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Review Article

ANALYSIS OF SUBSTRATES IN MICROSTRIP ANTENNA DESIGN

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ABSTRACT

Microstrip antenna design uses the dielectric substrate materials of varying constant values. The use of cost effective substrate material is suggested from the research outcome in this paper. RT duroid material can be used for military applications and FR4 may be utilized for industrial applications.

INTRODUCTION

Dielectric substrates are unavoidable materials in microstrip antenna design. The characteristics of that antenna are varied by using different substrate materials, changing the thickness and relative permittivity of the substrate. The number of substrate layers used in the antenna structure also determines the bandwidth of the antenna. Substrates provide mechanical rigidness to the antenna (Asok, *et al*., 2010).

If the dielectric substrate size increases, then the volume of the antenna increases. The radiation energy of the antenna depends on the substrate. The cost of the antenna is proportional to the cost of the substrate used in that. Hence while choosing a dielectric substrate for the microwave microstrip antenna, the selection is important (Qingwei, *et al*., 2011). Relative permittivity, loss tangent, are important properties of substrate in design aspect. Foil adhesion, bonding ability, formability, impact resistance, resistance to chemicals are some physical properties of substrate in fabrication aspect (Anzar and Rajesh, 2012).

Analysis of substrate has been discussed in this paper. Ten different dielectrics are taken for analysis. The antenna substrate is used for the applications of wireless communication (Kiran and Keshav, 2012).

ANTENNA DESIGN

A circular shaped meander antenna stacked structure is designed. The antenna consists of substrates in three layers. The first second and third layer thicknesses are 1.6 mm , 1.6 mm, 3.2 mm respectively. In first substrate radius of 45 mm star shaped patch, second substrate radius of 30 mm hexagonal fractal, third substrate radius of 47.65 mm meander patch is designed. All these are stacked together to form as antenna. The patch of meander structure substrate is varied each time for the analysis and the design. The view of the antenna is shown in (Fig. 1).

This antenna is fed by coaxial probe fed diameter of 1.35 mm. The ground plane is constructed on the size of 200 mm X 200 mm. The side view of the stacked patch structure is shown in (Fig. 2).

RESULTS

The analysis of ten different substrates (Shukla, *et al*., 2015; Salai, *et al*., 2015) is carried out in the antenna's lower patch meander design. The stacked patch antenna is simulated in the simulator software IE3D, and its results were recorded in Table 1.

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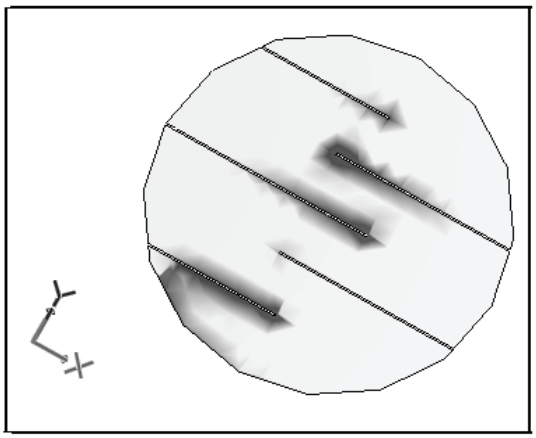

Fig. 1 Bottom patch view of stacked antenna.

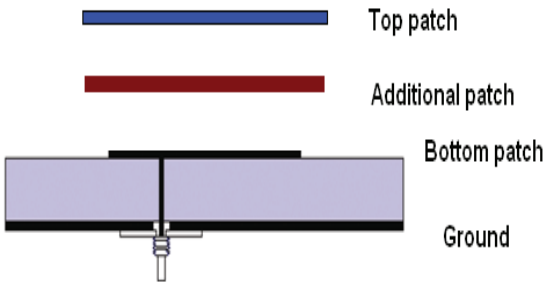

Fig. 2 Side view of stacked antenna with additional patch.

DISCUSSION

It is inferred from the analysis that if the dielectric constant value increases, the multi resonant frequencies are decreasing.

CONCLUSION

Different substrate materials were analyzed in the antenna. By selecting suitable materials, the radiation performance will be good. It is concluded that out of the analyzed substrate materials, even though FR4 is lossy material, it shows acceptable antenna parameters in industrial applications. Rogers RT Duroid is costly and used for antenna parameters in defense applications.

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