

MMC-based Phonon-scintillation Detection for Rare-event Search Experiments

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Abstract – Metallic magnetic calorimeters (MMCs) are highly sensitive temperature sensors that use the paramagnetic nature of erbium ions and superconducting electronics composed of a superconducting quantum interference device (SQUID) with superconducting input coil. In rare-event search experiments such as search for neutrino-less double beta decay ($0\nu\beta\beta$), MMCs provide high precision tool for simultaneous measurement of phonon-scintillation signals from a target crystal. The MMC-based phonon-photon simultaneous measurement technology has been adapted in the Advanced Molybdenum-based Rare Process Experiment (AMoRE), an international project searching for $0\nu\beta\beta$ of ^{100}Mo , which aims to realize zero background measurement condition for the Majorana neutrino mass sensitivity of 12-22 meV.

Keywords (Index Terms) – Metallic magnetic calorimeter, SQUID, low-temperature detector, scintillating crystal, rare event search, Majorana neutrino.

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