Public Abstract
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An antenna radiates when a time rate of change of signal arrives at the structure from a generator, after travelling through a transmitting medium. THz radiation in a photoconductive semiconductor switches (PCSS) follows the same principles. Here the signal is produced by the photoconductive action, which travels through the bulk to the metallic contacts. In the simulation analysis, therefore, one needs to analyze the substrate with semiconductor code to characterize the generated pulse and then use Maxwell equation solver for the antenna (contact) analysis. This is because of the unavailability of a comprehensive simulation code that can solve both Maxwell and semiconductor equations in tandem. In this study, two different commercially available simulation codes were used to optimize the THZ radiation from a GaAs PCSS.

Results show that the 50 X 50 micrometers PCSS material produces a central frequency of 1.75 THz, and a pulse amplitude of approximately 0.22 A at an optimum bias voltage of 1100 Volts. The PCSS was illuminated for 350 fs with a 0.78 micrometers beam, 50 MW/sq cm in intensity.

In the antenna analysis, results show that the rectangular patch antenna had a maximum return loss (S11) of approximately -30 dB and had multiple resonant frequencies. The maximum S11 was achieved at 5.6845 THz. The directivity of the main lobe was found out to be 6.2 dB with an angular width of 36.9 degrees and was directed at 148 degrees. The side lobes were found out to be -6.8 dB.