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Superconducting Nuclear Recoil Sensor for Directional Dark Matter Detection ANN JUNGHANS, NINA WEISSE-BERNSTEIN, KEVIN BALDWIN, Los Alamos National Laboratory, RANDY LAFLER, NGUYEN PHAN, DINESH LOOMBA, University of New Mexico, MARKUS HEHLEN, Los Alamos National Laboratory — The Universe consists of 72% dark energy, 23% dark matter and only 5% of ordinary matter. One of the greatest challenges of the scientific community is to understand the nature of dark matter. Current models suggest that dark matter is made up of slowly moving, weakly interacting massive particles (WIMPs). But detecting WIMPs is challenging, as their expected signals are small and rare compared to the large background that can mimic the signal. The largest and most robust unique signature that sets them apart from other particles is the day-night variation of the directionality of dark matter on Earth. This modulation could be observed with a direction-sensitive detector and hence, would provide an unambiguous signature for the galactic origin of WIMPs. There are many studies underway to attempt to detect WIMPs both directly and indirectly, but solid-state WIMP detectors are widely unexplored although they would present many advantages to prevalent detectors that use large volumes of low pressure gas. We present first results of a novel multi-layered architecture, in which WIMPs would interact primarily with solid layers to produce nuclear recoils that then induce measureable voltage pulses in adjacent superconductor layers, in response to exposure to a range of sources.

Ann Junghans
Los Alamos National Laboratory

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