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Metastable Liquids: Breakthrough Technologies for Dark Matter and Neutrinos

Friday, 19 March 2021 13:20 (20 minutes)

We will present a discussion of our revolutionary new detector technology, the "Snowball Chamber," which is based on the phase transition (of liquid to solid) for metastable fluids, and has been shown to be neutron-sensitive. A water-based supercooled detector has the potential to move past the Neutrino "Fog," and extend the reach of direct detection dark matter experiments to GeV-scale WIMP candidates for both proton spin-dependent and spin-independent interactions. We also will consider supercooled noble elements to observe scintillation for energy reconstruction. Some of the foreseeable, potential pitfalls will be presented, alongside a brief vision of an R&D program toward the maturation of this technology. A host of related measurements within neutrino physics, utilizing the CEνNS interaction on different nuclei, and/or the potential of these detectors to track electron and gamma-ray interactions, is likewise possible. Low-cost and modular designs would enable searches for sterile neutrinos with a total neutral current disappearance experiment at multiple baselines. A large-scale world-wide deployment would also play an important role for supernova neutrino burst detection. A detector using deuterated water could be a viable technology for normalizing low-energy neutrino fluxes from stopped-pion beams. Lastly, liquid Xe and Ar versions will be discussed with their benefits.

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