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Exploring the Advantages of an Undoped, Cryogenic CsI Detector for CEvNS Experiments at the SNS with COHERENT

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Inorganic crystal scintillators, especially doped alkali-halide scintillators such as NaI[Tl], CsI[Tl] and CsI[Na], play an important role in neutrino experiments. The pioneering achievement of the COHERENT experiment, utilizing CsI[Na] for the initial detection of Coherent Elastic Neutrino-Nucleus Scattering (CEvNS), demonstrated a nuclear recoil detection threshold of approximately 8 keV(nr). However, to advance the capabilities of next-generation neutrino detectors, it is crucial to significantly reduce this detection threshold. Recent studies have illustrated that undoped alkali-halide scintillators, when operated at cryogenic temperatures near 77 K, exhibit a substantial increase in light yield –nearly doubling that of their room-temperature counterparts, alongside diminished afterglow effects. This poster outlines the advantages of adopting undoped, cryogenic CsI as a novel detector material for CEvNS experiments, focusing on its implementation in the COHERENT experiment at the SNS, offering a promising pathway to unlocking new physics through enhanced neutrino detection sensitivity.

Poster prize

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