

Searches for New Physics through Dark Matter and Neutrino Interactions

Rupak Mahapatra

Mitchell Inst for Fundamental Physics & Astronomy, Texas A & M University

Understanding the nature of the dark matter is a very exciting prospect for the next generation direct detection experiments, such as SuperCDMS and LZ. Direct detection of dark matter is challenging due to the very small energy deposition from rare recoils on terrestrial detectors, compounded by dominant radioactive background. Our group is developing low-threshold, large-mass cryogenic semiconductor (Germanium and Silicon) detector technology that would provide unprecedented low-mass dark matter search capabilities to SuperCDMS at SNOLAB.

I will also discuss how such detector innovations are providing means to access a whole new frontier of precision neutrino ex-

periments. Mitchell Institute Neutrino Experiment at Reactor (MINER) is an exciting new experiment operating at a research reactor at Texas A & M University. MINER has poised to become one of the most sensitive experiments to detect coherent scattering of weakly interacting neutrinos on our detectors, the same coherent scattering process that governs dark matter scattering on our detectors, with same low threshold challenges. Such precision measurements may hold the key to discover New Physics beyond the Standard Model, such as what is the nature of dark matter, is there a 4th generation of neutrino, do neutrinos have non-Standard Model interactions, are they their own anti-particles.