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Gamma background model for the Ricochet Experiment

The RICOCHET experiment is currently being deployed at the ILL –Institut Laue Langevin (France), a research nuclear reactor. It is aiming at measuring precisely the $CE\nu NS$ - Coherent Elastic Neutrino-Nucleus Scattering process : at the neutrino energy available at the ILL (0-8 MeV), the coherence mechanism is maximal and the cross section fully benefits from the enhancement by a factor N^2, where N denotes the number of neutrons of the nucleus. A $\sim$1 kg scale sensitive detector is therefore sufficient for a measurement.

In the final configuration of RICOCHET, two cryogenic detector concepts will be deployed : an array of 18 germanium bolometers, $\sim$40 g each, and 9 super-conducting zinc crystals inserted in a cryostat operating at a temperature of 10 mK. In the initial commissioning phase, up to 9 germanium crystals were installed.

The raw background level is significant due to the proximity of the reactor core (neutron and gamma) and to the positioning of the detector on the surface (cosmic background). To fight against the backgrounds, a three-fold strategy is used: an active muon veto, a passive shielding of lead and polyethylene to mitigate the gamma and neutron backgrounds, and the simultaneous measurement of ionization and heat to discriminate electron and nuclear recoils.

Prior to the installation of the RICOCHET cryostat, a campaign of measurement of the radiogenic and reactogenic gamma background was carried out inside the detector shielding with a dedicated HPGe detector (High Purity Germanium). This contribution will present the gamma background model elaborated from these measurements and highlight some comparisons with data recorded in the commissioning phase.

Secondary track

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