Contribution ID: **552** Type: **Contributed Oral Presentation**

Early-stage deveploments about studying Ta-180m decay at cryogenic temperature

Thursday, 29 May 2025 11:40 (15 minutes)

Ta-180m is the longest-lived metastable nuclear isomer, with no observed decay. Investing this decay could provide valuable insights into the nucleosynthesis mechanisms, K-spin violation, and the dark matter. This study will utilize a cryogenic calorimeter equipped with a metallic magnetic calorimeter (MMC), leveraging its high detection efficiency to investigate the decay channels of Ta-180m, including the internal conversion, a channel with highest branching ratio. As an initial step, we plan to conduct measurements using a 20 g tantalum single crystal as a target absorber.

In the presentation, we will discuss about our experimental proposal, along with potential low background measurement at Yemi Underground Laboratory (Yemilab), the candidates of different absorber forms, and the enrichment of Ta-180.

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Session Classification: Parallel Session

Track Classification: Nuclear Astrophysics