

Characterisation of particle interactions in superconducting calorimeters

Saturday, 25 March 2023 11:05 (15 minutes)

The Ricochet experiment aims to detect coherent elastic neutrino-nucleus scattering at the Institut Laue-Langevin nuclear reactor in Grenoble, France. The experiment is expected to start data-taking in 2024 with two complementary detector technologies, both employing cryogenic calorimeters. One of the two detector technologies envisaged by Ricochet has a target mass consisting of superconducting crystals.

When a neutrino interacts coherently with a nucleus in a superconducting crystal lattice, the recoil energy produces phonons and excites Cooper pairs into Bogoliubov quasiparticles. The milli-electronvolt-scale bandgap of superconductors might enable a significantly lower energy threshold with respect to semiconductor-based detectors.

In this work, we demonstrate the detection of particle-induced pulses in a superconducting calorimeter, read out using a manganese-doped aluminium transition-edge sensor. In addition, we investigate and characterise the detector response to muon, gamma and neutron interactions.

Primary author: Dr VAN DE PONTSEELE, Wouter (Massachusetts Institute of Technology)

Co-author: Prof. FORMAGGIO, Joseph

Presenter: Dr VAN DE PONTSEELE, Wouter (Massachusetts Institute of Technology)

Session Classification: New Ideas