Abstract Submitted
for the CUWIP22 Meeting of
The American Physical Society

The use of CEvNS to monitor spent nuclear fuel[1] CAROLINE VON RAESFELD, University of California, Los Angeles, PATRICK HUBER, Virginia Tech — With a growing demand for a clean energy supply along with concerns over effective nuclear waste storage, it is imperative to be able to monitor highly radioactive waste in a safe and effective way. To date, no effective technology exists to re-verify the content of Spent Nuclear Fuel (SNF) in a dry storage cask should this become necessary. For this purpose we explore the applicability of using Coherent-Elastic Neutrino-Nucleus Scattering (CEvNS) to monitor the content of SNF in dry storage casks, as SNF produces neutrinos chiefly from ^{90}Sr decays. We compare these results with what can be achieved via Inverse Beta Decay (IBD), demonstrating that at low nuclear recoil energies CEvNS event rates exceed the IBD event rates by 2-3 orders of magnitude for a given detector mass. We find that 10 kg argon or germanium detectors 3 meters from a fuel cask can detect over 100 events per year if sub-100 eV recoil energy thresholds can be achieved. Backgrounds from cosmic ray neutrons are estimated and considered in a preliminary analysis to examine with what certainty the fuel content in a dry storage cask can be verified.

[1]The work was supported by the National Science Foundation REU grant number 1757087, by the U.S. Department of Energy Office of Science under award number DE-SC00018327 and by the National Nuclear Security Administration Office of Defense Nuclear Nonproliferation RD through the Consortium for Monitoring, Technology and Verification under award number DENA0003920

Caroline von Raesfeld
University of California, Los Angeles

Date submitted: 11 Jan 2022 Electronic form version 1.4