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A REVIEW PAPER ON DUAL BAND CIRCULARLY POLARIZED MICROSTRIP ANTENNA (CPMA)

Ryan Dias
Faculty of Engineering and Technology
Jain (Deemed-to-be University), Ramnagar District, Karnataka – 562112
Email Id- ryan.dias@jainuniversity.ac.in

Abstract

This paper discusses the techniques used in regard to the feeding techniques to produce circular polarised radiation. In wireless communication, circular polarised antennas are rapidly gaining significance. The usable bandwidth is the overlap of the bandwidth of the axial ratio and the bandwidth of impedance. Cross polarisation is a measure of the purity of circular polarised antenna polarisation. The generation of both RHCP (Right Handed Circular Polarized Radiation) and LHCP (Left Handed Circular Polarization) using the antenna for either frequency reuse or diversity applications is double circular polarisation. There are several techniques for the designing of circularly polarized microstrip antennas to improve the desired level of performance parameters like resonance frequency, gain, directivity, radiation efficiency and antenna efficiency for the dual resonance. This letter describes circularly polarized microstrip antennas, literature review, simulation software's, advantages and disadvantages over conventional microwave antennas and applications. This letter also presents the comparative study of several circularly polarized microstrip antenna design methods used by researchers.

***Keywords**: Circularly Polarized Microstrip Antenna (CPMA), Slotted-Patch, Slot and GPS.*

I. INTRODUCTION

Microstrip antenna in its basic form consists of four parts (metallic patch, dielectric substrate, ground plane and feeding structure) as shown in fig. 1 [1]. Where L is the length of the patch, W is the width of the patch, h is the dielectric substrate height and ε_r substrate relative permittivity. Often microstrip antennas are also referred to as patch antennas. Recently, wireless communication and GPS systems have forced the use of circular polarization, since circularly polarized radiations offer numerous advantages [2]. The fundamental advantages of

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circular polarization are its huge penetration capability compared with linear polarization and its ability of establishing a reliable signal link irrespective of the antenna orientation of the device [3].

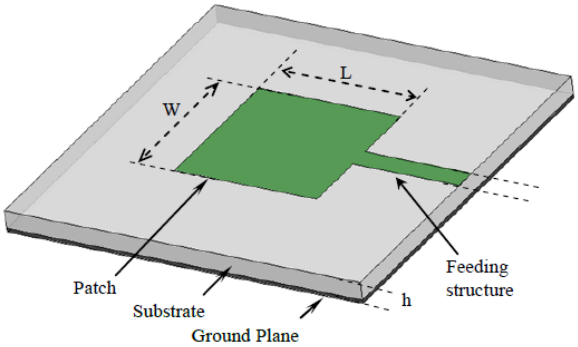

Fig. 1 Shows the Basic Microstrip Antenna

The width W of the DRA antenna can be determined by utilizing the following equation.

$$w = \frac{c}{2\, f_r \sqrt{\frac{(\varepsilon_r + 1)}{2}}}$$

Where
f_r denotes the resonant frequency, and
r represents substrate dielectric constant

The effective dielectric constant (ε_{reff}) of DRA antenna is derived by using the following equations [4].

$$\varepsilon_{reff} = \frac{(\varepsilon_r + 1)}{2} + \frac{(\varepsilon_r - 1)}{2} \sqrt{\left(1 + 12\frac{h}{W}\right)}$$

Where h denotes the height of the antenna and W denotes the width.

The length of the antenna may be measured by applying the following equation.

$$L = \frac{c}{2\, f_r \sqrt{\varepsilon_{reff}}}$$

The antenna length extension is calculated by applying the equation below.

$$\Delta L = 0.412\, h \frac{\left(\varepsilon_{reff} + 0.3\right)\left(\frac{W}{h} + 0.246\right)}{\left(\varepsilon_{reff} - 0.258\right)\left(\frac{W}{h} + 0.8\right)}$$

Here W represents the width and h denotes the height.

The real length (L_{eff}) of the antenna can be calculated by using the following formula.

$$L_{eff} = L + 2\Delta L$$

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A Planar Inverted-F Antenna (PIFA) is around half the general dipole antenna size and has a ground layer conductor layer in it [4][5]. The relation between the characteristics of wide band width and material thickness can be calculated by the following equation [6].

$$BW = \frac{Ah}{\lambda_0\sqrt{\varepsilon_r}} = \sqrt{\frac{W}{L}}$$

For A =180

$$\frac{h}{\lambda_0\sqrt{\varepsilon_r}} \leq 0.045$$

For A = 200

$$0.045 \leq \frac{h}{\lambda_0\sqrt{\varepsilon_r}} \leq 0.075$$

For A =220

$$0.075 \leq \frac{h}{\lambda_0\sqrt{\varepsilon_r}}$$

II. LITERATURE REVIEW

A paper on the configuration of a broadband all-textile slotted PIFA was done by Zied et al. A new PIFA antenna structure based on broadband textiles designed for wireless body area network (WBAN) applications is introduced. It is possible to explicitly incorporate the new topology into clothing. The analysis begins by considering three different materials: lightweight copper foil and conductive textiles made of ShieldIt Super and pure copper polyester taffeta. By implementing a novel and easy slot in the radiating patch, bandwidth broadening is successfully achieved. The calculated coefficient of reflection and characteristics of radiation agree well with simulations [7].

III. DISCUSSION AND CONCLUSION

This paper is a survey of circularly polarised microstrip patch antenna design methods and techniques. The technologies used and the research work increase the use and efficiency of the Micro strip antenna day by day and allow better use of it in the future as well. The gain and bandwidth of the Micro strip Antenna is improved by different techniques. The drawbacks of CPMAs can be minimised due to this survey effect. The low gain and power handling capability can be compensated by the array configuration. The feeding methods also maximise their results. There are several simulation tools designed for micro strip antennas that make it easy and precise to build correctly, accurately and automatically, removing all complexity.

To achieve frequency diversity or frequency reuse, the use of dual polarised antennas leads to the need for the design of dual circular polarised wireless communication antennas, where the direction of the receiver is random with respect to that of the receiver, restricting the use of linear polarised antennas. Extensive research is being carried out with particular focus on improving circular polarised bandwidth, gain, unidirectional radiation pattern and cross polarisation reduction for the design of dual circularly polarised microstrip patch antennas.

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