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Probing new physics with Coherent Elastic Neutrino-Nucleus Scattering and the future Ricochet experiment

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Neutrinos continue to be a source of scientific wonder in nuclear physics, particle physics, and cosmology. Although much has been learned about the properties of neutrinos, much still pleads for more experimental investigation. The measurement of Coherent Elastic Neutrino-Nucleus Scattering (CENNS) has been a holy grail in neutrino physics since its prediction almost 40 years ago, and has now become a burgeoning field of research following its recent discovery by the COHERENT collaboration in July 2017. Following this first detection, the future Ricochet experiment aims at searching for new physics in the electroweak sector by providing the first low-energy and high-precision measurement of CENNS down to the O(10) eV energy-scale, where new physics signatures may arise. These include for instance the existence of sterile neutrinos and of new mediators, that could be related to the DM problem, and the possibility of Non Standard Interactions that would have tremendous implications on the global neutrino physics program. Thanks to a recently awarded ERC starting grant, the collaboration is building a kg-scale cryogenic detector, with outstanding sensitivity to low-energy nuclear recoils, that will be deployed at an optimal nuclear reactor site within the forthcoming Ricochet neutrino experiment. The key feature of the proposed CryoCube detector technology is to combine two target materials: Ge-semiconductor and Zn-superconducting metal, both targeting O(10) eV energy thresholds with unparalleled background rejection capabilities. This talk will review the science reach of the future Ricochet neutrino experiment as well as the ongoing R&D efforts dedicated to the construction of the CryoCube detector array.

Less than 5 years of experience since completion of Ph.D

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Student (Ph.D., M.Sc. or B.Sc.)

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