

**Title:** Development of a Cryogenic CsI and SiPM-based Detector with  
Ultra-high Light Yield for  $CE \nu NS$  Experiments

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**Abstract:**

While the initial detection of Coherent Elastic Neutrino-Nucleus Scattering ( $CE \nu NS$ ) utilized CsI(Na) crystals, maximizing detection sensitivity requires significantly higher light yields. Addressing this challenge, we introduce a cutting-edge detector architecture that couples low-temperature CsI crystals with SiPM readout arrays. By exploiting the superior brightness of cryogenic CsI and the ultra-high photon detection efficiency of SiPMs, this design offers a dramatic improvement in sensitivity.

We have successfully realized this concept through a kilogram-scale prototype, which exhibits state-of-the-art light yield and energy resolution. These results establish our design as a competitive candidate for future  $CE \nu NS$  experiments. In this talk, we will present the comprehensive characterization of the prototype, focusing on key performance indicators such as light yield and energy resolution. The analysis will also cover critical technical challenges, specifically the mitigation and evaluation of SiPM dark noise and optical crosstalk.