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MODELING AND INVESTIGATION OF BLADE ANTENNA WITH AND WITHOUT SINGLE RING RESONATOR

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ABSTRACT

In this paper, a few promising antenna designs for airborne applications which is compact, small in size and ease of fabrication is described. In order to achieve that objective, novel approach like single ring resonators are employed in the Blade antennas to improve the band of operation and achieve the desired antenna attributes for air borne applications. The design and the simulation is carried in CST microwave studio tool. Attractive approach in this paper is the proposed blade antenna design with and without the single ring resonator and also the investigative analysis of the proposed two antenna models are presented.

Keywords: Blade antenna, Single ring resonator, air borne applications, metamaterials, CST microwave studio

I.INTRODUCTION

An antenna is a dedicated transducer which converts radio-frequency (RF) energy into alternating current (AC) and vice-versa. Antennas find countless applications in numerous fields of Engineering. Basically antennas are of two kinds the transmitting antenna and the receiving antenna. It is not considered to exaggeration about antennas with the following statement as antennas provide tremendous services. The safety and the security of the nation are depended on the intelligent design, development and the implementation of the antennas. Different types of antennas and their classification is shown in the following figure.

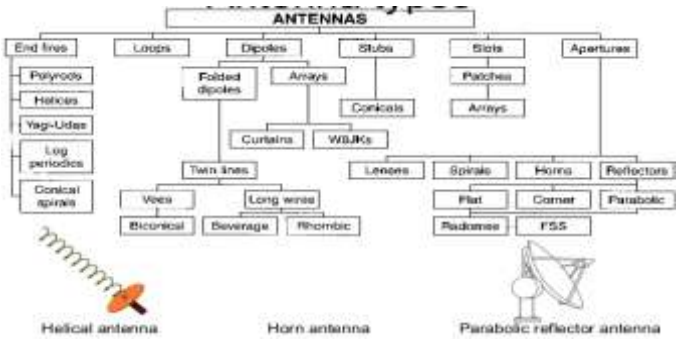

Figure 1: Types of antennas

The antenna hierarchy is shown in the following figure 2.

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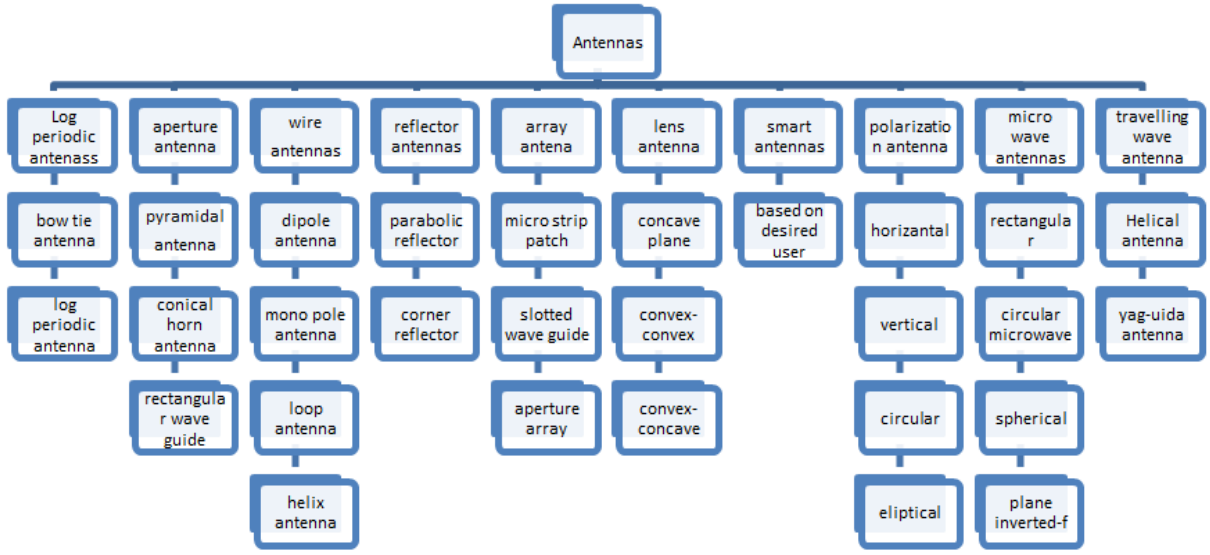

Figure 2: Antenna Hierarchy

Antennas are predominant components of all gear that makes use of radio. They are used in techniques for various systems to radio broadcasting, broadcast television, two-means radio, communications receivers, radar, cell phones, and satellite communications, as well as different devices similar to garage door openers, Wi-Fi microphones, Bluetooth enabled devices, wireless computer networks, baby monitors, and RFID tags on merchandise.

II.PROBLEM STATEMENT

There are several types of antennas mounted on aircrafts. Out of which monopole antenna is the fundamental antenna that is mounted on aircrafts to fulfill the required necessities in air borne applications. Later with the invention of the planar antennas the performance of the airborne has improved. It is already proposed a blade antenna by the researchers to fulfill the requirements. In this paper the concept of miniaturization and the metamaterials are applied on to the blade antenna thereby the shape of the respective blade antenna gets modified and the performance will be improved. With introduction of the miniaturization concept into the antenna structure the current distribution in the antenna altered and thereby the gain and the directivity of the antenna approaches to the accepted level. Design and development of the Blade antenna with single ring resonator is presented in this paper. Single ring resonator is introduced on to the Blade planar antenna and its performance is analyzed in the later section.

III.THOUGHT PROCESSES

An extensive study over the Blade antenna is done, and inspired to produce an ideas to improve the enhanced parameters of Blade antenna by introducing the single ring resonator. The model of the single ring resonator on blade antenna is proposed, presented and is illustrated the figure3.

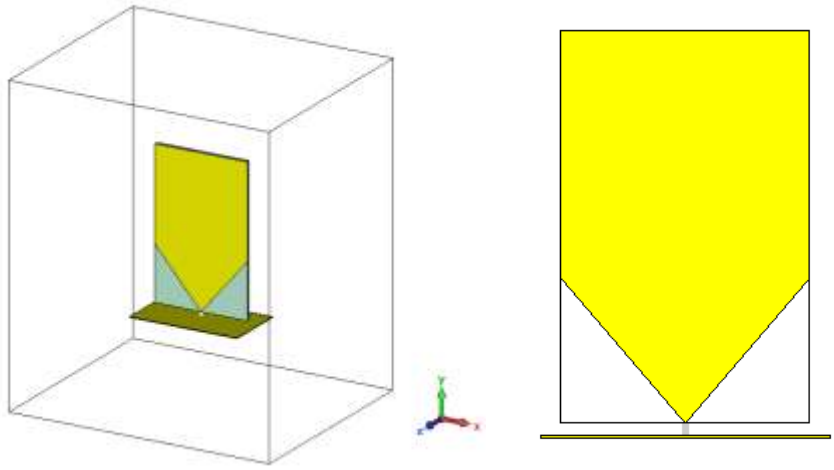

Figure3: Structure of a Simple Blade antenna

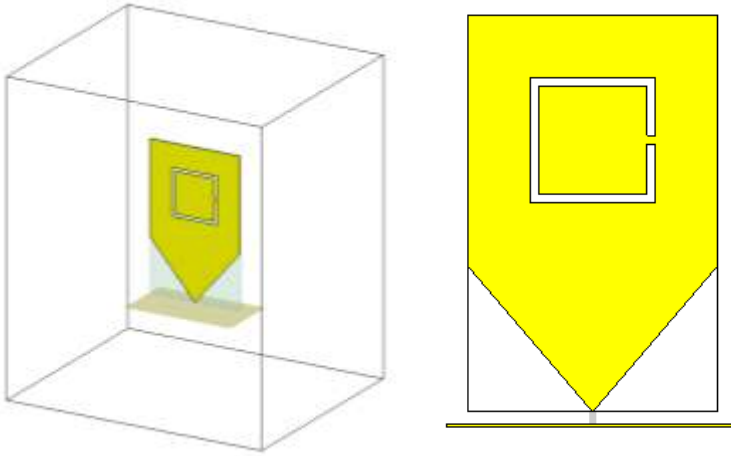

Figure 4: Structure of Blade Antenna with single ring resonator

IV.RESULTS & DISCUSSION

The Blade antenna and the proposed Blade antenna with the single ring resonator are modeled and are simulated in CST Microwave studio tool. The simulation results are shown in the following figures. The antenna attributes like S- Parameters, VSWR, radiation pattern and others are analyzed in this paper. It is observed that a simple blade antenna perform in a single band of operation. In contrast the proposed Blade antenna with the single ring resonator operated in dual band of operation at frequencies 1.15 GHz and 1.58GHz respectively. Figure 3 illustrates a simple Blade antenna whereas the figure 4 represents the modified blade antenna with concept of the single ring resonator. The radiation pattern of both the antenna models is shown in the figure5. VSWR of the simple Blade antenna is around 1.4 : 2.2 whereas for the blade antenna with single ring resonator is around 1.4 : 2.2 at 1.63GHz.

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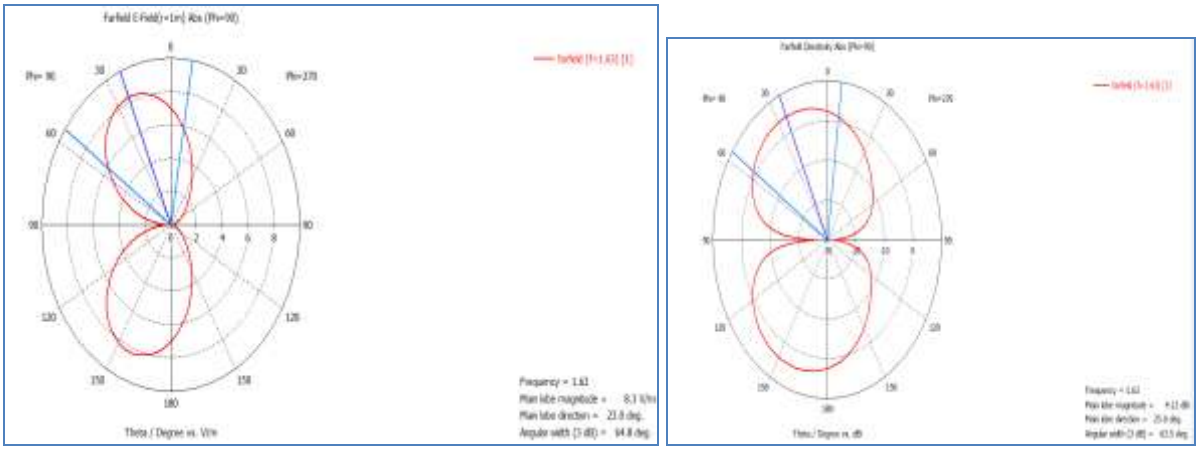

Figure 5: Radiation pattern of Blade antenna with and without single ring resonator

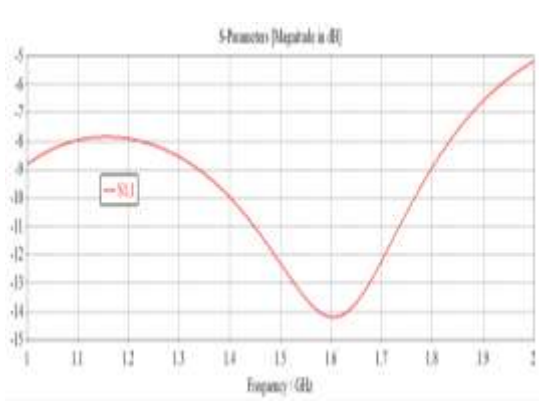

Figure 6 :S- parameters of Simple Blade antenna

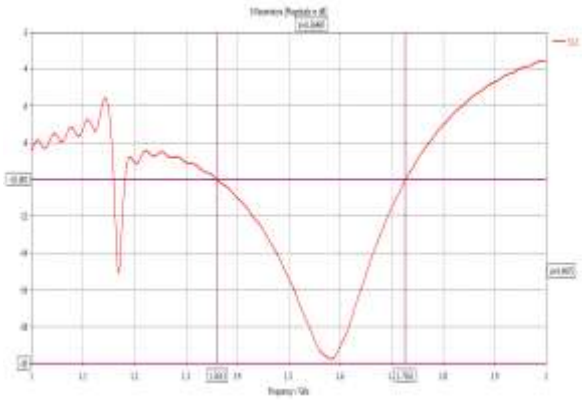

Figure 7: S- parameters of Blade with single ring resonato

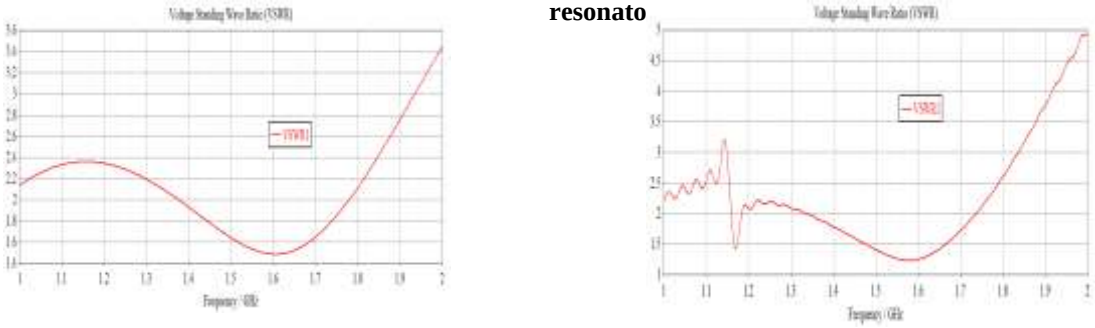

Figure 8: VSWR of Blade antenna with and without single ring resonator respectively.

V.CONCLUSION

Blade antenna plays a vital role in the airborne applications. It is compact, small in size, ease of operation. Blade antenna can be easily mounted on the aircraft surfaces as it is a planar type antenna. In this paper the Blade antenna is modeled and simulated in CST microwave tool. Two designs of the Blade antennas are presented in this paper. Proposed Blade antenna with the single ring resonator produced dual band of operation and the

antenna attributes like VSWR, S-parameters and the others are enhanced in this design model. Further this Blade antenna can be modeled with double ring resonator.

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