Ultrafast Photoconductive Antenna with Dual-Band

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Abstract:- *The new proposed system is combining of two RF frequency bands. One band is around 300GHz and the other between 10-20 GHz. For different frequency ranges we have to use different antennas. For higher band a square spiral antenna and for lower band a dumb- bell dipole antenna. The drawback in the conventional system is the spectral efficiency. The newly designed antenna has just one PCS that can simultaneously emit in the low THz region (300 GHz) and in low frequency range region (10-20 GHz).*

Keywords: THz, ultrafast photoconductive emitter, square spiral antenna, dipole planar antennas.

1. INTRODUCTION:

Ultra fast photo conductive source which are driven by near-infrared (NIR) lasers became the main work horse of Tera Hertz science & technology. It continues to improve on an evolutionary path. By comparing the two sources, the PCS is the efficient device, more common, and powerful, being the primary emitter in THz time domain imagers and biomedical imaging, spectrometers.

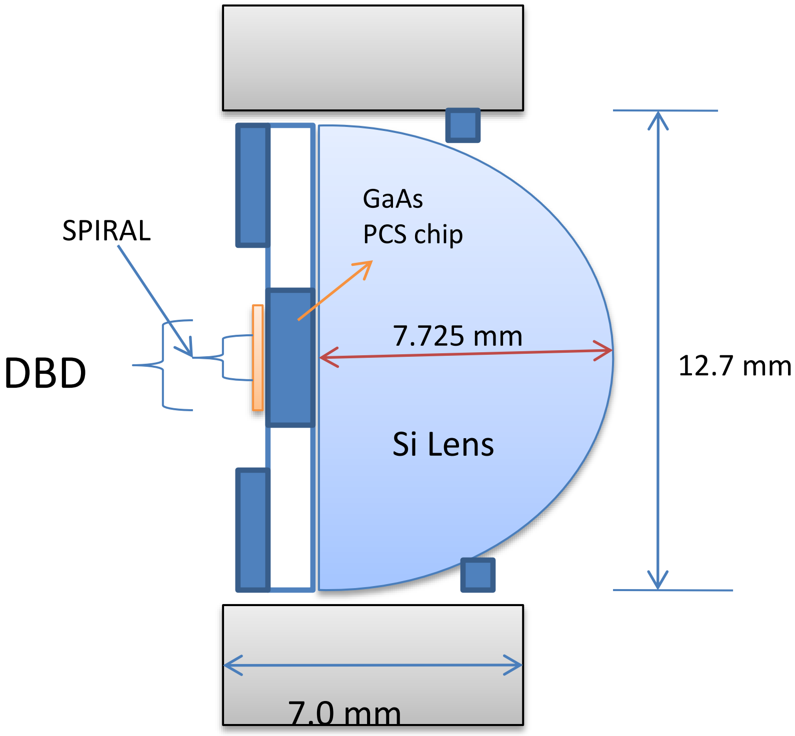
A drawback of PCS devices of all types is spectral efficiency, being that their internal dynamic photoconductive responsivity is maximum at DC and then falls off with frequency at a rate dependent on the photo carrier lifetime, electrode capacitance. The antenna in which the photo conductive switch is embedded usually determines the actual spectrum coupled to free space or to the experiment at hand. However, very few if any antennas have supported the low-frequency end of the spectrum where the potential performance is the highest.

In this paper a new antenna design having just one PCS that emits simultaneously in the low-THz region around 300 GHz and in the low-frequency region between roughly 10 and 20 GHz. We characterize it experimentally in terms of average power, polarization, and power spectral density. The low-frequency region is chosen specifically because of its good atmospheric transmission, not dependent of water vapour, rain, etc. – a benefit to wireless communications and radar.

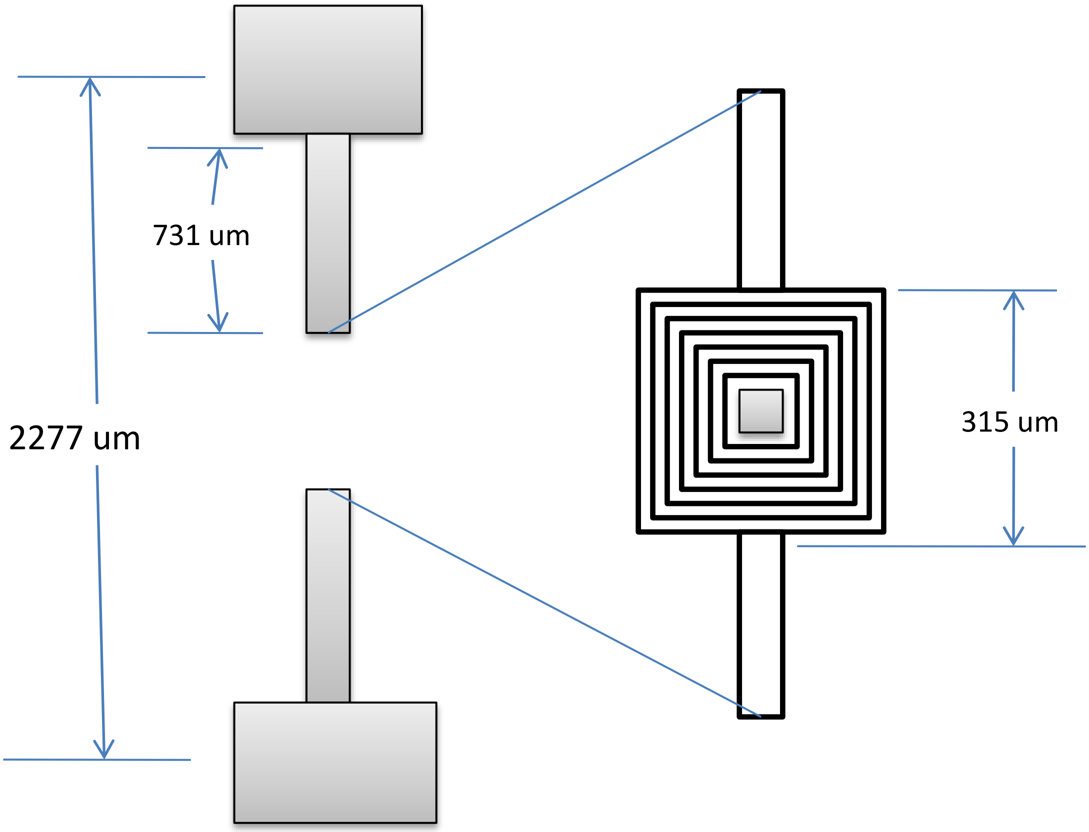
2. Literature survey:

Salman Behboudi Amlashi et al proposed that photoconductive antenna is configured to work as both pulse-terahertz emitter and pulse-terahertz receiver. The new proposed 2 port antenna has advantage from polarization diversity with high sensitivity of polarization detection. The new photoconductive antenna is proposed that has prominent working conditions in terahertz regime. The main advantage of proposed system is its polarization diversity which able the antenna to transmit and receive more amount of information with more sensitivity in 2 orthogonal polarization **[1].** Photoconductive antenna is consider as the compact and fundamental source for the terahertz generation was described by Lucky Saurabh el al. They are used for emission and detection of terahertz using pulsed laser. These is proposed for the issues of designing simple, miniaturised and compact photoconductive antenna with low water absorption at 1.6 THz [2]. Jyothi el al described design of a new high gain bow-tie photo conductive antenna in terahertz frequency band. It also deals with the effect of the silicon lens on the antenna radiation pattern which increases the directivity. In frequency of usage these antennas give better impedance bandwidth. **[3].** Utkarsh Deva el al proposed that enhancement of gain technique of photo conductive terahertz antenna by optical designing of a GaAs conical horn and si lens. This design technique can be implemented on various shaped THz radiator like bow tie antennas, spiral, dipole **[4].** In this article, two emitters were designed on a GaAs layer embedded with ErAs quantum dots. The two emitters used are one is square spiral antenna and other is slot antenna which are driven with 1550 nm mode-locked lasers for THz generation. And the device designed using these emitters were tested for THz generation and obtained the results [5]. Here Veena et.al presented a work for the generation of multiband terahertz antenna by using Meta material induced structures. The antenna is of dual band split ring resonator structure which gives results in improved radiation and efficiency at multiple frequencies. It is used in THz imaging applications and operates in the 0.1 to 5 THz band [6]. In this Ji Su Kim et.al proposed a work for THz radiation using two fiber pigtailed log spiral In GaAs photoconductive antenna and mode locked laser. To generate THz radiation using these modules, the mode locked laser is fixed with two diffraction gratings. This gives results in 2.0 THz radiation [7]. Ruben Dario Velasquez et.al analyzed that GaAs thin film based phoconductive antenna are fabricated is compared with conventional bulk LTG-GaAs PCAs on their THz performance. LTG-GaAs thin filmsare fabricated by separating Si- GaAs substrate and integrated onto bow-tie electrode tips on a SiO2 layer. By varying the applied bias voltage and maintaining the optical pump power same THz waves radiated. And THz radiation signal is higher in LTG-GaAs compared to conventional one [8].

3. Block diagram:



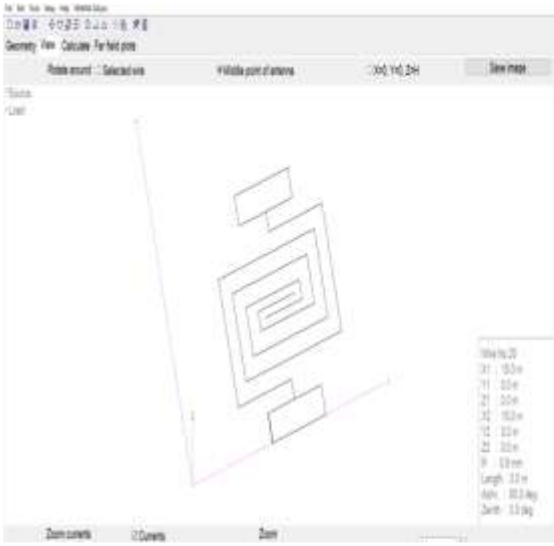
(1) Side view of emitter.



(2) Top view of dual band antenna.

4. Antenna design:

This dual band antenna is constructed with square spiral and dipole antenna and these antennas consist of photoconductive element as base material for THz generation. This is chosen because of its performance, material absorption, and THz PCS.



(3) Design of dual band using MMANA-GAL.

5. Conclusion:

In this paper we have discussed on a dual band antenna consisting of photo-conductive material in which PCS switch is connected to square spiral and dipole antenna. This dual band antenna is efficient in Tera hertz generation at different microwave frequencies for different applications.

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