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Latest results from the CUORE experiment

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The Cryogenic Underground Observatory for Rare Events (CUORE) is the first bolometric experiment searching for $0\nu\beta\beta$ decay that has successfully reached 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 has been collecting data continuously at ~ 10 mK since 2017, achieving a 90% uptime and amassing over 2.5 tonne-years of TeO_2 exposure. In March 2024 the collaboration released the most recent result of the search for $0\nu\beta\beta$, corresponding to two tonne-year TeO_2 exposure. This is the largest amount of data ever acquired with a solid state cryogenic detector, which allows for further improvement in the CUORE sensitivity. In this talk, we will present the current status of the CUORE search for $0\nu\beta\beta$ with the updated statistics of two tonne yr exposure. This statistics also allows for one of the most detailed background reconstructions in the field and enables a precision measurement of the ^{130}Te $2\nu\beta\beta$ decay half-life. The study of $2\nu\beta\beta$ has significant implications in nuclear physics, as a precise measurement of the transition half-life and spectral shape.

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