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Title:Image plane coded aperture for terahertz imaging
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Abstract:In the absence of detector arrays, a single pixel coupled with an image plane coded aperture has been shown to be a practical solution to imaging problems in the terahertz and sub-millimeter wave domains. The authors demonstrate two laboratory, real-time, two-dimensional, submillimeter wave imagers that are based on an image plane coded aperture. These active imaging systems consist of a heterodyne source and receiver pair, image forming optics, a coded aperture, data acquisition hardware, and image reconstruction software. In one of the configurations, the target is measured in transmission, while in the other it is measured in reflection. In both configurations, images of the targets are formed on the coded aperture, and linear measurements of the image are acquired as the aperture patterns change. Once a sufficient number of linearly independent measurements are obtained, the image is reconstructed by solving a system of linear equations that is generated from the aperture patterns and the corresponding measurements. The authors show that for image sizes envisioned for many current applications, this image reconstruction technique is computationally efficient and can be implemented in real time. Measurements are collected with these systems, and the reconstruction results are presented and discussed. © 2012 Society of Photo-Optical Instrumentation Engineers (SPIE).
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