# Development of high-Q superconducting resonators for use as Kinetic Inductance detectors

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One of the greatest challenges in the development of future radiation detectors for space applications is the fabrication of large detector arrays, which should have background limited sensitivity in combination with many pixels with a multiplexed readout. Within this context we have started the development of Microwave Kinetic Inductance Detectors (MKID's) [1], which have the potential to fulfill both requirements. The heart of every pixel of a MKID detector array is an extremely high Q superconducting quarter wavelength microwave thin film resonator. Many resonators, each with slightly different resonance frequency, can be read out simultaneously using 1 single microwave low noise amplifier coupled to room temperature electronics enabling, in principle, arrays with $10^5$ pixels. We present measurements of thin film Coplanar waveguide (CPW) resonators, made from Aluminum on high dielectric substrates such as Si and Sapphire. We use an adiabatic demagnetization cooler (ADR) with a mechanical pulse tube cooler as cryogenic system. We have measured the electrical noise equivalent power (NEP) of several resonators made in different batches using sputter deposition and wet etching. The resonators are typically 3 μm wide and several mm long, with resonance frequencies between 3 and 8 GHz. The film thicknesses of the devices are 100 nm or 280 nm. We obtain a NEP ~ $1 \cdot 10^{-17}$ W/Hz$^{1/2}$ at frequencies of about 0.5kHz. At lower frequencies the NEP increases due to increasing phase noise from the resonators.

[1] Peter K. Day, Henry G. LeDuc, Benjamin A. Mazin, Anastasios Vayonakis & Jonas Zmuidzinas, NATURE 425, 817 (2003).