Contribution ID: **52** Type: **not specified**

Search for neutrinoless double beta decay at AMoRE

Wednesday 23 October 2024 15:00 (20 minutes)

Observation of neutrinoless double beta ($0\nu\beta\beta$) decay can reveal the neutrino properties beyond the Standard Model. AMoRE searches for the $0\nu\beta\beta$ decay of molybdenum-100 using the isotope in the form of scintillation crystals equipped with the cryogenic detector system in the underground laboratory. In the first two phases of AMoRE using $^{48\mathrm{depl}}\mathrm{Ca}^{100}\mathrm{MoO}_4$ and $\mathrm{Li}_2{}^{100}\mathrm{MoO}_4$ crystals, working principles and stability for a long-term operation of the detector have been demonstrated, and the half-life of Mo-100 $0\nu\beta\beta$ decay have been constrained at $T^{0\nu}_{1/2} > 2.9 \times 10^{24}$ years at 90% confidence level. The AMoRE-II detector is under preparation for its data taking to be started in 2025. AMoRE-II will be conducted using 157 kg of ^{100}Mo-based crystals for longer than 5 years. With a background level below 2×10^{-4} count/keV/kg/year at the energy around the Q-value at 3.034 MEV, we expect the experimental sensitivity about $T^{0\nu}_{1/2} \sim 4 \times 10^{26}$ years, or in terms of the effective Majorana mass $m_{\beta\beta} \sim 25 - 73$ meV for the exclusion limit at 90% confidence level, covering most parameter space in the inverse mass ordering scenario.

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Session Classification: Parallel Session 2