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Title:THz active imaging systems with real-time capabilities
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Abstract:This paper presents a survey of the status of five active THz imaging modalities which we have developed and investigated during the last few years with the goal to explore their potential for real-time imaging. We start out by introducing a novel waveguide-based all-electronic imaging system which operates at 812 GHz. Its salient feature is a 32-pixel linear detector array heterodyne-operated at the eighth subharmonic. This array in combination with a telescope optics for object distances of 2-6 m reaches a data acquisition speed suited for real-time imaging. The second system described then is again an all-electronic scanner (now for around 300 GHz), designed for object distances of ≥8m , which combines mechanical scanning in vertical direction, synthetic-aperture image generation in horizontal direction, and frequency-modulated continuous-wave sweeping for the depth information. The third and fourth systems follow an optoelectronic approach by relying on several- to multi-pixel parallel electrooptic detection. One imager is based on a pulsed THz-OPO and homodyne detection with a CCD camera, the other on either continuous-wave electronic or femtosecond optoelectronic THz sources and a photonic-mixing device (PMD) camera. The article concludes with a description of the state of the art of imaging with focal-plane arrays based on CMOS field-effect transistors.
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