SPECTROSCOPY OF SUPERHEAVY NUCLEI*

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A growing number of experiments is currently opening up the transfermium region of nuclei for detailed spectroscopic investigations [1,2]. In the deformed nuclei in the nobelium region this allows an identification and mapping of single particle orbitals closest to the top end of the nuclear chart.

Initial in-beam measurements in the region focussed on γ-ray spectroscopy of even-even nuclei (e.g. ^{252,254}No, ^{250}Fm), studying the ground-state yrast bands and allowing extraction of parameters such as the moments of inertia, and proving the deformed nature of these nuclei. More recently, attention has switched to odd-mass nuclei such as ^{253}No, ^{251}Md and ^{255}Lr, the latter being the heaviest nucleus so far studied in-beam. Rotational bands have been observed in all these nuclei. Non-yrast and K-isomeric states have recently been observed in ^{252,254}No and ^{250}Fm through the use of both in-beam and focal plane decay spectroscopy. The studies employed a calorimetric technique, whereby the summed energy from a cascade of conversion electrons is detected in a DSSSD detector and used as a "tag" for γ-rays detected in the various germanium detectors. These experiments have yielded data which can be used to determine the excitation energies and configurations of two-quasiparticle states in the region, and compared to the predictions of various theories. These comparisons show that reasonable agreement is obtained with Woods-Saxon approaches but discrepancies are observed with the predictions of HFB calculations with SLy4 or Gogny interactions. Such observations highlight the need for such detailed spectroscopic data in order to improve the interactions used in these modern approaches.

An overview of the most recent results and the experimental techniques used will be presented and new experimental developments such as the SAGE spectrometer coming online in Jyväskylä and the new TASISpec setup at will be discussed.

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[2] R.-D. Herzberg, P.T. Greenlees, Prog. Part. Nucl. Phys. 61, 674 (2008).