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Authors:
P.K.Day, H.Leduc (JPL)
B.Mazin, A.Vayonakis, J.Zmuidzinas (Caltech)

Superconducting Kinetic Inductance Detectors with Microwave Readout

We report the observation of a large kinetic inductance signal in the microwave response of a thin film superconducting device subjected to x-ray and optical radiation. The devices studied are coplanar waveguide transmission line resonators with resonance frequencies of several Ghz and quality factors in the range of $10^4$ to $10^6$. Absorbed photons create quasiparticle excitations that change the phase and amplitude of a microwave signal transmitted through the device. We demonstrate the use of these devices as sensitive detectors of pair-breaking radiation, and show that the resposivity of the devices to thermal quasiparticles can be accurately calculated. The decay time of the quasiparticle population is measured as a function of temperature, and the energy resolution and NEP of a test device is estimated. We demonstrate the multiplexed readout of an array of these detectors using a single cryogenic amplifier.