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Title:Three-dimensional broadband terahertz synthetic aperture imaging
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Abstract:Terahertz (THz) technology holds great promise for applications such as explosives detection and nondestructive evaluation. In recent years, three-dimensional (3-D) THz imaging has been considered as a potential method to detect concealed explosives due to the transparent properties of packaging materials in the THz range. Another important advantage of THz systems is they measure the electric field directly. They are also phase coherent, supporting synthetic aperture (SA) imaging. In this paper, a near-field synthetic aperture THz imaging system is investigated for its potential use in detecting hidden objects. Frequency averaging techniques are used to reduce noise side-lobe artifacts, and improve depth resolution. System depth resolution is tested and characterized for performance. It will be shown that, depending on system bandwidth, depth resolution on the order of a few hundred microns can be achieved. A sample consisting of high-density polyethylene and three ball-bearings embedded inside is imaged at multiple depths. 3-D images of familiar objects are generated to demonstrate this capability. © 2012 Society of Photo-Optical Instrumentation Engineers (SPIE).
Number of references:19
Main heading:Three dimensional
Controlled terms:Ball bearings - Electric field measurement - Electric fields - Explosives detection - Nondestructive examination - Packaging materials - Spectroscopy - Synthetic aperture radar
Uncontrolled terms:3-D image - Broadband terahertz - Depth resolution - Frequency-averaging technique - Hidden objects - Near-field - Non destructive evaluation - Phase coherent - Potential methods - Side lobes - Synthetic aperture imaging - System bandwidth - Terahertz technology - Tetrahertz imaging - Threedimensional (3-d) - THz imaging - Transparent properties
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