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A detailed background model for the CUPID-Mo $0\nu\beta\beta$ experiment TOBY DIXON, University of California, Berkeley, CUPID-MO COLLABORATION, CUPID COLLABORATION — CUPID-Mo, located in the Laboratoire Souterrain de Modane (France), is a demonstrator for CUPID, a next generation search for $0\nu\beta\beta$ in ^{100}Mo. CUPID-Mo consists of $20 \sim 200g$ $Li_2^{100}MoO_4$ scintillating bolometers with 20 Ge light detectors. It has demonstrated excellent crystal radiopurity (^{238}U ^{232}Th chains 0.3 - 1 $\mu Bq/kg$ for relevant isotopes), α, β/γ particle discrimination ($> 99.9\%$) and energy resolution ($\sim 7keV$ FWHM at $2615keV$). CUPID-Mo has placed the leading limit on the half life of $0\nu\beta\beta$ in ^{100}Mo of $T_{1/2}^{0\nu} > 1.4 \cdot 10^{24}yr$ with 90% c.i. In this talk, we present a detailed model to disentangle the various background sources using a Geant4 Monte-Carlo simulation. This enables a precision analysis of the $2\nu\beta\beta$ decay spectrum in ^{100}Mo. This decay has a short half-life of $\sim 7 \cdot 10^{18}yrs$, and CUPID-Mo will provide statistics competitive to much larger experiments but with a much better signal to noise ratio. We then apply these results to the CUPID background model which with a $\sim 100\times$ increase in mass and significant reduction of passive material will have an unprecedented sensitivity to $0\nu\beta\beta$ in ^{100}Mo.

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