INVESTIGATION ON THE EFFETS OF PHYSICAL PARAMETERS OF TERAHERTZ BOW-TIE PHOTOCONDUCTIVE ANTENNAS TO THEIR PERFORMANCE

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ABSTRACT

The physical parameters of bow-tie PCA is investigated in this project, their effects and relationship with resonant frequency have been reviewed and discussed. The dimensions at 1 terahertz (THz) resonant frequency for bow-tie PCA has been used as the reference for the parameter sweep method.

Analysis has been done using data from the parameter sweep simulation result. The physical parameter chosen is dipole length, angles of tapered flare, gap length, gap width, substrate length, substrate width, substrate thickness and copper thickness. 10 dimension is taken for each parameter and their relationship to the resonant frequency is illustrated in graph. The simulation is done by using CST Studio Suite and plotted by Matlab software.

From the analysis studied, the dipole length and gap length affect the resonant frequency but with unclear behavior. Other parameters also affect the resonant frequency but with predictable and clear characteristics. Angle of tapered flare, gap width and copper thickness share almost the same pattern which is the resonant frequency gets higher as the parameter dimension increased. Substrate width, substrate thickness and substrate length however gives difference characteristics which is the resonant frequency gets lower as the parameter dimension increased. This study conclude that all the investigated parameter affect the resonant frequency of bow-tie PCA with their own characteristics.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND STUDY

What is Terahertz? Terahertz radiation is an electromagnetic radiation which frequency falls between microwaves and infrared regions. Terahertz radiation cannot be seen by human eyes but it warmth can be feel because it shares the same spectrum with the infrared radiation. The terahertz frequency range is mostly defined around 0.3 to 30 THz even though some other sources might define it in other frequency range. This radiation does have uniquely attractive qualities, for example it can yield extremely high resolution images and also could move a lot amount of data in just a split second. Terahertz radiation also is non-ionizing sub-millimeter microwave radiation that shares the characteristics of microwaves. Non-ionizing radiation refers to the electromagnetic radiation that does not carry enough energy per quantum to ionize atoms or molecules. In other words, the electromagnetic radiation does not have enough energy to completely remove an electron from an atom or molecules. The energy terahertz radiation carry are not enough to knock electron off atoms and molecules in human tissue which could trigger harmful reactions[1]. This is why Terahertz is now being developed mostly for imaging and medical applications as it not causes harmful to the human body.

Terahertz technology start to gaining attention in early 1990's where the two basic techniques for generating terahertz are being developed. These two basic technique known as solid-state electronics and optical generation both give different