Towards Background-Limited Kinetic Inductance Detectors for a Cryogenic Far-Infrared Space Telescope

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Arrays of tens of thousands of sensitive far-infrared detectors coupled to a cryogenic 4 - 6 meter class telescope are needed to characterize the cosmic star formation history. The sensitivity of a 4 Kelvin telescope would be limited by zodiacal light and Galactic interstellar dust emission, and require broadband detector noise equivalent powers (NEPs) in the range of 3e-19 W / sqrt(Hz). We are fabricating and testing 16 x 16 element arrays of lumped-element kinetic inductance detectors (LEKIDs) designed to reach NEPs near this level in a low-background laboratory environment. The LEKIDs are fabricated with aluminum: the low normal-state resistivity of aluminum permits the use of very thin wire-grid absorber lines (~100 nm) for efficient absorption of radiation. The resulting small sensitive volumes enable high sensitivities because quasiparticles densities are high. Such narrow absorption lines present a fabrication challenge, but if they can be realized aluminum LEKIDs could provide a straightforward means to meet the required NEPs. We will present the design of these low-NEP aluminum LEKIDs and sensitivity measurements, both dark and optically at 350 microns loaded by cold blackbody radiation.