PHYSICS AND ASTRONOMY COLLOQUIUM

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Searches for New Physics through Dark Matter and Neutrino Interactions

Weakly Interacting Massive Particles (WIMP) are the most promising candidates for Dark Matter that makes up 85% of the matter content in the Universe. Directly detecting the elusive WIMP is challenging due to the very low probability of interaction and very low energies such interactions would leave in a detector, especially compounded by dominant radioactive background. It takes ingenious detector technology to make a WIMP discovery possible. In this talk, I will discuss how our TAMU group is leading the semiconductor detector technology world, through its cryogenic Germanium and Silicon detectors that have world-best energy resolution for large mass detectors. I will also discuss how such detector innovations are providing means to access a whole new frontier of precision neutrino experiments. An exciting new experiment is being proposed at the TAMU nuclear reactor that could be the first experiment in the world to detect coherent scattering of weakly interacting neutrinos on our detectors, the same coherent scattering process that governs the WIMP scattering on our detectors, with same low threshold challenges. Such precision measurements may hold the answer to key questions, 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, are there free fractionally charged particles, amongst a few.

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