

Flying Aerial Transceiver for Providing Communication after Natural Calamities Using Bi-quad Antenna

N. Shenbagam, M.D. Bhargavi, S. Kowsalya, S. Mirunalini and T. Rajeswari

Electronics and Communication Engineering, SACET, Trichy, India

Abstract: Flying Ariel Transceiver is to provide a temporary mobile communication by social networks after the failure of network coverage due to natural calamities. Flying Ariel Transceiver contains two modules (1) Base station and (2) Transceiver (Drone). The Controlling unit restrains the remote which controls the unit of drone, by RF signals. Drone, the moving aircraft be full of a FM and WI-FI Transmitter. FM is a form of modulation which conveys information by varying the frequency of carrier wave. For FM broadcasting aerial antenna is used and this can be done by VHF broadcasting particularly for high fidelity sound. Our frequency range is 94.7 MHz. After receiving the information from the base station, the people can communicate via WI-FI with the help of WI-FI modem. The network for modem can be created by the bi-quad antenna. The transmission depends on the size of a bi-quad antenna which is made up of copper wire in a blanked printed circuit board. Its frequency range is about 2.4 GHZ. So with the help of these two modules we can help the people to communicate the base station.

Key words: Drone • Aerial Antenna • Bi-quad Antenna • FM; Wi-Fi

INTRODUCTION

It is highly impossible to communicate the people in the affected area after natural calamities. For that we proposed a system having drone which consist of Fm broadcasting and Wi-Fi. Here we are using a Transceiver device for communication. It is also called as drone. Drone is also known as UAV (Unmanned Aerial Vehicle). The information can be transmitted by the transmitter in the control unit which can be received by the receiver in the drone. In this paper our device is broadly classified in to two units. They are

- Control Unit
- Drone Unit

Hardware Description: Control unit consists of switches as a remote control and wireless microphone. Using RF signals and their frequency range our drone will act. I.e Our remote control will control the overall action of our drone. The drone actions can be controlled by the remote control as mentioned earlier. There are four flip forward actions, they are

- Flip Forward
- Flip Backward
- Flip towards right
- Flip towards left

This four axis aero craft is suitable for indoor/outdoor flying, it adopts 2.4 GHz band, with long controlled distance. Here in this drone we are using lithium battery in the vehicle, we can use it as a rechargeable battery. While charging it glows red light when the charge is completed it glows green colour. The charging time is approximately one hour. Drone is degree of remote control operator located on a base station. It is also called "Aircraft without a human aboard".



Fig. 1: Drone model



Fig 2: Aerial antenna

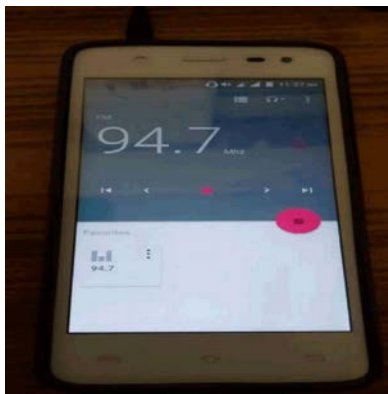


Fig. 3: Frequency range in our mobile

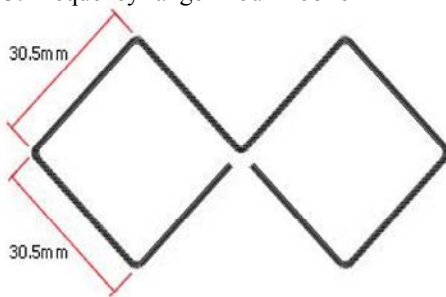


Fig. 4: Design of Bi-quad antenna

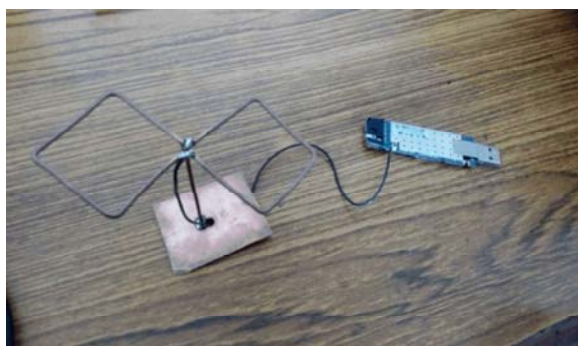


Fig. 5: Our 2.4GHZ Bi-quad Antenna

Next is drone unit microcontroller is programmed and placed in the drone. Motor actions will be controlled by ESC (Electronic Speed Controllers) it helps to control the speed of motors and Driver Unit.

Modules of Drone: There are two different modules of drone.

They are

- FM Broadcasting
- Wi-Fi

Above two modules are used for broadcasting and it also helps the receiver to communicate with the base station. FM broadcasting can be done by aerial antenna and Wi-Fi transmission can be done with the help of bi-quad antenna.

FM Broadcasting: FM Broadcasting is a process in which voice is input it is encoded and processed either using AM or FM. And at the receiver side it is decoded and amplified. FM is a process in which electrical signals are converted in to radio signals and broadcast using VHF and very high sound fidelity.

Here Fig (2) shows we are going to use an aerial antenna. It acts as a transducer which helps to convert electrical signals in to RF Signals. Aerial antenna is a directional dependent antenna.

The voice input from wireless microphone is received by the receiver in the drone and it is processed using FM circuit in the drone and the data is broadcasted, now if the frequency is set as 94.7MHZ in receiver's side FM they can hear the information from base station.

Wi-Fi: Wireless technology is the developing technology in today's world. In order to make the communication among the mobile users it is much important to provide the wi-fi connection among them. So we are providing the network to the modem via Bi-quad antenna from satellite, and using the wireless modem we can spread the Wi-Fi to the mobile users who are in the affected area. For designing a bi-quad antenna we are using the basic component as copper wire, copper pipe, and blanked printed board. These are some specifications.

Above picture is the real time bi-quad antenna we designed which works under the frequency range of 2.4GHZ. It is simple to design and provides better coverage. Bi-quad antenna consists of two quads of same $\lambda/4$ wavelength with copper plate and copper wire. The bi-quad antenna that we made is a combination of two one wavelength square loop antennas [1].

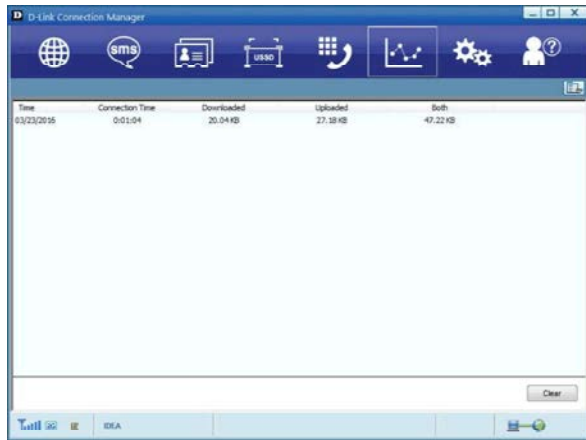


Fig. 6: Output With Antenna

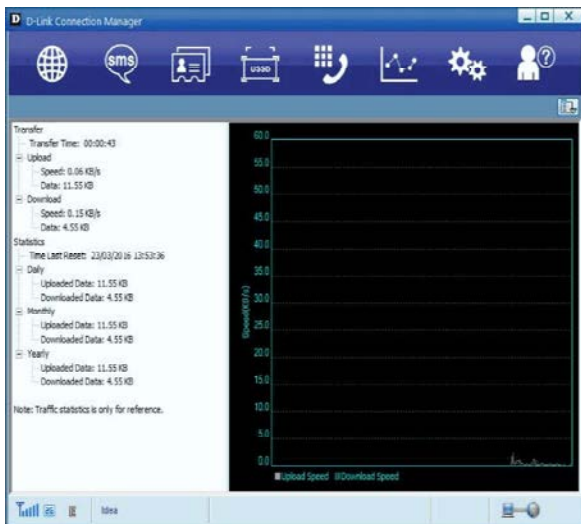


Fig. 7: Output without Antenna

Table 1: Parameters and ranges

Parameters	Value
Flying Speed of drone	20km/hr
Coverage range of bi-quad antenna	300-500m
Frequency Range for FM	94.7MHZ
Frequency Range for Wi-Fi	2.4GHZ
Wavelength of bi-quad antenna	244mm

The required components for designing a bi-quad antenna:

- Copper wire of thickness 1.5 mm
- Copper plate of size 4 cm of each side after designing the antenna the signal strength can be increased and the coverage area increases upto 300-500 m [2].

Calculation of Biquad Antenna: To Determine the Bi-quad Antenna Wavelength:

$$\begin{aligned}
 f &= 2.45 \text{GHz} \\
 c &= 3.8 \times 10^8 \text{m/s} \\
 \lambda &= c/f \\
 &= 3.8 \times 10^8 / 2.450 \times 10^9 \\
 \lambda &= 122 \text{mm}
 \end{aligned}$$

Total Wavelength of Bi-quad Antenna:

$$2 \lambda = 244 \text{mm}$$

where,

F-Frequency of the Bi-quad Antenna,

C-Velocity of the light,

λ - Wavelength of the Bi-quad Antenna.

Above calculations are made as per the specifications in [5].

Test Results: We have proved that, the result of bi-quad antenna with two test results. Fig 6 & 7 shows the data rate of modem for both uploading and downloading with and without antenna. For bi-quad antenna modem the uploading speed is about 27.18 kbps and the downloading speed is about 20.04 kbps is shown in the Fig 6.

For ordinary modem the uploading speed is about 11.55 kbps and the downloading speed is about 4.55 kbps shown in Fig 7.

While comparing the results, the modem with bi-quad antenna provides better data rate than the modem without antenna.

Table 1 gives the features and range of drone, FM and Wi-Fi.

CONCLUSION

Thus we are create a temporary network as FM broadcasting for passing the information from the base station to the receiver, and for response from the receiver side we using Wi-Fi that helps the affected people to communicate with the base station. Thus the defence force or the people who are in the recovery operation can help to find the people and help them to survive. In future a camera can be inserted in the drone for surveillance purpose also and the coverage area can be extended by Li-Fi.

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