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Updated background simulation and detector design for AMoRE-II

Wednesday 27 August 2025 16:00 (20 minutes)

AMoRE-II aims to search for neutrinoless double-beta decay of ^{100}Mo using cryogenic detectors based on an array of $Li_2^{100}MoO_4$ crystals. The first stage of the experiment will employ 90 LMO crystals (27 kg of ^{100}Mo) in 2025, expanding to 360 crystals (155 kg ^{100}Mo) for full-scale data taking in 2027. To achieve a target sensitivity of $T_{1/2}^{0\nu\beta\beta}$ > 4.5×10^{26} years, we aim for a background level below 1×10^{-4} ckky. A Geant4-based simulation framework has been developed to evaluate expected background contributions, currently estimated to be below 2×10^{-4} ckky. Major contributors include ^{226}Ra in lead shielding and ^{222}Rn in air. To mitigate these sources, we optimized material selection—using ultra-pure lead and copper replacements—and designed enclosures to minimize radon intrusion. Surface contamination on crystals and nearby components, such as copper holders and reflectors, was also addressed through improved handling, cleaning, and assembly protocols. These updates, supported by detailed simulations, have led to an optimized detector configuration that meets the stringent background requirements. We present the updated background estimates, simulation methodologies, design refinements, and ongoing strategies for further suppression as AMoRE-II prepares for full-scale operation.

Collaboration you are representing

AMoRE

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