TERAHERTZ IMAGING SYSTEMS BASED ON BEAM ENGINEERING METHODS

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Miniaturization of terahertz (THz) imaging systems is a key-factor for increasing applicability in mobile unattended package inspection systems in airports or public places [1]. Practical potential of THz imaging systems for non-destructive testing encourage a search for a compact and practically convenient solutions. One of the important issues is assumed to the development of compact diffractive optics for the THz frequency range in order to boost an evaluation of practical hand-held terahertz imaging systems applications in real time.

In a given communication, THz beam forming and spatial filtering methods are discussed. The compact diffractive optics solutions for THz beam formation starting from high efficiency multilevel silicon phase Fresnel lenses [2], graphite based flexible lenses [3], Fibonacci [4] and Bessel diffractive elements for thick object inspection [5] are presented. Focusing performance of these elements are investigated both, theoretically and experimentally. Particular attention is directed to low absorbing objects imaging due to a poor signal-to-noise ratio and small contrast. To tackle these problems, routes of using spatial filtering methods are offered. The proposed methods exhibit enhancement in images contrast up to 30 dB and an order of magnitude increased signal-to-noise ratio [6]. It opens the promising route for functional applications in medicine and biology-related issues, where weak absorbance of THz radiation in many cases is inherent feature of objects under test.

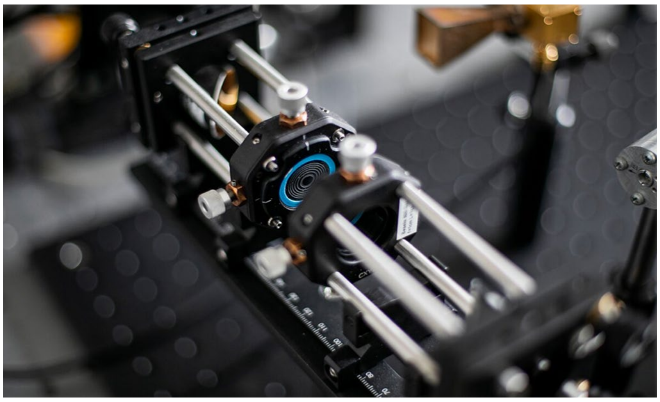

Fig. 1. An innovative terahertz imaging system based on compact diffractive optics.

References

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