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Dissertation Award in Nuclear Physics Lecture: New Germanium Detectors for Neutrino Research and Dark Matter Searches

PHILLIP BARBEAU, Stanford University

The recent development of large mass, low noise P-Type point contact (PPC) germanium detectors has opened up new opportunities for experiments in neutrino and astroparticle physics. Several of these experiments have been performed with the earliest prototypes. As part of a campaign to measure coherent neutrino-nucles scattering (CoGeNT), and assessment of the low energy backgrounds at a nuclear power reactor are presented. Using the exposure of the detector to this high flux of neutrinos, a search for a neutrino magnetic moment is demonstrated and a projected limit from a more complete experiment is discussed. A limit is also placed on the magnitude of a continuous energy deposition by reactor neutrinos. Searches for signatures of light WIMPs and dark galactic pseudoscalars using these detectors are highlighted. Finally, the role that the PPC detectors play in searches for zero neutrino double beta decay, specifically within the MAJORANA collaboration, is also discussed.