

Isomer spectroscopy of ^{251}Md

Tuesday, July 23, 2024 4:10 PM (20 minutes)

Experiments seeking the heaviest nuclei are exploring the limits at which protons and neutrons can be bound together. Such extreme nuclear systems are difficult to produce and the details of their structure remain scarce. Theory can guide our understanding, but calculations disagree on the shell gaps where the most stable superheavy elements might be found [1, 2]. Alternatively, the nuclides near $Z = 100$, $N = 152$ can be produced far more easily and are amenable to greater scrutiny. The orbitals near the Fermi surface in these well-deformed nuclei often arise from the same configurations which define the predicted spherical shell gaps in the superheavy elements. Thus, we can test theory against observations in this region in order to draw inferences about the heaviest systems.

With this in mind, we have undertaken a study of the odd- Z nucleus ^{251}Md . Rotational bands based on the $1/2[521]$ [3] and $7/2[514]$ [4] Nilsson configurations, as well as a high- K isomer [5], have recently been reported. Using the Argonne Gas-Filled Analyzer (AGFA) and X-Array, we have studied the γ -ray decay pattern following decay of the isomeric state. The spin, parity, and excitation energy of this three-quasiparticle state are firmly established, and rotational bands are newly observed to be populated in the decay from the isomer. Configurations are suggested and comparison to recent calculations are made, and the implications for the structure of ^{251}Md will be discussed.

This work is supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics.

[1] S. Cwiok et al., Nucl. Phys. A 611, 211 (1996)

[2] M. Bender et al., Phys. Rev. C 60, 034304 (1999)

[3] A. Chatillon et al., Phys. Rev. Lett. 98, 132503 (2007) [4] R. Briselet et al., Phys. Rev. C 102, 014307 (2020)

[5] T. Goigoux et al., Eur. Phys. J. A 57, 321 (2021)

Presenter: MORSE, Chris (Brookhaven National Laboratory)

Session Classification: Heavy Nuclei and Super Heavy Elements - Part 1