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Title:CMOS detector arrays in a virtual 10-kilopixel camera for coherent terahertz real-time imaging
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Abstract:We demonstrate the principle applicability of antenna-coupled complementary metal oxide semiconductor (CMOS) field-effect transistor arrays as cameras for real-time coherent imaging at 591.4 GHz. By scanning a few detectors across the image plane, we synthesize a focal-plane array of 100 × 100 pixels with an active area of 20 ×20 mm², which is applied to imaging in transmission and reflection geometries. Individual detector pixels exhibit a voltage conversion loss of 24dB and a noise figure of 41dB for 16 μWof the local oscillator (LO) drive. For object illumination,weuse a radio-frequency (RF) source with 432 μWat 590 GHz. Coherent detection is realized by quasioptical superposition of the image and the LObeam with 247 μW. At an effective frame rate of 17 Hz, we achieve a maximumdynamic range of 30 dB in the center of the image and more than 20 dB within a disk of 18mmdiameter. The system has been used for surface reconstruction resolving a height difference in the μm range. © 2012 Optical Society of America.
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