

SPEAKER

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VITA

Arttu Luukanen (born 1972, native of Finland) received his M.Sc. degree from the University of Helsinki, Finland in applied physics in 1999. He was awarded a Ph.D. in 2003 from the University of Jyväskylä, Finland, also in applied physics.

Since 1996, Arttu Luukanen has investigated direct detector technologies for passive millimeter wave imaging for concealed weapons detection. His early research culminated in passive scanned imagery of objects taken with an imaging system utilizing room temperature antenna-coupled microbolometers as the detectors. Dr Luukanen continued his bolometer research as a graduate student at the University of Jyväskylä, Department of Physics under a joint ESA contract with Metorex International Oy, a Finnish company specializing in analytical X-ray instruments for the metal industry and a supplier of X-ray detectors for several space science missions. His Ph.D. research focussed on the development of ultra-sensitive transition-edge microcalorimeters and microbolometers for X-ray and THz sensing applications. After completing his Ph.D., Dr Luukanen took a research scientist position at VTT Technical Research Centre of Finland. From 2003 to 2005 he worked as a guest researcher at the National Institute of Standards and Technology's Quantum Electrical Metrology Division in Boulder, Colorado (USA), developing an active millimetre-wave imaging system based on antenna-coupled microbolometers. In 2005, Dr Luukanen was nominated as the Director of MilliLab, the Millimetre Wave Laboratory of Finland (www.vtt.fi/millilab). Since 2006, Dr Luukanen has served as the chairman of IEEE Electron Devices/Microwave Theory & Techniques and Antennas & propagation Chapters of the IEEE Finland Section. He is the author and co-author of over thirty peer-reviewed journal and conference articles, and two patents related to THz imaging with microbolometric detectors.

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ABSTRACT

"A passive terahertz imaging system for security applications"

Imaging at millimetre to terahertz frequencies has been identified as one of the key technologies for concealed weapons and explosives detection. The electromagnetic radiation in the wavelength range is characterized by good transmission through common clothing materials. Generally, the clothing (and atmospheric) transmission decreases with increasing frequency thanks to increased absorption losses as well as scattering in the clothing materials. However, given a maximum aperture size for the imaging optics, better spatial resolution can be achieved at higher frequencies with some penalty on the contrast.

In this paper we describe a passive imaging system that operates over the 200 GHz to 1 THz band. The system is designed for a stand-off range of 8 + meters, and it will produce real-time passive imagery with sub-kelvin radiometric sensitivity. The approach is centered around using cryogenic superconducting bolometers, operated within a cryogen-free refrigerator. The combined benefits of the excellent spatial and thermal resolutions suggest that the system will be able to achieve better detection statistics compared to existing technologies.