Toward ~ eV Threshold Large Mass Detectors for GeV Scale Dark Matter and Coherent Neutrino Scattering Detection

Next generation light mass dark matter searches are strongly motivated by both the near threshold signal excesses found in many Dark Matter direct detection experiments and a large number of natural theoretical models. The energy threshold of the current Dark Matter experiments are generally by an order of magnitude above what is required for detecting such low mass Dark Matter particles. Low energy threshold is also a necessary requisite for observing coherent neutrino scattering, a standard model process that has recently been proposed as a sensitive and flavor invariant probe for sterile neutrinos. Consequently, the development of massive low energy threshold detector technology is motivated by multiple astro-physics fields. Phonon measurement in very low temperature detectors offer excellent signal to noise and thus are considered as a natural choice for these very low threshold experiments. Dr. Mirabolfathi will present the R&D status and future plans using athermal phonon sensors in semiconductor Ge or Si detectors. In particular, he will discuss recent collaborative work between TAMU, UC Berkeley and LBNL in developing large mass detectors using inherent phonon amplification (a.k.a Neganov-Luke effect capable of reaching ~ 1eV detection threshold).