DESIGN AND SIMULATION OF TRIBAND TAPERED SLOT ANTENNA USING DUROID MATERIAL

S. Parameswari[1], P.Arun pandian [2]
B.Madhan[3],M.Arunachalam[4].

[1]*Kalasalingam Institute of Technology [Assistant Professor, ECE]*
[2,3,4]*Kalasalingam Institute of Technology [Final Year UG Student]*

Abstract—In this Paper, a tri band tapered slot antenna with new geometrical gratings, which is fed by a circular slot that The measurement shows that triple frequency band is from 8GHz, 14GHz, 17GHz is occurred .The proposed design of antenna are used Rogers duriod substrate material and with analyzed performance. The gratings are introduced to make the antenna to perform better radiation characteristics of a low side lobe over the operating band as well as obviously higher gain and sharper beam width. The proposed antenna design are used X band and C band applications.

Keywords: Tapered Slot Antenna, Circular Slot, Tri Band

I. Introduction

The TSA are first introduced in 1979 in the 9th European Microwave Conference by two independent presentations. TSA is a planar element, and a class of end fire, traveling wave antenna known as surface wave antennas. In TSA‟s EM wave travel gradually along the separated metallization tapers until the separation is such that the wave detaches from the antenna structure and radiates into free space from the substrate. For TSAs E-plane vector is parallel to the substrate and the H-plane is perpendicular to the substrate, orthogonally to the electric field. TSAs antenna length, aperture width, and the substrate thickness directly affect their radiation performance and the flare angle determines the input impedance of the antenna

The radiation planes are illustrated below in Figure 1, usually in broadside antennas a portion of the radiated energy becomes trapped in the substrate and is lost. The surface wave acts as a principle mechanism of radiation and is advantageous compared to traditional broadside, integrated antennas.

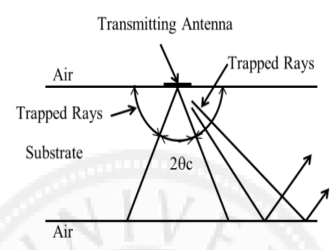

Figure 3.1. Trapped surface waves

Tapered-slot antennas (TSAs) offer a wide operational bandwidth and high gain. Therefore, they are widely used in radar, remote sensing, and ultra wideband (UWB) communications. TSAs are designed using different types of tapering, such as linear, constant width, exponential (Vivaldi), broken linear, dual exponential, and elliptical In its basic configuration, the TSA is fed by a slot line with high input impedance. To overcome this problem and achieve the required matching with the widely used 50- microstrip feeder, the utilized feeding structure, which includes slot line-to-microstrip transition and tapered ground, introduces an additional size to the antenna Tapered Slot Antenna Advantages TSAs are planar elements, therefore can be integrated on the same substrate with other transceiver components. Additionally, their planar structures, makes them lightweight and compact compared to the traditional antennas. The cost of manufacturing and performance of TSA are comparable to horn antennas. Remarkably, considering the aperture dimensions most TSA elements have symmetric E- and H-planes radiation patterns, narrower beam width and high gain compared to other planar antennas

II. Description and Analysis of the Antenna

Figure 2 shows the antenna geometry. The antenna is fed by the microstrip line. In order to meet the ultra-wideband (UWB) demand, slot line transition is utilized. Microstrip Taper Length The microstrip taper is used to adapt the optimum width found W, to the input impedance of the microstrip line Wo, A large difference between these two widths will require a long taper. The taper length LM is given by Equation 1

$$L_M = \frac{n\lambda_g}{4}, n = 1,2,3,4....$$

Eqn 1

Where, gλ is the guided wavelength and is obtained using Equation 1

$$\lambda_g = \frac{c}{f\sqrt{\varepsilon_r}}$$

mw frequency range and for a substrate with a permittivity comprised in orderλbetween 2 and 10, taper lengths must be chosen as a multiple of a quarter of a to minimize the return loss.

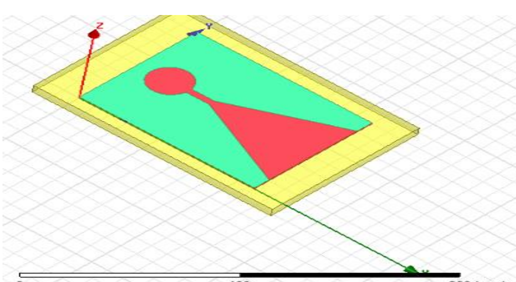

Figure 2 Tapered Slot Antenna

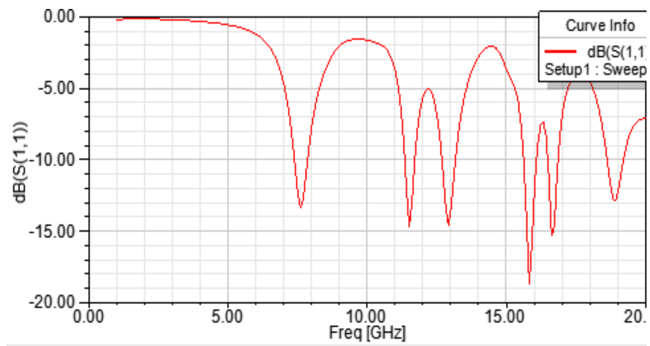

Figure 3 Return Loss

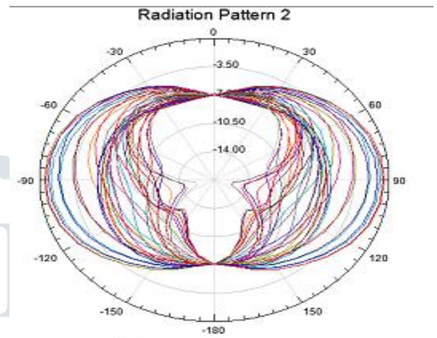

Figure 4 2D radiation pattern of the designed Antenna

III Radiation pattern

The radiation pattern of an antenna that refers to directional depedance of the strength of the radio waves from the antenna , the radiation pattern of our antenna that covers far field ranges and that is applicable to all the microwave frequency ranges.

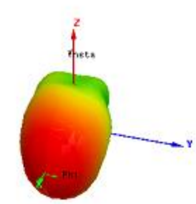

Figure 5 3D radiation pattern

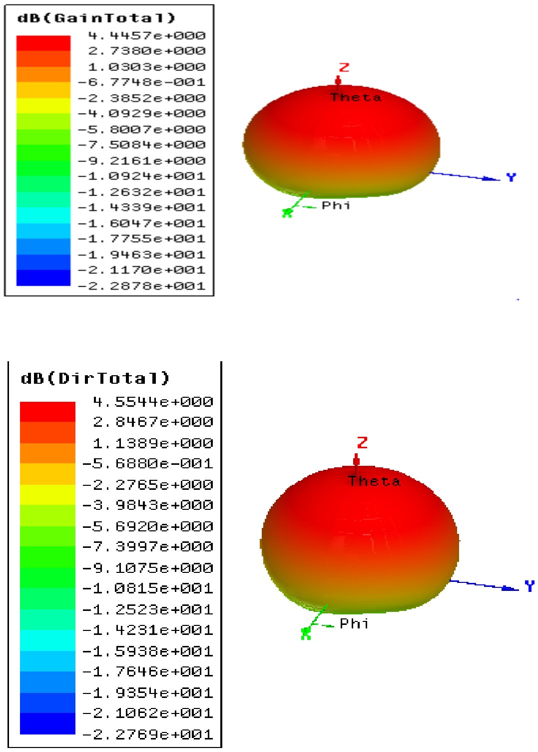

Fig 10. 3D gain and directivity for Rogers duroid

IV.Conclusion

A compact, tri band exponentially tapered slot antenna with Strip line feed with different frequency are presented in this paper. By transforming the Strip line feed to Slot line, the bandwidth and radiation characteristics are preserved. Reasonable amount of reduction in size is achieved when compared to the antennas existing. The effects of the various parameters on the antenna performance are studied. Addition, it has a comparatively stable gain over the whole operating band. Therefore, the proposed antenna should be useful for broadband wireless communication systems.

V.References

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