542. Title:Active sparse-aperture millimeter-wave imaging using digital correlators Authors:Caba, Wilson (1); Boreman, Glenn (1)
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Abstract:Millimeter-wave imaging systems have desirable characteristics, particularly in their ability to form images of objects obscured by various barrier materials. However, the relatively long wavelength of the millimeter-band implies a penalty in angular resolution, usually compensated using large-aperture systems. Synthesized apertures provide the desired collecting area with a reduced number of discrete detectors. In this research we designed, built, and characterized the performance of a prototype sparse-aperture imaging system, utilizing an active 94 GHz source. Discrete sensors were used to sample the radiation field backscattered from the object. The signals were down-converted using heterodyne receivers with digital in-phase and quadrature detection. Signal correlations were performed using the digitized data sets to reconstruct millimeter-wave images. Image-quality performance was experimentally evaluated using four different non-redundant aperture configurations, with good agreement to the theoretical expressions. The feasibility of digital electronic-focusing correction was also demonstrated over an object range from 400 to 700 mm.