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Design Of Planar Trapezoidal Toothed Log Periodic Antenna Using HFSS

Rakhi Dua
Ph.D Student JJTU Jhunjhunu, India

Abstract – This paper describes the performance of a Log Periodic Antenna that operates over wide band width of frequencies and is a high gain and broad beam width antenna. This antenna is a type of frequency independent antenna and it has been seen that the performance of the antenna on Teflon substrate provides widest bandwidth among all the substrate antennas. Also the performance of the antenna on Teflon substrate is better than conventional antenna.
Keywords - Frequency Independent Antenna, Trapezoidal Toothed Log Periodic Antenna, Radiation Pattern

I. INTRODUCTION

The modified version of Logarithmic spiral antenna is Trapezoidal toothed log –periodic antenna. This modification makes the construction easy. The longest and shortest teeth are required to decide lower and upper frequency limits. It has been assumed that the length of the tooth is approximately quarter wavelength at the corresponding operating frequency. The frequency limits is being affected by the properties of the material and their thickness. The implementation of such type of antennas is in radar communication as elements of phased arrays and as primary feed for the reflector or lens type antenna. In this paper simulation study of trapezoidal log periodic antenna using Anosoft HFSS software has been done.

II. PARAMETERS OF PROPOSED TRAPEZOIDAL LOG PERIODIC ANTENNA

This paper emphasis on the design of planar, directional and physically compact LPDA. However the antenna design may get influenced by some other factors which need to be controlled in order to attain better results. The cumulative and dielectric return loss of the antenna should be kept low in order to attain high radiation efficiency. Group delay is another major factor which needs to be controlled for the better performance of the antenna. LPDA must have a constant group delay over the entire operational frequency in order to attain distortion less transmission of LPDA signal. This is the major constraint of LPDA when we compare it with narrow beam antenna.
The proposed parameters of the antenna for the design of Planar Trapezoidal Toothed Log Periodic Antenna are given in Table.1.

Table I Parameters of proposed trapezoidal log periodic antenna

Parameters	Dimensions
Substrate Width (W)	8.2 cm
Substrate Length (L)	13 cm
Outer Length (R1)	3.563 cm
Tau (τ)	0.7
Sigma (σ)	0.84
Port Gap Width	0.89 cm
β Angle	60 °
δ Angle	30 °

The two important factors in the design of proposed antenna are design ratio and mean spacing factor.

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In the above table design ratio is denoted by τ and means spacing factor is denoted by σ.

III. ANTENNA DESIGN

The construction of proposed antenna using substrate is shown in fig.1.below.

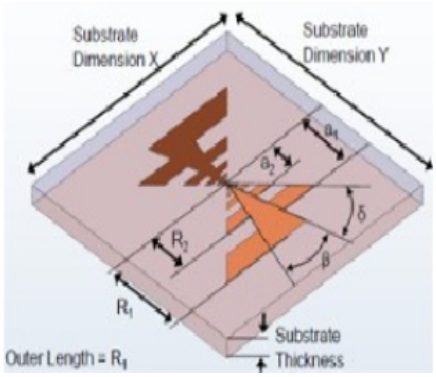

Fig.1. Geometry of planar trapezoidal toothed log periodic antenna using substrate

The geometry of proposed antenna without substrate is shown in fig.2.The port gap width is shown in fig.3. It has been observed that as the frequency increases the active region shifted to the smaller teeth and as the frequency decreases the active region shifted to wider teeth.

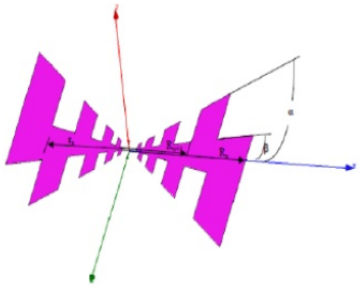

Fig.2. Geometry of planar toothed log periodic antenna without substrate

Fig.3. Port gap width of Trapezoidal Log Periodic Antenna

IV. SIMULATION RESULTS

The gain of the proposed antenna with ϕ=90° is shown in fig.4.

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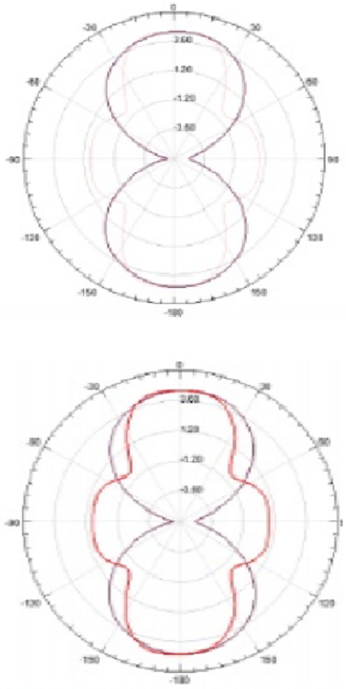

Fig.4. Radiation Pattern of proposed antenna with ϕ=90°

V. CONCLUSION

Such type of antenna is convenient up to a frequency range of 5GHz and can be implemented in variety of applications such as TV, point to point communication and feeds for reflector and lenses.

REFERENCES

[1] R.H DuHamel,"Broadband Logarithmically Periodic Antenna Structure," IRE National Convection Record, Part I pp. 119-128,1957.
[2] R.H DuHamel," Logarithmically Periodic Antenna Designs," IRE Convection Record, Part I pp. 139-157, 1958.
[3] J.D Dyson," The Equiangular Spiral Antenna," University of Illinois, Antenna Laboratory, September 15,1957.
[4] Frequency Structure Simulator (HFSS) [online] available :http://www.ansoft.com
[5] Balanis, Antenna theory" Analysis and Design," John Wiley and Sons, Inc, Publication, New York,2008.
[6] Romodin,V.I. Oznobikhin,V.V Kopylov."Log Periodic microstrip array,"IEEE 2000,in press.
[7] S. Bruni,A. Neto, and F. Marlini," The ultrawideband leaky lens ntenna," IEEE Trans Antennas Propagation, Vol. 55,no. 10,pp.2642-2653,Oct.2007.