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Development of Kinetic Inductance Detectors Array for the Space High-Cadence Observing TeraHertz Telescope (SHOT)

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Fast radio bursts (FRB) has become one of the hottest scientific frontiers in astronomy recently. FRB research is one of three core new goals of the ASTRO2020, and the positioning of FRB in 2017 was called the most significant discovery since the detection of gravitational waves by LIGO. The discovery of FRB and the rapid development of the field are based on fundamental advances in spatial coverage and temporal sampling in a relatively traditional band. The terahertz/ far-infrared band is severely blocked by the atmosphere, and the previous large-scale space projects were limited by the technical conditions of the detectors, which failed to achieve a large field of view and high time-frequency sampling sky survey. Space High-cadence Observing Terahertz telescope (SHOT) is proposed as a space-borne terahertz high-speed imaging camera. It is expected to complete the first large-sky area terahertz survey and open up a revolutionary discovery space for the dynamic universe with 1 meter aperture, 25.6" angular resolution, $1.5^\circ \times 1.5^\circ$ FOV, cadence from 0.1 ms to hours, and plan to cover full sky in 5 years to study the radiation mechanism of compact stars and fast radio bursts on short timescales (> 0.1 ms) and the radiation evolution of late-evolving starts, supernovae, active galactic nuclei on long timescales (hours).

In this talk we will present our progression on the development of kinetic inductance detector array with ten kilo-pixels for the SHOT telescope, from design, fabrication and characterizations. We have already designed and fabricated a THz KID detector array with kilo-pixels in various design parameters to find the optimal parameters for SHOT and it is being characterized, shown in Figure 1. The detailed design, fabrication, characterizations and future plan of the SHOT detector array development will be present in this talk.

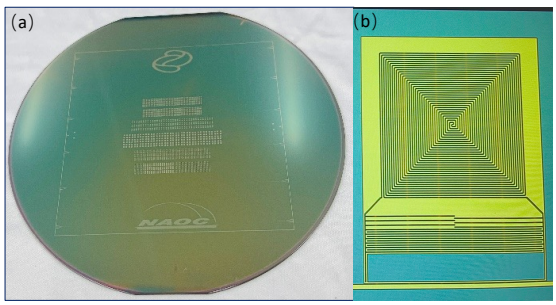

Figure 1. (a) photograph of the THz KID detector array. (b) photograph of the THz KID single pixel.

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