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Advancing Beyond Standard Model Physics with Cryogenic Detectors: The ASGARD Experiment and Novel Applications

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The advent of novel cryogenic detectors has significantly broadened the scope of Beyond Standard Model searches at low energy, with promises of shedding light on, e.g., the neutrino mass scale and even fundamental aspects of quantum mechanics. Superconducting tunnel junction detectors, for example, have recently been used to pioneer direct spectroscopy of recoiling nuclei following electron capture decays with eV-scale resolution, which proved competitive in sterile neutrino searches [1] and the determination of the size of the neutrino wave packet [2]. Even so, several technical and conceptual hurdles remain which limit their broad, competitive deployment for fundamental symmetries and nuclear structure searches. In this talk, we will outline the ASGARD experiment, which aims to perform Beyond Standard Model physics searches at the (tens of) TeV scale directly at radioactive ion beam facilities [3]. In addition, we will highlight novel applications in nuclear structure studies and exotic decay modes.

[1]: Friedrich et al. (BeEST collaboration), Physical Review Letters 126 (2021) 021803

[2]: Smolsky et al. (BeEST collaboration), arXiv:2404.03102, Accepted at Nature

[3]: Hayen, Annual Reviews of Nuclear and Particle Science 74 (2024) 497

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