

COPPER NANO-FERRITE BASED GIGAHERTZ ANTENNA ON EM SUBSTRATE

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Abstract— the realization of nano-sized, highly-featured, Copper Ferrite (CuFe_2O_4) for the preparation of Circular patch antenna substrates is being reported in this present investigation. The Designed antenna is suitable for working at the range of 1 to 15 GHz. The suggested technique is applied to improve the Bandwidth performance in the UWB region. The antenna is designed and simulated using MOM method based Electromagnetic solver - FEKO software. The radiation performance parameters of antenna like its radiation pattern, directivity, return loss and gain are analyzed in the band of operation.

Index Terms— FEKO, MOM, UWB.

1 INTRODUCTION

In decades ago, the innovation enhanced in light of the advancement in the field of media transmission, towers and flying machine. As of now, the microwave engrossing materials have been centered on mindfulness. Among differing ferrites, electromagnetic materials have been generally contemplated [1], for instance garnet, magnetoplumbite, spinels ferrite. These ferrites are extremely intriguing to a great deal of analysts on the planet because of the ferrites materials are for the most part displaying electrical and attractive properties and in addition their warm and substance secure qualities [2-7]. In this paper, Copper Ferrites are prepared and calculated the dielectric values to be applied in to the design of Antanna applications.

2 EXPERIMENTAL DETAILS

2.1 MATERIALS

Chemical such as cupric nitrate hexahydrate ($\text{Cu-NO}_2\text{O}_6 \cdot 3\text{H}_2\text{O}$), ferric nitrate nano-hydrate ($\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$), Citric Acid ($\text{C}_6\text{H}_8\text{O}_7 \cdot \text{H}_2\text{O}$), sodium hydroxide (NaOH) all from Merck, and double distilled water were used without additional purification.

2.2 SOFTWARE USED

FEKO programming was utilized to reproduce this radio wire plans. FEKO re-enachment display comprises stacked fix and wide space UWB receiving wire; it works on recurrence 1-15GHz. By considering the measure of the receiving wire, that program was reproduced utilizing Method of Moments (MOM) based stage. The streams were figured

utilizing a direct mix of premise capacity where coefficients were acquired by illuminating an arrangement of straight Once the present circulation is ascertained alternate prameters like far field, directivity or the info impedance of receiving wires are acquired.[2,4].

3 RESULTS AND DISCUSSIONS

3.1 SCHEMATIC DIAGRAM

A Circular space fix reception apparatus are composed. It comprises of a little wide square opening on fix with relative permittivity of Copper ferrites as 4.02 which is calculated from UV absorption studies [3] and on the opposite side of the substrate was forked small scale strip sustain which associates the substrate and adjusted fix. The reception apparatus was re-created with the given recurrence extends in the vicinity of between 1GHz and 15GHz. The bolster are picked as a method for expanding the operational data transfer capacity. Over a legitimate scope of the parameters of little space, it can be anticipated that the coupling between the microstrip line and the printed wide opening. It can be controlled all the more adequately, which makes conceivable huge transfer speed enlargement of the printed Circular-space fix receiving wire. The schematic outline of Circular opening patch reception apparatus is appeared in figure 1. The method that utilization circle molded and the contorted plan of the ground plane to enhance the reflection coefficient, transmission capacity and pick up of this reduced antenna.

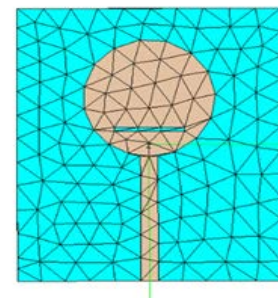


Figure 1 Schematic diagram

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3.2 RETURN LOSS

S11 is a measure of how much power is reflected back at the antenna port due to mismatch from the transmission line. When connected to a network analyzer, S11 measures the amount of energy returning to the analyzer not what's delivered to the antenna. The amount of energy that returns to the analyzer is directly affected by how well the antenna is matched to the transmission line. A small S11 indicates a significant amount of energy has been delivered to the antenna. S11 values are measured in dB and are negative. The return loss value is -25.5dB shown in fig.2.

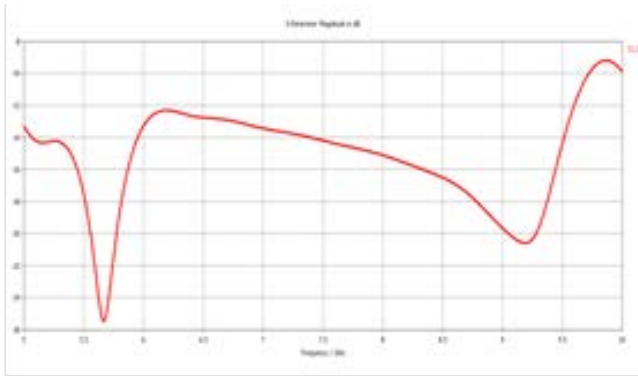


Figure 2 Return Loss

3.3 GAIN

The term antenna gain describes how much power is transmitted in the direction of peak radiation to that of an isotropic source. Antenna gain is directly proportional to directivity. The maximum gain is 6.5 at 8 GHz is shown in fig.3.

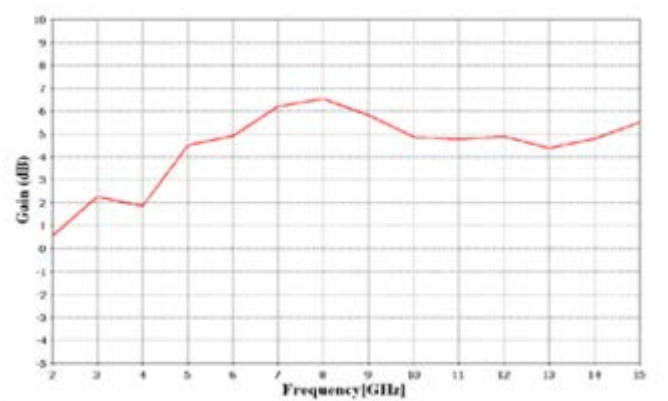


Figure 3 Gain

3.4 VSWR

The VSWR is always a valid and constructive number for antennas. The smaller of VSWR that the better antenna is matched to the transmission line and the power is supplementary delivered to the antenna. The minimum VSWR is 1.0. In this case, no power is reflected from the antenna, which is id ideal. The VSWR value is below 1 is shown in fig.4

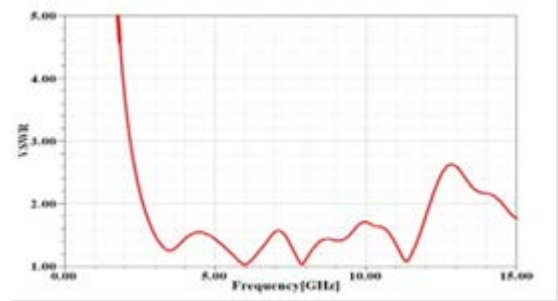


Figure 4 VSWR

3.5 BANDWIDTH

It is typically measured in hertz, and may sometimes refer to passband bandwidth or base band bandwidth which is depending on context. Passband bandwidth is the difference between the upper and lower cutoff frequencies. Here bandwidth is calculated as 0.6GHz is shown in fig.5.

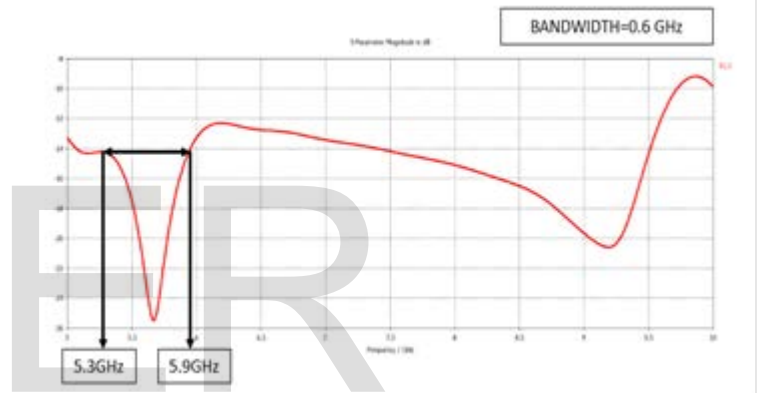


Figure 5 Bandwidth

4 CONCLUSION

Utilizing the substrate parameter (Copper ferrites), an underlying Circular space fix radio wire was composed and mimicked utilizing FEKO programming. The mimicked |S11| parameter in dB (20 log₁₀ |S11|), will be called as |S11| from now on) and the radiation example of an adaptable miniaturized scale strip reception apparatus. In this recreation the receiving wire gives upgraded radio wire parameters because of its great attributes like single layer, little size and huge data transmission. This basic, scaled down reception apparatus structure may be a decent application for Wireless Applications like Biomedical field.

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