication and easy way to transmit the information. In this new application the requirements of UAV increased for autonomy, intelligence, multitasking, efficiency, and intelligence level of UAV have gradually decreased to acquire the task application. When the drone flying alone, there is a limitations of energy supply and for operation range. At the same time, it also affects various networks and communication is not proper for longer distance.

UAV makes the communication network composed of multiple UAV can effectively improve and development of communication. UAV is an open network for communication, and it is advanced in communication network. UAVs have the ability of interaction. UAV technology makes quick operation effectively and its merits of many functionalities and survivability. In recent years, Unmanned Aerial Vehicle (UAV) have been used for emergency purposes and surveillance catastrophic situation, for which it is necessary for a signal detection system. This application is based on hardware to send data to transmit in UWB (Ultra-Wide Band). Communication with UAV applications is a big challenge because of dragging issues while drone is in motion and of instability. The characteristics of UAV antenna is ultra- wideband, low-profile, and aerodynamic. UAV should have a directive pattern to the earth and spatial diversity. Generally, the UAV antenna are flat square patches and dipoles, UAV cannot be used for UWB applications. Hence, it has a solution that UWB antenna design that can be easily located on the UAV with the spatial diversity for UAV application.

This antenna H-shape structure should be conformal to avoid drag problems that suffer during the flights. Using UWB antenna, we can provide flexible antennas. In recent years, UAV applications based on designs of antenna have also been proposed. Here, reflector was used to increase gain at 2.4 GHz for UAV applications. Here, we used to dual-polarize conformal antenna array at frequency range at 9.8 GHz was proposed. This is the conformal antenna with circular polarization and the band range from 1.5GHz to1.65 GHz.

The operation of conformal circular antenna at 700 MHz A conformal monopole antenna with operation at 700 MHz. The UAV antenna was designed with fixed-wing drones. For example, a helix antenna installed on a drone. This antenna provides an Isolux pattern. An Isolux pattern is omnidirectional (circularly symmetric) with the azimuth angle and has cosecant-squared dependence on the elevation angle. This produces constant signal level at all the points over the beam footprint on the ground surface. This antenna works at the frequency range from 865 MHz to 871 MHz and it is circular polarization. The above-mentioned antennas are mainly focused on UAV applications with a narrow frequency range not for UWB signal detection. In recent years, UWB conformal semi-spherical antenna works within the range from1.85 GHz to 10 GHz. The fixed-wing drone was situated at the center of UAV antenna. The electrical dimension of volumetric shape is 400mm × 200mm × 800mm. This antenna is made with the square pattern and this antenna is mainly for signal detection system. For MIMO systems wings of quadcopters drones with linearly polarized conformal antenna.

Quadcopter helicopters and convertiplanes have long been flown experimentally, the configuration remained a curiosity until the arrival of the modern UAV or drone. In MIMO system, the same data has been transmitted through multiple antennas over same path in same bandwidth. A bunch of signals reaches the receiver end through different paths, resulting in more of the same data. Increases in factor, data rate also increases determined by the number of transmit and receive antennas. This antenna is joined to work within a UWB frequency range. This antenna is joined to work within a UWB frequency range. In this parasitic circular antennais achieved by using a H-shaped at the center of H-shaped antenna. It is suitable for aerial vehicles when the drones are flying.

In this new application the requirements of UAV increased for autonomy, intelligence, multitasking, efficiency, and intelligence level of UAV have gradually decreased to acquire the task application. This antenna is joined to work within a UWB frequency range. This antenna is joined to work within a UWB frequency range. The above-mentioned antennas are mainly focused on UAV applications with a narrow frequency range, not for UWB signal detection. Thecorrect performance of the UAV must be independent of weather conditions, as very dense fog,rain or wind, which are especially common for next to the shore and maritime operation.

## 1.1 OUTLINE OF THE PROJECT

In this regard, this master thesis aims to introduce a safe method to operate the UAV without any form of vision as part of the Unmanned Aerial Vehicle Systems paradigm. This thesis goal is based on the desired outcome to transform the whole color concept into a fully autonomous system. The thesis is focused on fulfilling the missing landing solution that does not require a human controlling the UAV to perform a high accuracy landing in a moving platform. The correct performance of the UAV must be independent of weather conditions, as very dense fog, rain, or wind, which are especially common for next to the shore and maritimeoperation.

These cases describe the drawback of having a ground operator, because of the lack of visual aid the operator cannot anticipate the behavior of the UAV and prevent a crash. UAVs are almost fully autonomous, except for lack in a generalized landing method, that would make UAVs truly wholly autonomous. To make this happen, it is proposed to rely on radio-frequency signals to perform the landing. These signals will be transmitted from antenna on the ground and received by the UAV that will process the signal strength and approximate the distance from the antennas it is located.

A bunch of signals reaches the receiver end through different paths, resulting in more of the same data. Increases in factor, data rate also increases determined by the number of transmit and receive antennas. This antenna is joined to work within a UWB frequency range. This antenna is joined to work within a UWB frequency range. In this parasitic circular antenna is achieved by using a H-shaped at the center of H-shaped antenna. It is suitable for aerial vehicles when the drones are flying. It senses the aircrafts orientation; it also sends the data to micro- controller and the processes the raw data to estimate the angles. It provides the error compensation to bring it back to its initial position. It does this with amazing speed and the accuracy. Accelerometer, it is an electromechanical device. It is used for measuring the acceleration of a moving body. It measures acceleration force. This force can be static or dynamic. Measure the amount of static acceleration by means of gravity then we can find the angle.

# CHAPTER 2

# LITERATURE REVIEW

UAV is defined as the powered and an aerial vehicle that does not carry a human operator. It provides vehicle lift and can fly autonomously or piloted remotely by using aerodynamic forces. It can be expendable and carry a lethal or non-lethal payload. A cruise missile is used against terrestrial or naval targets. It remains in the atmosphere and most of the portions are approximately constant speed. The cruise missile cannot consider UAVs because already the vehicle is a weapon that cannot be used again it is also unmanned and remotely guided the UAV term, it is a representative of a class of air vehicles known as un inhabitant aerial vehicle or unmanned aerial vehicle or remotely operated aircraft. The unmanned aerial vehicle uses geometric and photogrammetric.

In the last few years it was increased and the development in mathematical algorithm and sensors also increased to achieve the more precise navigation and stabilization of unmanned aerial vehicles. We can easily see the changes in the tendency of open-source software. The geographical information system, itis a computer system used for storing, capturing, checking data and displays data on earth surface. The test field has a result that was carried out with very low-cost system. Many strategies and theorists in the military has been concluded based on the history.

This paper gives a scientific literature overview at the packages of UAVs in humanitarian comfort which targets to analyses the principal traits of guides at the issue and talk traits for destiny studies directions. The primary packages are supposed to map affected regions after a catastrophe, analyze the pox accrued, coordinate UAVs networks, discover failures thru chemical sensors, and combine UAVs with different motors to enhance the velocity and excellent of statistics' transmission. Just in case of transmission, radiation from the bi-conical conductor construct it loss consequently the wave reflected with the aid of using the electric circuit end is to some extent lessened and if the conic floor had been sufficiently long, their manner end might be rendered electrically "invisible" on the terminals. An electrical battery is a device that has a two or more electrochemical cells which convert the stored chemical energy into an electrical energy. Every cell has a positive terminal or cathode, and it has a negative terminal or anode. The terminal that has a positive at a higher electrical potential energy than the terminal that has a negative. The positive terminal is the source of the electrons. When it is connected to an external circuit, it will flow and deliver energy to an external device.

When a battery relates to an external circuit, as ions theelectrolytes can move. It allows the chemical reaction at the separate terminals to be completed. It also delivers energy to an external circuit. The movement of ions allows current to flow out within the battery to perform the work.

Technically, the term battery means the device with multiple cells. A panel board is a component of an electricity supply system; it divides an electrical power feed into subsidiary circuit. Each circuit will provide a protective fuse in a common enclosure. A main switch andin the recent boards one or more residual breakers in current with overcurrent protection are also incorporated. A UAV is needed to stable on 3 axis that is pitch, roll and yaw axis. The orientation of the aircraft can be sensed by sensors. The sensor is the Inertial Measurement Unit.It is the combination of the accelerometer and gyroscope sensor.

It senses the aircrafts orientation; it also sends the data to micro-controller and the processes the raw data to estimate the angles. It provides the error compensation to bring back to its initial position. It does this with amazing speed and the accuracy. Accelerometer, it is an electromechanical device. It is used for measuring the acceleration of a moving body. It measures acceleration force. This force can be static or dynamic. Measure the amount of static acceleration by means of gravity then we can find the angle. We can analyze the way of the device is moving. The drone's communication is fully dependent on the transceiver. Simulated as well as measured results are presented for a semi-circular shape patch antenna. Compared with other micro strip patch antennas of high bandwidths this proposed structure has the attractive features of low profile, smaller patch size and being simple to design. Optimization of the structure gives impedance bandwidth with reasonable bidirectional patterns suitable for many applications.

The receiver connected to the flight controller. The transmitter section initiated the communication between receiver and the RF transceiver. For communication purpose, band spectrum. The spread spectrum technique was used by the receiver pair, the technique which makes the resistant to interference. It gives glitch free operation. Every channel allows the individual thing on the drone, it will be controlled by drone. It is used to capture the image in the area where surveillance is to be done. The video graphics array is small and low resolution.

It is equal to the standard definition television. To reduce weight and increase maneuverability a typical unmanned aircraft is made up of light composite materials. It allows military drones to cruise at an extremely high attitude by their composite materials strength. It is equipped with different state-of-the-art technology. They are infra-red cameras, GPS, and laser. It can be controlled by remote control system. The drone can come in a wide variety of sizes. It has a large drone; it is mostly used for military purposes. They are predator drones, other smaller drones which can be launched by hands and other unmanned aircraft. The drone and the control system are the two parts of the unmanned aerial vehicle system.

The unmanned aerial vehicle is all the sensors, and the navigation systems are present. Since there is no loss of the space to accommodate humans and the light weight is complete by the rest of the body. Drones are highly complex composites is used by the engineering materials which can be absorbs the vibration of which it decreases the noise produced.

Broad banding has different types of techniques used to alleviate the narrowband for limitation of antenna. There are four types of antennas, it has selected and compared with the proposed H-shaped antenna. The size of the metallic patch, the results are obtained clearly with the indicated main factor of the affected bandwidth are thickness of the dielectric substrate. The feed type is used for the coupling level to some extent. The technique to improve the performance to improve the conventional micro strip patch antenna has been proposed. A fed inverted to be slotted to micro strip antenna. By introducing the patch, it offers a low profile, broadband, high gain and the low cross-polarization level and these techniques are composite effect are infected. For L frequency band we design a wide band of micro strip patch antenna. The simulation of the antenna with a soft software reported obtained using a full wave element. The antenna used a desired wide bandwidth, and it stacked dielectric layer structure.

The width of the patches are squares, it feed position of the coaxial connected probe. Thereare two wideband printed patch antennas aimed at the several wireless services, the two wideband printed patch antennas aimed at several wireless services, especially medical telemetry, are designed and fabricated. The improvement of their impedance matching is verified. A compact size was obtained by optimizing the global geometry of the antennas, whereas a broadband behavior was achieved mainly by using an asymmetrical feed and a reduced ground plane.

Theoretically the use of micro strip feed line may impact on the cross-polarization performance of the antenna since high modes are generated by connection of the feed line that produces spurious radiation. The narrow slit etched on patch shifts the first resonance toward lower side of frequency as well as improves the bandwidth of second band. A novel slot antenna with Single-Sub structure, single slot and single frequency operation has been presented. A newly designed technique for enhancing Bandwidth that improves the performance of a conventional micro strip patch antenna is proposed. A co-planar micro strip patch antenna with wide bandwidth behaviors has been proposed. Simulated as well as measured results are presented for a semi-circular shape patch antenna. Compared with other micro strip patch antennas of high bandwidths this proposed structure has the attractive features of low profile, smaller patch size and being simple to design. Optimization of the structure gives 73% impedance bandwidth with reasonable bidirectional patterns suitable for many applications.

A new design of single-feed circularly polarized micro strip antenna using slotted tip-truncated equilateral triangular patch has been proposed. Genetic algorithm is utilized to design micro strip patch antenna shapes for broad bandwidth.

UAVs are treasured gear because of their flexibility, safety, ease of operation, and relatively low fee for the proprietor and the operation, which enables the usage of in catastrophe situations. This paper gives a scientific literature overview at the packages of UAVs in humanitarian comfort which targets to analyses the principal traits of guides at the issue and talk traits for destiny studies directions. The primary packages are supposed to map affected regions after a catastrophe, analyze the pox accrued, coordinate UAVs networks, discover failures thru chemical sensors, and combine UAVs with different motors to enhance the velocity and excellent of statistics' transmission. Just in case of transmission, radiation from the bi-conical conductor construct it loss consequently the wave reflected with the aid of using the electric circuit end is to some extent lessened and if the conic floor had been sufficiently long, their manner end might be rendered electrically "invisible" on the terminals.

At the higher frequency its behaviors tend closer to that of an actual bi-conical conductor, the better restriction depending basically at the accuracy of the possible implementation of the 'near- coincident apices'. Between those 2 extremes a worth come loss is likewise achieved over an octave, or all the additional, depending upon what constitutes "adequate" for the predicted utility as an instance 10dB. Left bimanual Dipole Antenna: Left bimanual dipole antennas place unit of recent type and it is named due to its transmission is left-handed.

The antenna fashion is based on the shunt inductors and capacitors. The electric condenser is added on aspect of the street that prompts modern of various amplitude on the two facets sincecast off modern have several adequacies, they do now no longer utterly strike off inside the manner field, and consequently it transmits. Left-Handed conductor incontestable a drop-off in frequency with faded wavelength. The receiving antenna of zero wavelength in free residence has an inflated benefit of three. 7% for |S11|& lot is 10dB. Left bimanual aerial proven in Left bimanual aerial bi-fold aerial The bi-fold aerial place unit extraordinarily easy, low fee,much less lined space, easy in generating and easy to place in. the improvement of bi-fold aerial is based on bi-fold wires; the bi-fold ends of the aerial is not closed. The bi-fold dipole antennas place unit huge loop. The resistivity is don't depend on the thickness of the strip, it relies upon the natural arithmetic parameters.

The radiation patters place unit equal like aerial. Bi-fold aerial is incontestable. Folded Dipole Antenna: Bi-fold aerial the bifold aerial place unit extraordinarily easy, low fee, much less linedspace, easy in generating and easy to place in. the improvement of bifold aerial is based on 2 bi-fold wires; the bifold ends of the aerial are not closed.

The bifold dipole antennas place unit huge loop. Is there is a wider relax-cap potential in adjustment of the resistivity fashion it is important. The resistivity is don't depend on the thickness of the strip, it relies upon the natural arithmetic parameters. The radiation patters place unit equal like aerial. Bi-fold aerialis incontestable. Ina wave aerial resonant frequency supported variant in sizes. In a wave aerial conductors installed in line and go away a bit gap among every conductor. The voltage is mounted to the center of every conductor. Forty-five times of wavelength much. There are unit poles of 1/2 of-wave aerial inside which modern float. All matters thought of types of antennae contain of unmarried twine or restrained tape wound form of a mitt or paw screw, self-assisting or became on an insulator cylinder consequently.

# CHAPTER 3

# PROBLEM DEFINITION

Construction sites generally involve various types of materials being delivered, stored, and installed throughout construction periods. As a critical type of on-site resource to manage, materials should be carefully monitored on construction sites in terms of their locations as well as quality. When the number of material types involved in a construction project is large, and the construction site is very crowded or large, it becomes relatively difficult to monitor the material locations. For the effective monitoring of the material locations, technologies have been applied in many projects. However, the current practices of the based material localization have several limitations to overcome. The use of hand-held readers requires on-site workers to patrol a site to read all the tags attached to materials. This process is time-consuming especially when materials are spread over a large-scale site.

The use of fixed readers can retrieve location data only when materials pass near the readers. In other words, the former and latter have limitations in terms of time cost and sensing coverage, respectively. In this study, we aim to overcome the limitations by proposing a new platform that integrates UAVs. The proposed platform localizes tags attached to materials based on the tag data collected by a UAV as well as the GPS location data of the UAV. The proposed platform has the potential to resolve the limitation of hand-held readers by replacing humans with UAVs that can fly over a construction site within a short time and access the spaces that are difficult for workers to reach. The mobility of a UAV can also be a key to resolve the limitation of fixed readers. Moreover, we investigate the specifications of readers and tags to study the feasibility of the integration of UAVs for on-site localization purposes.

In this paper, we present various experiments that determine the sensitivity of tags and readers as well as the factors that affect the tag reading performance. Finally, the feasibility of the proposed platform is validated for localizing materials spread over flat ground. Note that the objective of this paper is limited to the feasibility test signifying the potential of the UAV platform, and more accurate localization for practical applications of the platform is beyond the scope of this study and remains as a future work. Also, in the experiments, metal materials are focused, and all materials are spread on the ground.

# CHAPTER 4

# FEASIBILITY STUDY

The UAV model employed in this research is a quadcopter made for developers. It allows developers to install additional sensors beside a GPS, a camera, a gyroscope, and an inertial measurement unit, and to embed newly developed codes for data analysis, wireless communication, and hardware control. In this research, the UAV model is used to collect GPS data and to carry readers. The specifications of the UAV model. There are two types of tags active and passive. The active tags are powered by an embedded battery to spread their own signals. When a tag receives a signal from a reader, it sends its own signal back to the reader. Also, beacon types of active tags simply emit their own signals consistently regardless of signal reception, which is appropriate for tolling high-speed vehicles.

The active tags generally exhibit long read distances up to around 100 m. However, the use of batteries limits their lifetime to within 3–5 years. Also, they are relatively bulky, and their price is high. On the other hand, the passive tags have no internal power source and rely on the electromagnetic energy transferred from a reader. Accordingly, their price is usually much lower than that of the active tags, which is practically a major advantage. The passive tags are relatively small because they do not require batteries; thus, they can last a lifetime. The passive tags are utilized for various purposes such as access control and stock management.

# CHAPTER 5

# PROJECT METHODOLOGY

## 5.1 EXISTING SYSTEM

The physical parameters of the new structure were configured by running several simulations. S11 parameter of the antennas depicted. The designs with no parasitic element do not work within the whole UWB range. Nonetheless, the parasitic circular element helps to increase the bandwidth even if the structure is bent. After the above procedure, the final structure was slightly bent by varying the parameter b. Figure 4 shows the S11 parameter under −10dB for different values of b. The proposed antenna keeps the UWB performance when the structure is bent. The width of the first microstrip feed line w is part of the distribution of the current to the radiator patch. It is an important parameter for the design of the conformal UWB antenna.

It mainly distributes current along with the patch. The structure was simulated for different parametric values of w. We observed that the reflection coefficient varies considerably. When this parameter is 3 mm, the antenna is tuned over the entire established frequency range. The parameters R1 and R2 define the spacing between the parasitic element and the U-shaped. The circular parasitic element is coupled with the U-shaped element and has a radius defined by the variable R4. These parameters were also modified by using different values where it is found that the S11 parameter does not have a significant change in lower frequencies. The reflection coefficient only changes slightly in higher frequencies as depicted. The ground plane of the antenna is a rectangular metallization with an upper notch that provides certain miniaturization of the antenna. The size of the parameter affects the performance of the antenna. It is preferable to tune the antenna with a slightly wider ground plane. The performance of antenna when the notch is tuned, the parameters a and s does not affect substantially in the low frequencies. These parameters only affect high frequencies.

As a result of this parametric study. It is worth to note that the remaining parameters were constant during this parametric study. The propagating modes are found when the imaginary part of the impedance is zero. Hence, the modes correspond to the following resonance frequencies: 3.43 GHz, 4.38 GHz, 6.72 GHz,8.29 GHz, 9.39 GHz and, 11.18 GHz. The average current distributions for the propagating modes.

In this case, the current flows on the metallization with different levels for each frequency. The level of current increases in high frequencies. The corresponding prototype is depicted in we measured the UWB antenna mounted on the aircraft structure. As a result of this, the comparison of the measurement and simulated S11 parameter when the antenna is isolated as well as when the antenna is on the UAV structure.It was found that the measured antenna works perfectly from 2.9 GHz to 15.9 GHz. The measured reflection coefficient was obtained by using a calibrated network analyzer R&S model. For any UWB MIMO system, it is essential the isolation of the antennas. In this case, depicts the coupling coefficients of four antennas mounted on the UAV. The levels of these parameters are under −30dB in all UWB ranges. As can be observed the antenna provides themaximum radiation towards down of the aircraft structure, this is very suitable for explorationabove the earth with UAVs.

This type of radiation can communicate to any user on the earth. The antennas are strategically located to save space in the center. 2D patterns versus θ angle in dB of XZ-plane. The drone and to add the spatial diversity to the system. It is worthy to note that this is one of the technical challenges in quadcopter drones. Placing the antennas on this location, it is possible to mount four antennas in the aircraft structure for a UWB system. The 3D views of simulated radiation patterns when the UAV structure is excluded and included during the simulation. Note that the radiation patterns are slightly distorted for low frequencies when the UAV structure is included in the simulation. However, pattern distortion is more noticeable in high frequencies. Moreover, the maximum radiation remains towards the ground directly in the patterns from 3.1 GHz to 10.1 GHz. Nonetheless, there is a change of 90 degrees of the maximum radiation in the patterns from 11.1 GHZ to 15.1 GHz. The fiberglass of the drone model affects the performance of the radiation pattern until 10.1 GHz.

As conjecture of this performance, the antennas can detect signals coming from the ground directly in low frequencies and coming from the surrounding of the UAV in the azimuth plane for high frequencies. Hence, the acceptable radiation pattern performance is until 10.1 GHz for exploration flights because the UWB system mounted on the UAV would be detecting signals coming from the earth. There are acceptable differences in the patterns. However, it demonstrates the excellent operation of the antenna. It was used the equipment to measure the radiation patterns. This equipment can only measure the half radiation pattern of the antenna until 6 GHz. Now depicts the maximum directivity of the antenna in the 3D patterns versus frequency.

The presence of the UAV body does not substantially affect the directivity of the antenna. In fact, it is slightly increased when the antenna is mounted on the drone structure.

Otherwise, following the mathematical procedure, we computed the system transfer function by extracting the S11 parameter, radiated E-field phase and gain versus frequency from software. Then, it was computed the system fidelity factor by modeling the cross-correlation between the normalized receiving (Rs(t)) and transmitting (Ts(t)) pulses.

The antenna has an SFF>0.9. These are the directions of the significant concentration of power. Finally, presents a comparison of UAV antennas of state of the art and the proposed design in this research. This antenna solution is the right candidate for a UWB system mounted drones. The main differences of this design in comparison with the literature are the frequency range, spatial diversity for UWB MIMO systems, the low profile, type of radiation that it is concentrated towards the ground direction and the application for small quadcopters drones.

## 5.2. PROPOSED SYSTEM

The basic parameters of the structure by working several simulations with the Microwave Studio Software. The S11 parameter of the antennas represented. In the whole UWB range, the structure with greedy element will not work. Even though the arrangement gets bent, the bandwidth gets increased with the help of the greedy circular element. After completing the mentioned process, we can vary the parameter so that the end structure will bend slightly. The suggested antenna holds the UWB execution when the arrangements get bends. The thickness of the initial micro strip cater for line w is slice of the issuance of the thermal to the radiator antenna and patch antenna. For the designing of the compliance with antenna, the chief framework is used. It largely gives out current next to the streak. The arrangement was pretendfor various constant values of the thickness.

When the input vector is 3 mm, the antenna is overriding the whole confirmed frequency span. The variables R1 as well as R2 sense the line up in the middle of the parasitical portion and the U-shaped outline. The disc liked today component is attached with the U-shaped component and that has an extent sense by the element or parameter R4. These variables have been changed by the help of various merits where it is appeared that the S11 variable or value will not have a remarkable modification in underneath frequencies.

These variables specifically harm the towering frequencies. Fixing the antennas on this placement, it is practicable to occult four antennas in the aircraft arrangement for a UWB system. The 3D perspective of imitative radiation specimen when the UAV arrangement is eliminated as well as involved throughout the action ofpretending.

Notice that the radiation specimen is moderately contorted for knee-high frequencies when the UAV arrangement is incorporated in the output. In high frequencies, we must watch the arrangement distortion. It is very important.

In addition, the towering energy comes from source rest regarding the earth as the crow flies in the arrangement range from 3.1 GHz to 10.1GHz. However, there is a swap of perpendicular happens present of the peak emission in the arrangements between 11.1 GHZ and 15.1 GHz.

The glass made up of fiber of the Unmanned Aerial Vehicle design give a drawback in the working of the emissions arrangements at the least of 10.1 GHz. As a result of this working process, the antennas would have the ability of finding gesticulation raising from the earth straight in knee-high frequencies also emerging from the detect signals coming from the ground and emerging from the encompassing of the Unmanned Aerial Vehicle in the idiomatic plane for the maximum range of frequencies. Consequently, the considerable emissions arrangement working is least for 10.1GHz for investigation soaring in the view of the fact that the Ultra-wide band system surrounded by a frame on the Unmanned Aerial Vehicle will be aware of finding or analyzing the signal rays emerging from the ground.

Some of the agreeable deviations in the arrangements. This is used only to analyze the emission pattern. It is used to calculate only the 1/2 that is half emission pattern of the antenna at the least of 6GHz, the considerable emission arrangements working is possible only at the certain GHz frequencies that is 10.1 GHz for study ascend in the vision of true, the Ultra-WideBand system get surrounded on the Unmanned Aerial Vehicle that is (UAV) this will be used for finding or analyzing purpose of the signal or rays emerging out from the earth or we cansay as ground.

It finds out the peak directive of the antenna in the three-dimensional arrangements over the frequency. There is an important red colored line in the antenna structure. It is an isolated part that is without the Unmanned Aerial Vehicle (UAV). There is a line in the antenna part. The blue line indicates that the antenna directive element, as it was surrounded on the Unmanned Aerial Vehicle design.

### 5.3. CONFORMAL UWB ANTENNA MODEL

It is a new conformal UWB antenna. Here, we follow a step-by-step procedure to get a final design of RF antenna using UAV applications. The first step is to obtain an H-shaped structure. Then, the structure was modified to an H-rounded shape. Final step of this procedure, parasitic element was added at the center of radiating substance. The H-shaped element is connected to feeding line which provides current to the entire antenna in the range of 50 ohms SMA connector. Both the H-shaped antenna and circular parasitic element provides a wider bandwidth. This H-shaped antenna is used to describe the outer surface of the antenna. Antenna provides a ground plane with a small notch.

The orientation of the H-shaped antenna is perpendicular with respect to the antenna which is in bent position. This antenna is a low-profile to facilitate with its wings of the quadcopter drone. This H-shaped antenna was developed with the feature of flexible and light circuit board. This is called Rogers Duroid 5880LZ. The characteristics of this material are the thickness of 1.28mm, a copper layer of 36µm, permittivity = 1.98 and a tangential loss of δ = 0.00198. In a wing of a multirotor genericquadcopter drone antenna was mounted and look like panoramic view. The structure of the antenna is perfectly fitted to the drone wing. This type of drone is comfortable for UWB sensing. The main merits of this RF antenna are that they fly in a static way on a fixed path, aswell as small and light in weight, portable to carry, and easy to manage.

The purpose of UWB system in antenna on the aircraft structure is to find the location of the challenge. Due to the noise produced from circuitry the antenna cannot be placed at the center of the drone, and either cannot be installed close to the wings. The antenna is preferable to be located at the middle of the wing where is the place with fewer interferences. Due to this data transmission issues are avoided in UWB communications. Fiberglass is widely used in UAV technology.

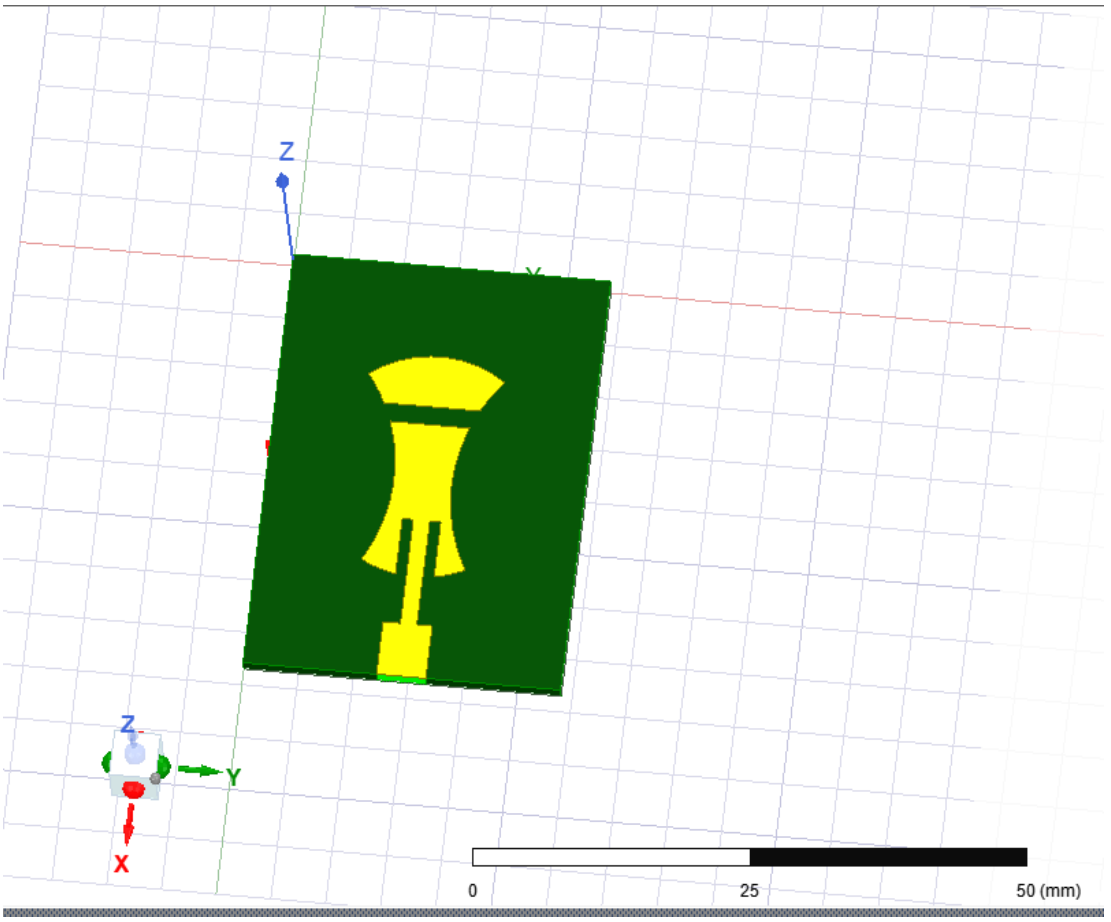
# CHAPTER 6

## RESULTS AND ANALYSIS

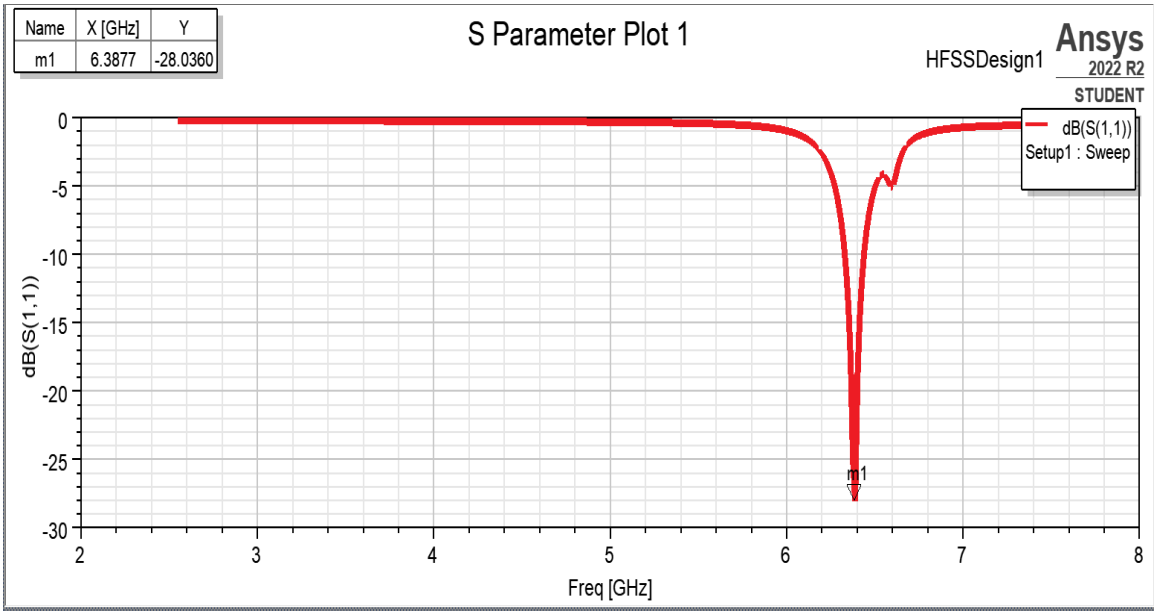
The physical parameters of the new structure were configured by running several simulations with the CST Microwave. Nonetheless, the parasitic circular element helps to increase the bandwidth even if the structure is bent. After the above procedure, the final structure was slightly bent by varying the parameter b. Figure 4 shows the S11 parameter under −10dB for different values of b. The proposed antenna keeps the UWB performance when the structure is bent. The width of the first microstrip feed line w is part of the distribution of the current to the radiator patch. It is an important parameter for the design of the conformal UWB antenna; it mainly distributes current along with the patch. the structure was simulated for different parametric values of w. For any UWB MIMO system, it is essential the isolation of the antennas.

The levels of these parameters are under −30dB in all UWB ranges. As can be observed the antenna provides the maximum radiation towards down of the aircraft structure, this is very suitable for exploration above the earth with UAVs. This type of radiation can communicate to any user on the earth. The drone and to add the spatial diversity to the system. It is worthyto note that this is one of the technical challenges in quadcopter drones.

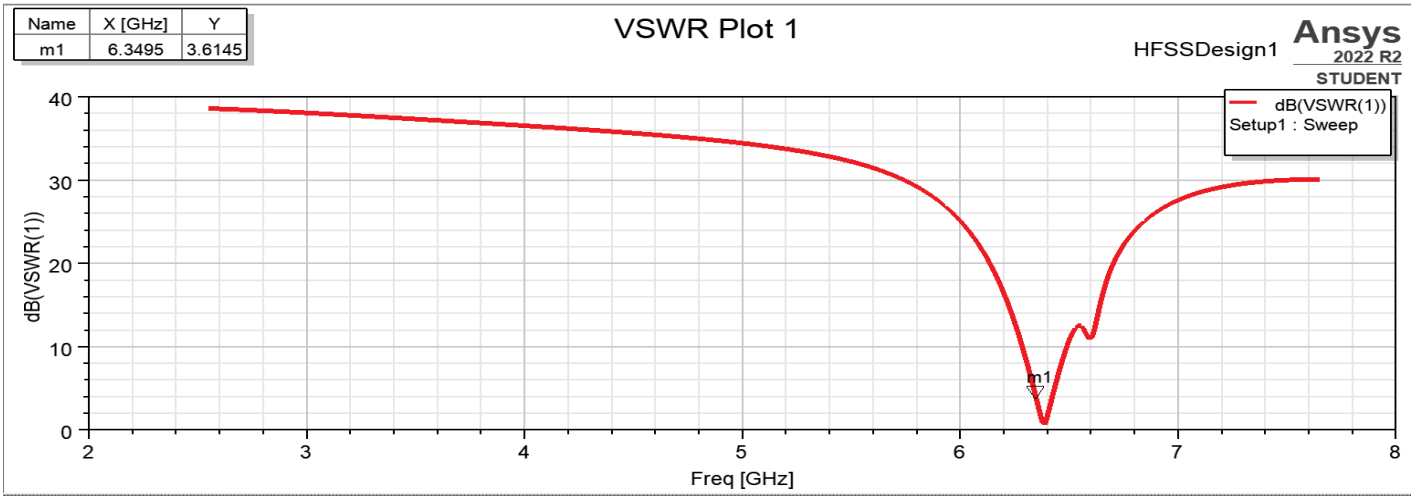
Placing the antennas on this location, it is possible to mount four antennas in the aircraft structure for a UWB system. The 3D views of simulated radiation patterns when the UAV structure is excluded and included during the simulation the antennas can detect signals comingfrom the ground directly in low frequencies and coming from the surrounding of the UAV in the azimuth plane for high frequencies. Hence, the acceptable radiation pattern performance isuntil 10.1 GHz for exploration flights because the UWB system mounted on the UAV would be detecting signals coming from the earth. the maximum directivity of the antenna in the 3D patterns versus frequency. The red line corresponds to the antenna in isolation, i.e., without thedrone model. The blue line is the directivity of the antenna when it Comparison of antennas. Low-Profile Conformal UWB Antenna for UAV Applications Comparison of antennas. is mounted on the UAV model. The presence of the UAV body does not affect substantially the directivity of the antenna.



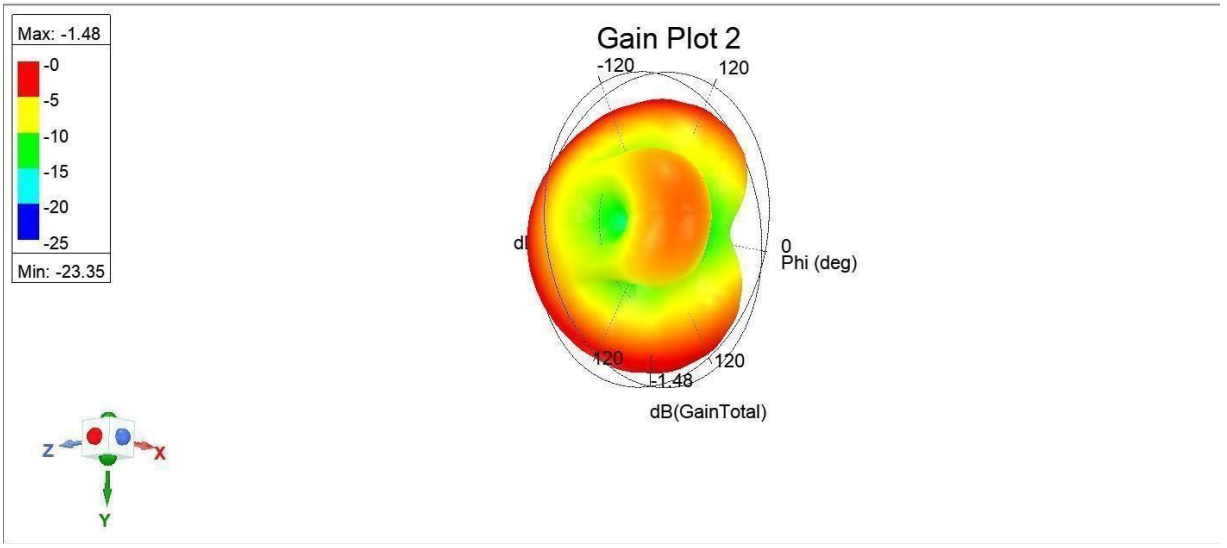

6.1. Design of H shape (Roger Substrate)




6.2.S Parameter (Roger Substrate)

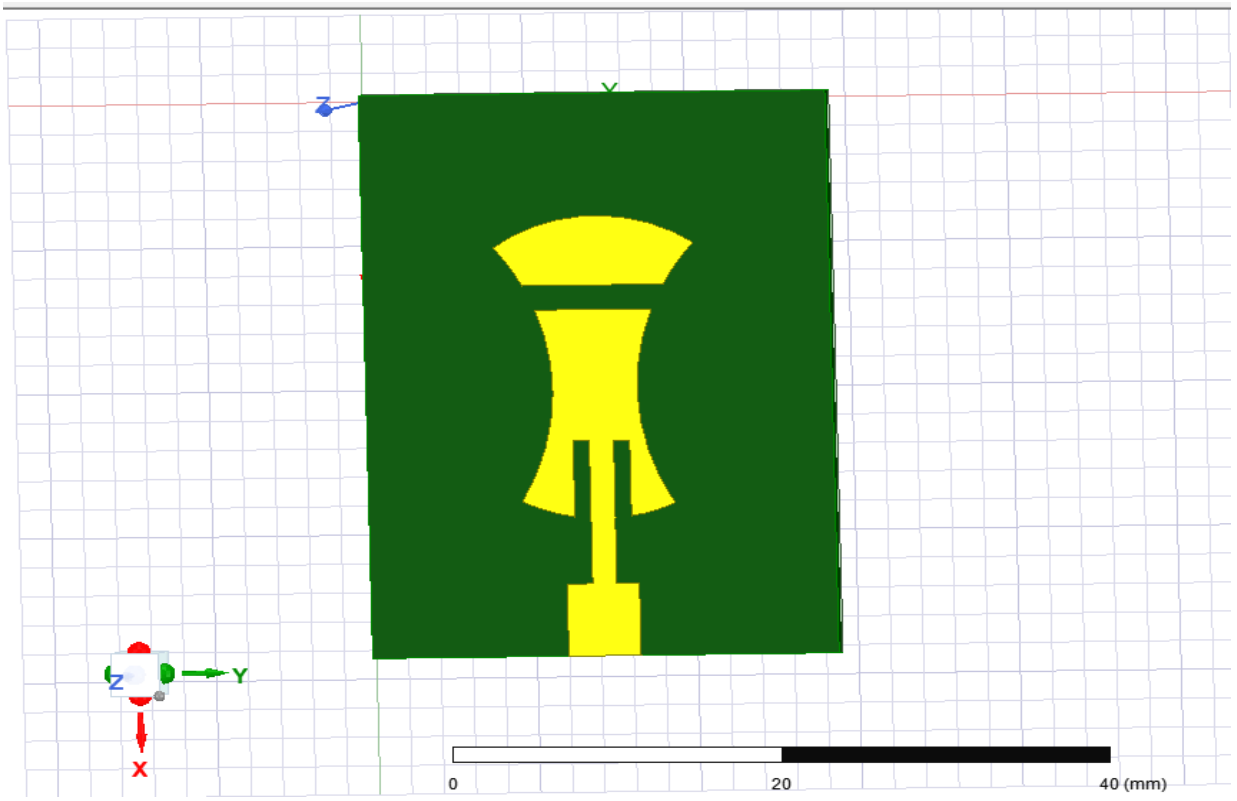



6.3. Simulation of VSWR (Roger Substrate)

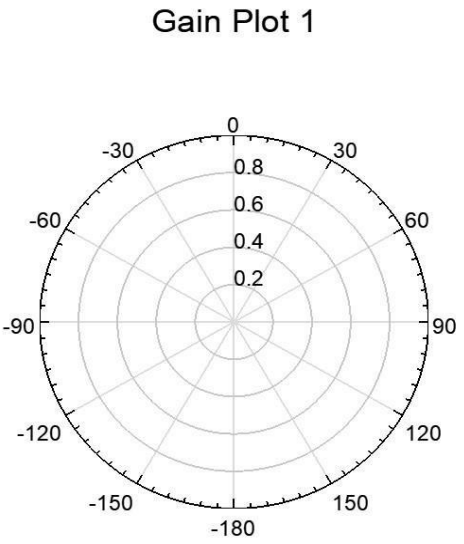



6.1 Gain Plot (Roger Substrate)

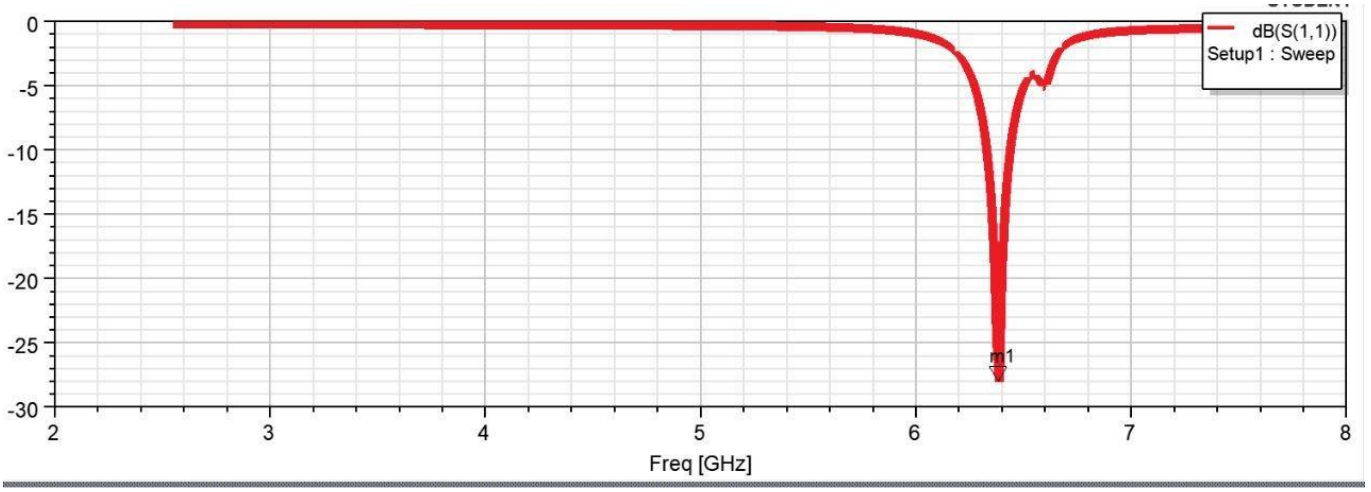
The figure 6.1, 6.2, 6.3, 6.4 shows the design of H shape batch antenna, S-Parameter, Simulation of VSWR and Gain Plot over the roger substrate.



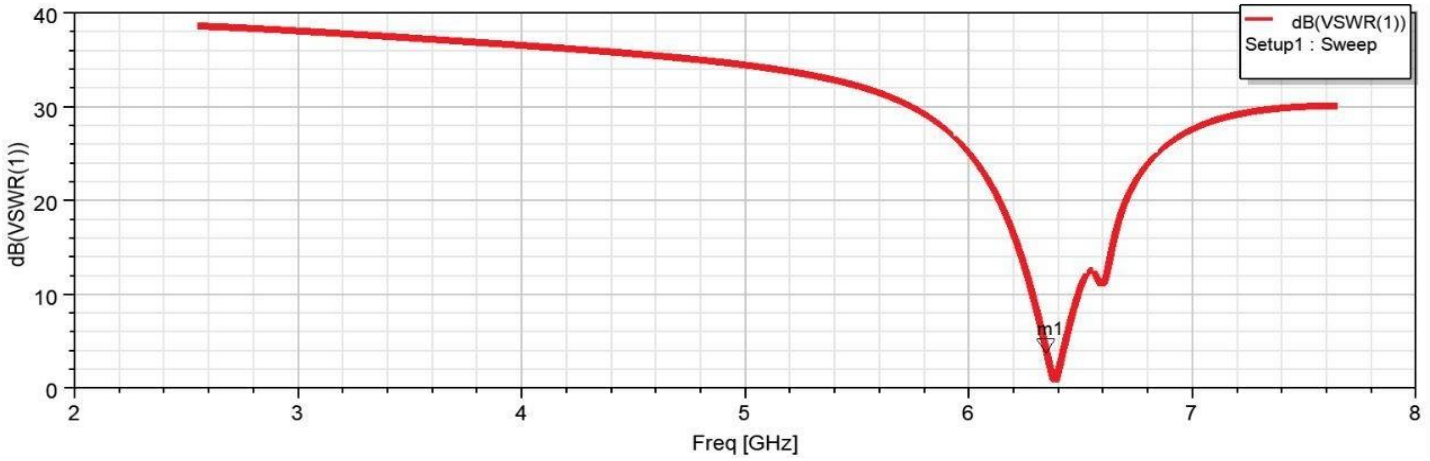

6.5. Design of H-Shape (Polyamide Substrate)




6.6. Gain (Polyamide Substrate)



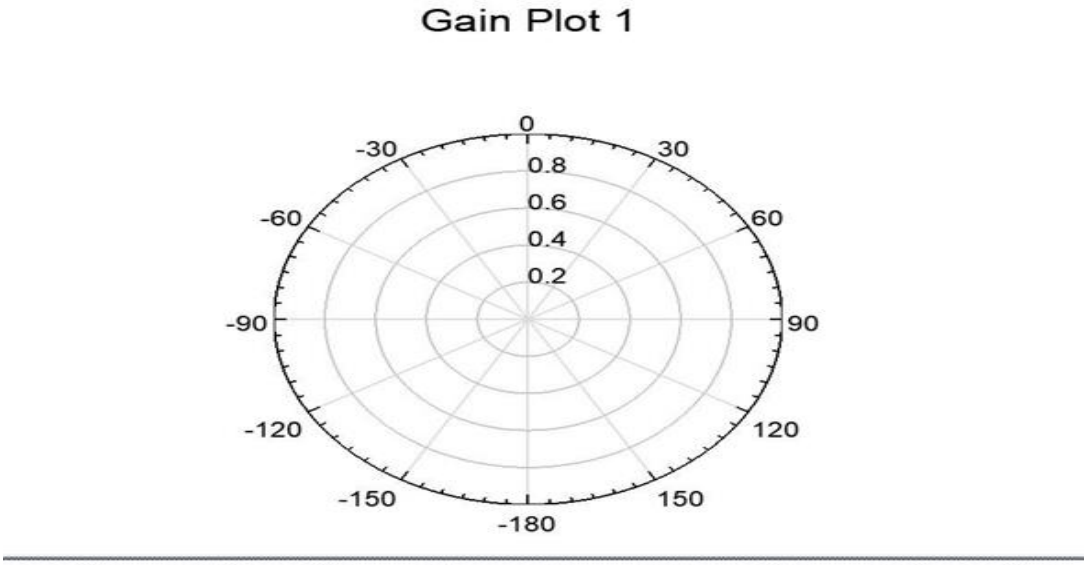

6.7. Simulation of frequency plot (Polyamide Substrate)



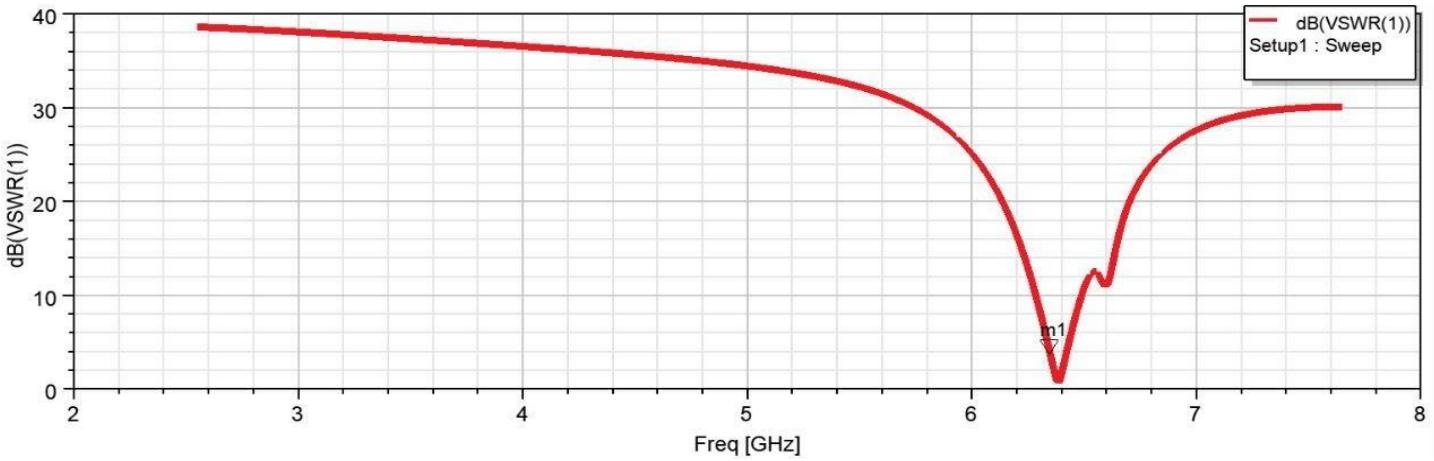

6.8. Simulation of VSWR (Polyamide Substrate)

The figure 6.5, 6.6, 6.7, 6.8 shows the design of H shape batch antenna, S-Parameter, Simulation of VSWR and Gain Plot over the polyamide substrate.

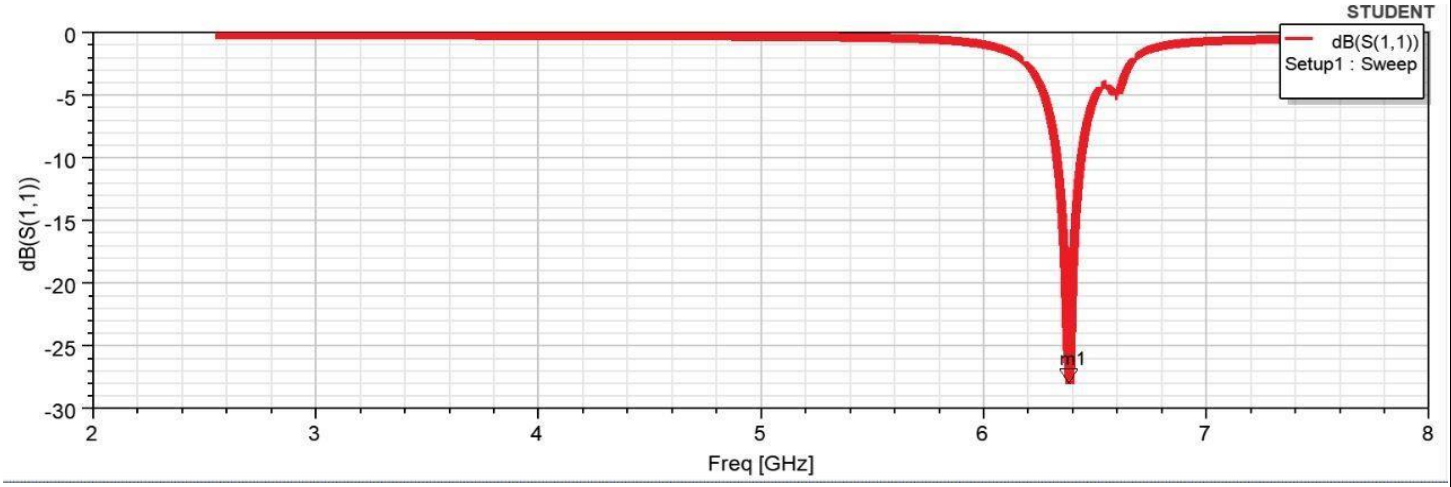
6.9. Simulation of VSWR (FR4 Substrate)




6.10. Gain (FR4 Substrate)




6.11. Simulation of VSWR (FR4 Substrate)




6.12. Simulation of frequency plot (FR4 Substrate)

Figure 6.9, 6.10, 6.11, 6.12 show the design of H shape batch antenna, S-Parameter, Simulation of VSWR and Gain Plot over the FR4 substrate.

# CHAPTER 7

# CONCLUSION

This paper presented a new linearly polarized antenna design for UWB communications. The main advantages of the proposed antenna are the aerodynamic shape for quadcopter drones, low-profile, and UWB operation. With this geometry, the drag problem can be diminished during the flights. This new antenna is a good alternative for UWB systems with drones because there exists the possibility to use four antennas on the aircraft. This can avoid generating interferences with the circuitry of the whole system. The fabricated prototype was mounted in a real aircraft structure and provided a similar performance to the simulated antenna.

Future works will be focused on the implementation of a UWB system during the flight of a UAV. A wideband microstrip slot antenna was designed with suitable dimensions and position coordinates. With this design we conclude that this antenna is well suited for wireless LAN and WiMAX applications with the frequency of 6.7 GHz. The measured gain is also suited with the required value. By using the IE3D v14.65 Simulation software all the radiation parameters and gain were simulated. The experimental details like the antenna gain of and VSWR of 1.5 show that it is fit for this application.

The simulated results were very close to the measured values. All the graphs and charts show the simulation results of the antenna. It is ideal for wireless communication. The observed parameters of the manufactured antenna are matched with the simulated values. The presence of the UAV body does not affect substantially the directivity of the antenna. In fact, it is slightly increased when the antenna is mounted on the drone structure. In fact, it is slightly increased when the antenna is mounted on the drone structure. Both the H-shaped antenna and circular parasitic element provides a wider bandwidth. This H-shaped antenna is used to describe the outer surface of the antenna. Antenna provides a ground plane with a small notch.

# CHAPTER 8

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**PAPER ID: I142**

## VEHICLE STARTER USING ARDUINO UNO

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*Abstract*: The paper presents the "Vehicle starter using Arduino UNO". The system mainly designed for accessing vehicle by authorized people. The presented design prevents the user's vehicle from unauthorized access. For real time implementation of the vehicle stater system, the Arduino UNO is the heart of the system. The fingerprint sensor (R305) is connected to the microcontroller in which n-number of authorized person's fingerprint are registered. The output module motor is connected to controller which is enabled whenever authorized finger print is detected. The overall system requires as power supply a power supply as +5V. By implementing our proposed model, no one can access our vehicle without are knowledge. this will lead to reduction of theft rate of of vehicle.

*Keywords*: Power supply, Arduino UNO, fingerprint sensor(R305), Motor.

**PAPER ID: I143**

## SMALL SIZE RF ANTENNA FOR UAV APPLICATION

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*G. Monika* UG Scholar

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*Abstract*: Owing to remote control and independent flying, commercial usage of unmanned aerial vehicles (UAVs) has recently been progressively extending from military use. Considering drones could be employed for remote sensing, communications broadcast. RF antenna is with compactness, light weight aeronautical design, and high penetration are essential due to the peculiarities of the operating conditions in UAVs. The main purpose of implementing Radio frequency (RF) is for high frequency antenna. This article is focused on the design of an ultra-wideband antenna for use with Unmanned Aerial Vehicles (UAVs). This antenna eliminates the problem of aerial vehicle drag. Low-profile construction is created by the RF Antenna. This antenna is designed to be light weight and compact. This antenna is manufactured of Rogers Duroid 5880LZ material and has dimensions of 29mm× 39 mm. The thickness of the material is 1.6mm. The feed used for the Roger Duroid material is inset feed. The antenna study reveals that the ultra-wideband productivity of S11< - 10dB from 2.4 GHz to 6.5 GHz. Radiation pattern performance is satisfactory up to 5.8 GHz. The antenna generates a gain of 1.48. The highest radiation is provided by the RF antenna. Using a UAV model, the novel unique antenna was simulated and evaluated to access its performance

*Keywords*: Antenna, UAV Application, RF Antenna, Inset feed .

**PAPER ID: I144**

## DESIGN AND IMPLEMENTATION OF MICROSTRIP FILTER USING FOR UWBAN APPLICATION USING CST

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*Karthickraja K,* UG Scholar
*Madheshwaran S,* Scholar
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*Abstract*: This paper presents a new compact microstrip filtering antenna with modified shaped slots to improve the impedance bandwidth. The proposed microstrip filtering antenna consists of three parts: the monopole radiating

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