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High Speed Terahertz Near-field Imaging Using Spatial Wavefront Modulator

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Non-destructive and high speed imaging is the requirement of many industrial, medical and scientific applications. The principle of non-destructive imaging using Terahertz (THz) radiation (0.1 THz –10 THz) has been already demonstrated in many research works. Single pixel imaging is the most commonly used method in obtaining THz image which lacks fast image acquisition. Few works has been carried out to increase the acquisition speed using multichannel detection and advanced algorithms. In this paper, we have shown the proof of concept for high speed acquisition of 2D image with improved resolution by dynamically reconfiguring the optical wavefront using spatial light modulator. An eight channel THz array antenna with an electrode gap of 100 μm and length of 0.5 cm is fabricated using the commercially available Gallium Arsenide (GaAs) semiconductor. By spatially reconfiguring the wavefront of the probe beam using spatial light modulator, we can excite each detector array simultaneously and record the THz electric field using 8 channel lock-in amplifiers. By scanning the probe beam along the length of the dipole array antenna with a small step size, the 2D image can be obtained with higher resolution along with frequency information.

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