459.

Author

Heinz, E (Heinz, Erik); May, T (May, Torsten); Born, D (Born, Detlef); Zieger, G (Zieger, Gabriel); Thorwirth, G (Thorwirth, Guenter); Anders, S (Anders, Solveig); Zakosarenko, V (Zakosarenko, Vyacheslav); Krause, T (Krause, Torsten); Kruger, A (Krueger, Andre); Schulz, M (Schulz, Marco); Meyer, HG (Meyer, Hans-Georg); Schubert, M (Schubert, Marco); Starkloff, M (Starkloff, Michael)

Title

Toward high-sensitivity and high-resolution submillimeter-wave video imaging

Source

OPTICAL ENGINEERING, vol.50,no.11. NOV 2011, 113204. Publisher: 2011 Society of Photo-Optical Instrumentation Engineers (SPIE).

Abstract

Against a background of newly emerged security threats, the well-established idea of utilizing submillimeter-wave radiation for personal security screening applications has recently evolved into a promising technology. Possible application scenarios demand sensitive, fast, flexible and high-quality imaging techniques. At present, best results are obtained by passive imaging using cryogenic microbolometers as radiation detectors. Building upon the concept of a passive submillimeter-wave stand-off video camera introduced previously, we present the evolution of this concept into a practical application-ready imaging device. This has been achieved using a variety of measures such as optimizing the detector parameters, improving the scanning mechanism, increasing the sampling speed, and enhancing the image generation software. The camera concept is based on a Cassegrain-type mirror optics, an optomechanical scanner, an array of 20 superconducting transition-edge sensors operated at a temperature of 450 to 650 mK, and a closed-cycle cryogen-free cooling system. The main figures of the system include: a frequency band of 350 +/- 40 GHz, an object distance of 7 to 10 m, a circular field of view of 1.05 m diameter, and a spatial resolution in the image center of 2 cm at 8.5 m distance, a noise equivalent temperature difference of 0.1 to 0.4 K, and a maximum frame rate of 10 Hz.