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PHYSICAL PARAMETRIC ANALYSIS OF TERAHERTZ PHOTOCONDUCTIVE BOW-TIE DIPOLE ANTENNA ON FREQUENCY AND RADIATION PATTERN USING ELECTROMAGNETIC SIMULATION TOOLS

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ABSTRACT

This paper presents the investigation of Terahertz (THz) Photoconductive Antenna (PCA) parameters on the frequency, bandwidth and radiation pattern. Nowadays, studies on PC antenna still don't provide a comprehensive solution in designing a good THz PCA for short distance applications. Most of the recent researchers focused on the GaAs as substrate material. Bow-tie antenna has been used in this investigation due to the frequency independent characteristics, bandwidth and high THz radiation power. Basically, the observation is focus on the performance of the antenna in terms of the resonant frequency, return loss, bandwidth and radiation pattern with respect to the change of substrate materials, substrate length, substrate thickness, gap width, gap length and the angle of the tapered flare by varies to a few dimensions and the result is illustrated in graph. Gallium Arsenide (GaAs) with 12.94 dielectric constant (εr = 12.94) was set as the substrate reference with the resonate frequency of 1 THz. Through this research finding, the parametric study of the substrate gives significant effect to the frequency whilst the parametric study on the dipole patch antenna gives significant effect to the bandwidth. The simulation is done using CST Studio Suite.

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Terahertz (THz) is a set of frequencies located in between microwave and optical. It has some advantages over microwave frequencies such as in the application of imaging system, in which it can provide higher resolution image compared with microwave imaging system [1]. The range of THz radiation is loosely defined between 100 GHz (3 mm) to 10 THz (30 μm) in the electromagnetic spectrum [2]. In recent years, Terahertz (THz) is one of the fastest growing research field and the most popular devices in THz system is photoconduction technique. Photoconductive antenna (PCA) is one of the most promising devices to radiate THz for various applications such as medical, medicine and security [3] in which distance is not a priority. However, the radiated power and the efficiency of this antenna are very low. So, many researchers in recent years focused on photoconductive antenna enhancement to overcome the weaknesses [4].