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Sensitivity of the CUPID experiment to $0\nu\beta\beta$ decay of ^{100}Mo

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CUPID is a next-generation bolometric experiment to search for neutrinoless double-beta decay ($0\nu\beta\beta$) of ^{100}Mo using Li_2MoO_4 scintillating crystals. It will operate at $\sim$10 mK in the existing CUORE cryostat at the Laboratori Nazionali del Gran Sasso in Italy. Each crystal will be facing two Ge-based bolometric light detectors for α rejection. In this work, we develop a statistical analysis, in a Frequentist and a Bayesian framework, to compute the discovery and the exclusion sensitivity of CUPID to the $0\nu\beta\beta$ half-life and to the effective Majorana neutrino mass. This computation is done numerically based on pseudo-experiments. We evaluate the sensitivity for various background indices and energy resolution. For the CUPID baseline scenario, with a background and an energy resolution of 1.0×10^{-4} counts/keV/kg/yr and 5 keV FWHM at the Q-value, respectively, this results in a Bayesian exclusion sensitivity at 90% confidence interval of $\hat{T}_{1/2} > 1.6^{+0.6}_{-0.5} \times 10^{27}$ yr, corresponding to the effective Majorana neutrino mass of $\hat{m}_{\beta\beta} < 9.6 - 16.3$ meV. In the Frequentist analysis, we obtain a discovery sensitivity at 3σ of $\hat{T}_{1/2} = 1.0 \times 10^{27}$ yr, corresponding to $\hat{m}_{\beta\beta} = 12.2 - 20.6$ meV.

Collaboration you are representing

CUPID

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