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Study of the neutrinoless double beta decay of Mo-100 with the CUPID-Mo demonstrator

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The LUMINEU project has recently set up a technology for the development of high-performance scintillating bolometers containing the nuclide 100 Mo, in the framework of the R&D activities towards the tonne-scale neutrinoless double beta decay (0 $\nu 2\beta$) experiment CUPID. Using in particular Li₂ 100 MoO₄ detectors, high energy resolution (~5-6 keV FWHM at 2615 keV), excellent α background rejection (~99.9 %) and extreme radiopurity (below 10 μ Bq/kg U/Th intrinsic activity) have been demonstrated in multiple tests with remarkable reproducibility. Moreover, with only ~0.1 kg × yr of 100 Mo exposure, the measured two-neutrino 2β decay half-life is one of the most precise values ever reported. As a follow-up of this activity, a demonstrator named CUPID-Mo is ready to collect data in the Modane underground laboratory in France. CUPID-Mo consists of twenty 0.2-kg 100 Mo-enriched Li₂MoO₄ scintillating bolometers (containing more than 2 kg of 100 Mo) to be operated for at least 0.5 yr, providing a sensitivity to $0\nu 2\beta$ of 100 Mo larger than 10 24 yr. A prolongation of the experiment and its extension to available ~7 kg of 100 Mo are under consideration.

Primary author:GIULIANI, Andrea (CSNSM-Orsay and DiSAT-Como)Presenter:GIULIANI, Andrea (CSNSM-Orsay and DiSAT-Como)Session Classification:Plenary Session 2