A modular 16-pixel terahertz imager system applying superconducting microbolometers and room temperature read-out electronics

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Superconducting bolometers have long been used as the "work horse" technology for terahertz astrophysics. In this paper we describe a system developed for stand-off imaging of concealed weapons and explosives. The system utilizes an array of NbN antenna-coupled vacuum-bridge microbolometers as detectors. The detectors are modular, with 8 pixels incorporated within a single module. The modules are mounted onto the 2nd cooling stage of a commercial cryogen-free pulse tube refrigerator with a base temperature of ca. 4 K. The readout of the sensors is carried out with an innovative room-temperature feedback preamplifier that can achieve bolometer noise limited performance when operated at the "inflexion point" of the voltage-biased bolometer.

In the paper we will describe the overall architecture of the modular system, describe the electrical and optical performance characteristics of the system, and show passive imagery of test objects acquired in the 200 GHz to 1 THz band. The system is a precursor for a video-rate imaging THz camera, which will be briefly discussed.

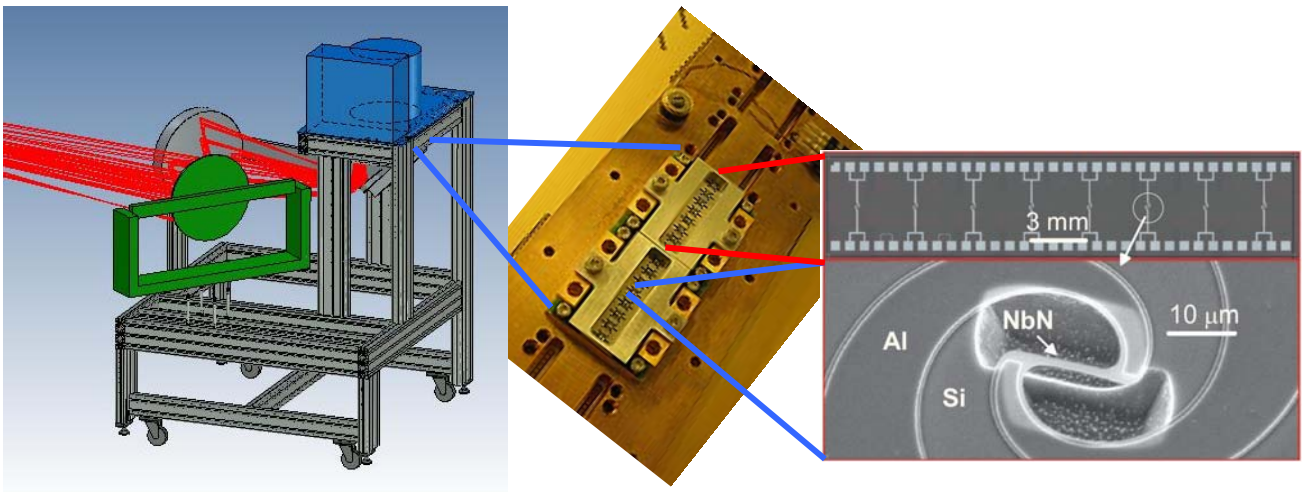

Fig. 1. Left) Overall setup of a 16-pixel THz imager system. Center) Two bolometer modules attached to pulse tube cold finger. Right) Micrograph of an antenna-coupled vacuum-bridge microbolometer array.