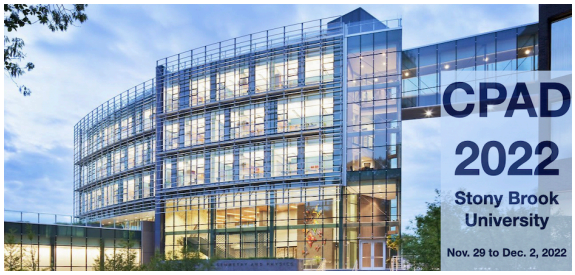

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Optimizing MKIDs for Future Millimeter Wavelength Cosmological Surveys

Thursday, 1 December 2022 12:15 (20 minutes)

Future mm-wave cosmological surveys need mega-detector focal planes to confirm or rule out defining theories for the missing cornerstones of modern cosmology. Microwave kinetic inductance detectors (MKIDs) can straightforwardly scale to large-format detector arrays, including photometer arrays and on-chip filter-bank spectrometers. This talk will present a suite of optimization efforts toward the next-generation MKIDs-based detector arrays. I will report the separation and tuning of detector noise components that resulted in photon noise-limited detectors. The optical efficiency, detector quality factor, and spectrometer resolution depend on dielectric loss. I will discuss our low-loss dielectrics and their loss tangent measurements from centimeter to millimeter wavelengths. Reliable galvanic contact between the niobium capacitor and aluminum inductor in our detector is a third challenge that we overcome by capping the niobium with a niobium nitride layer before depositing aluminum. These efforts have led to photon-noise-limited photometers with high optical efficiency and paved the way for our next-generation spectrometers.

Primary authors: PAN, Zhaodi (Argonne National Laboratory); Dr ANDERSON, Adam (Fermilab); Dr BENDER, Amy (Argonne National Laboratory); Prof. BENSON, Bradford (The University of Chicago); Prof. CHANG, Clarence (The University of Chicago); Dr WANG, Gensheng (Argonne National Laboratory); Dr HOOD, John (The University of Chicago); Dr LI, Juliang (Argonne National Laboratory); Ms DIBERT, Karia (The University of Chicago); Ms ROUBLE, Maclean (McGill University); Ms LISOVENKO, Marharyta (Argonne National Laboratory); Dr BARRY, Pete (Cardiff University); Dr GUALTIERI, Riccardo (Argonne National Laboratory); Dr CECIL, Tom (Argonne National Laboratory); Dr NOVOSAD, Valentine (Argonne National Laboratory); Dr YEFREMENKO, Volodymyr (Argonne National Laboratory)

Presenter: PAN, Zhaodi (Argonne National Laboratory)

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