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The CUORE and CUPID double beta decay experiments

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The Cryogenic Underground Observatory for Rare Events (CUORE) is the first bolometric experiment searching for neutrinoless double-beta ($0\nu\beta\beta$) decay that has been able to reach the one-tonne mass scale. The detector, located at the LNGS in Italy, consists of an array of 988 TeO_2 crystals arranged in a compact cylindrical structure of 19 towers. CUORE began its first physics data run in 2017 at a base temperature of about 10 mK and in April 2021 released its third result of the search for $0\nu\beta\beta$, corresponding to a tonne-year of TeO_2 exposure. This is the most sensitive measurement of $0\nu\beta\beta$ decay in ^{130}Te ever conducted, with a median exclusion sensitivity of 2.8×10^{25} yr. We find no evidence of $0\nu\beta\beta$ decay and set a lower bound of 2.2×10^{25} yr at a 90% credibility interval on the ^{130}Te half-life for this process. The next-generation of experiments aims at covering the Inverted-Ordering region of the neutrino mass spectrum, with sensitivities on the half-lives greater than 10^{27} years. CUPID (CUORE Upgrade with Particle IDentification) will search for the $0\nu\beta\beta$ decay of ^{100}Mo and will exploit the existing cryogenic infrastructure of CUORE. Thanks to about 1600 scintillating Li_2MoO_4 crystals, enriched in ^{100}Mo, coupled to $\sim$1700 light detectors CUPID will have a simultaneous readout of heat and light that will allow for particle identification, and thus a powerful alpha background rejection. Numerous studies and R&D projects are currently ongoing in a coordinated effort aimed at finalizing the design of the CUPID detector and at assessing its performance and physics reach.
In this talk, we present the current status of CUORE search for $0\nu\beta\beta$ and outline the forthcoming steps towards the construction of the CUPID experiment.

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