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Development of photon and phonon detectors for rare-event experiments

We developed photon and phonon sensors based on metallic magnetic calorimeters to be applied in scintillator-based experiments searching for neutrinoless double beta decay (AMoRE with CaMoO4, and LUMINEU with ZnMoO4 crystal scintillators) and in experiments searching for dark matter such as weakly interacting massive particles (WIMPs). This research is motivated by the need to reduce the background of such experiments by increasing the discrimination among different types of particles and to lower the energy threshold. We expect to achieve an energy resolution below 100 eV (FWHM) and a signal rise-time of less than 200 microseconds in the phonon detector while for the photon detector we expect an energy resolution between 3 eV and 10 eV (FWHM) and a signal rise-time below 50 microseconds. We discuss the design and fabrication issues of the combined photon and phonon detector.

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