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OPOSSUM - Optimal Particle identification Of Single Site events with Underground MKIDs detectors

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The goal of OPOSSUM is to discriminate for the very first time Single Site Events (SSE) from Multi Site Events (MSE) in mK calorimeters for rare events searches. The OPOSSUM project, funded by the European Research Council trough a Starting Grant in 2024, embarks on a transformative journey to push an order of magnitude forward the sensitivity of Neutrinoless double-beta decay (0νββ) experiments, a key process which, if observed, will redefine our comprehension of neutrinos and the physics beyond the Standard Model. Detecting 0νββ would not only confirm the Majorana nature of neutrinos could also enlighten us on the absolute neutrino mass scale and hierarchy.
At the heart of OPOSSUM is a novel discrimination strategy designed to positively identify 0νββ events (SSE), rejecting all other prominent background sources, as alpha and gamma interactions (MSE) in TeO2.
With its 33% isotopic abundance 130Te emerges as the leading 0νββ candidate, bypassing the need for the now-challenged enrichment process. In OPOSSUM 12 CUORE prototype crystals will be outfitted with 6 Microwave Kinetic Inductance Detectors (MKIDs) along with existing thermistors and through integrated analysis, The OPOSSUM technique could reduce the CUORE background to below 10-4 counts/keV/kg/y, positioning it to probe the inverted hierarchy scenario corresponding to the 10 meV Majorana mass. In this contribution I will outline the innovative experimental technique of OPOSSUM, its potential and the first steps towards the implementation of MKIDs on TeO2.

Collaboration you are representing

OPOSSUM

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