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Spectroscopy of the deformed 249,251Md

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Despite significant and steady advances in the synthesis of the heaviest elements, reaching the predicted superheavy island of stability is still a distant objective, because of the ever-decreasing cross sections. Nevertheless, nuclear spectroscopy, mass measurements, and laser spectroscopy of the heaviest nuclei have shown their effectiveness by providing information on the quantum nature of extreme mass nuclei. In this context, deformed midshell nuclei near N=152, Z=100, are of great relevance: a large diversity of orbitals are accessible, some of which being involved in the structure of heavier spherical nuclei, i.e., placed just above and below the predicted superheavy spherical shell gaps.

In a series of experiments performed at the University of Jyväskylä, we have studied different facets of the odd-Z ^{249}Md and ^{251}Md isotopes. ^{251}Md was studied using combined gamma ray and conversion-electron in-beam spectroscopy [1]. Besides the previously known K=1/2^{-} rotational band [2], a new band has been observed. Using the gamma and electron intensities that depend on the gyromagnetic factor, the ground-state configuration could be inferred. We will also present a new method that allows to derive the gyromagnetic factor using the gamma-ray intensity profile. A comparison of ^{251}Md with the ^{255}Lr nucleus [3] revealed unexpected similarities between transition energies. Skyrme-Hartree-Fock-Bogoliubov calculations were performed to investigate the origin of these similarities.

If time permits, we will discuss new isomers observed in ^{249,251}Md using decay spectroscopy, interpreted as high-K 3qp configurations [4]. These data were compared to new theoretical calculations using two scenarios: via blocking nuclear states located in proximity to the Fermi surface or/and using the quasiparticle Bardeen–Cooper–Schrieffer method.

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Orateur: THEISEN, Christoph (CEA Saclay, France)

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