

# From double to single beta decays –the search for the isomeric decay of $^{180m}\text{Ta}$ in the MAJORANA DEMONSTRATOR

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In 2021, the MAJORANA DEMONSTRATOR experiment concluded its investigation into neutrinoless double beta decay involving  $^{76}\text{Ge}$ . Proven to be one of the world's ultra-low-background facilities, we adapted the apparatus to explore the rare decay of a distinct isotope. Notably, in nature  $^{180m}\text{Ta}$  stands as the sole known isotope existing in an isomeric state rather than the ground state. This unobserved isomeric decay is hindered by spin suppression. However, measuring its rate will provide insight into the strength of its production, for example, through neutrino-induced reactions. Beyond understanding the underlying mechanisms of the decay this exceptional state, a measurement of the decay rate holds potential of probing dark matter through stimulated decay as an complimentary effort. To this end, we introduced Ta samples amidst the Ge detectors, capitalizing on the deep-underground ultra-low background environment, the exceptional energy resolution of the MAJORANA detectors, and established analytical methodologies to search for both, the nuclear decay and potential dark matter-induced emissions. The first year of data was dominated by backgrounds from surface activation of the Ta-samples yet still was able to set world-leading limits. I plan to present the findings from our latest data collection and discuss their implications for the dark sector.

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