Quasiparticle Diffusion and Detection Efficiency of Hybrid Kinetic Inductance Detectors

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Abstract*—Superconducting coplanar-waveguide (CPW) resonators made of NbTiN and Al have shown photon noise limited detection for optical loading equivalent to the typical sky signal at modern sub-mm telescopes. While the detection efficiency of these hybrid MKIDs is equal to the value expected based on antenna simulation and the known efficiency of quasiparticle generation, this is not the case for conventional CPW MKIDs made from pure Al. Given that the hybrid MKIDs use the large gap superconductor NbTiN to trap photo-excited quasiparticles in the sensitive area of the resonator made from Al, it is postulated that the origin of the lower detection efficiency of pure Al resonators is due to quasiparticle diffusion. During the conference we will report on the measurements comparing NbTiN/Al and pure Al resonators and the effect of quasiparticle diffusion on the detection efficiency of these MKIDs.