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Cuoricino to CUORE: Neutrinoless Double Beta Decay Measurements with TeO₂ Bolometers

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An introduction and status report are presented on the neutrinoless double beta ($\beta\beta 0\nu$) decay search efforts at Cuoricino, a bolometric experiment located at the National Laboratory of Gran Sasso (LNGS) in Italy. Cuoricino, currently the largest operating bolometer in the world, consists of a single tower of 62 TeO₂ crystals (41 kg), which serve as both the source and detector for the $\beta\beta 0\nu$ decays. The proposed CUORE (Cryogenic Underground Observatory for Rare Events) experiment will also be discussed. Similar in concept to Cuoricino, CUORE will consist of 988 TeO₂ crystals in 19 Cuoricino-like towers having a total mass of 750 kg. Although having various anticipated but tractable technical challenges, CUORE will have the sensitivity to observe $\beta\beta 0\nu$ for effective masses extending into the inverse hierarchy. This work is supported in part by the US Department of Energy.

¹for the Cuoricino and CUORE Collaborations