UNSAFE COULOMB EXCITATION AND FEW NUCLEON TRANSFER REACTIONS WITH ^{209}Bi BEAMS ON ACTINIDE TARGETS*

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The actinide nuclei have long been known to be an excellent laboratory for the study of collective motion. Most of the available data on high-spin states in these nuclei have been obtained using Coulomb excitation and deep-inelastic reactions. Several measurements have been performed at ATLAS using ^{207,208}Pb and ^{209}Bi beams, at bombarding energies $\sim$ 15% above the Coulomb barrier, incident upon a number of actinide nuclei. Large sets of γ-ray coincidence data were collected using the Gammasphere array. Initially, our studies concentrated on a series of Pu isotopes ranging from A=238 - 244. Based on comparisons between the Yrast band and the lowest lying excited band built on an octupole vibration. It was suggested that the octupole deformation stabilizes at high-spin for A$\sim$240. Part of the evidence which led to this conclusion came from the fact that a sharp upbend at $\hbar\omega \sim$0.25 MeV seen in the heavier Pu isotopes was not observed in either ^{239}Pu or ^{240}Pu.

In order to better understand this anomaly in the alignment patterns, we examined the available data on odd-A nuclei in this mass region. While some information was available on a number of odd neutron nuclei, the odd proton systems were poorly known. As a result, two experiments were performed on ^{237}Np and ^{241}Am targets. In both cases, rotational bands built on a $\pi i_{13/2}$ configuration were observed to high-spin in the target nuclei. From these new data and those available for even- and odd-A U and Pu isotopes, we have conclude that the $i_{13/2}$ quasiprotons dominate the observed alignments in this mass region and that

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there is little contribution from aligning $j_{15/2}$ neutron pairs. This is unexpected based on the Cranked Shell Model predictions which indicate that both quasipairs should be involved in the observed alignment processes. Furthermore, the new data give a strong indication that both the neutron and proton pairing force are reduced significantly relative to what current models predict.

Experiments were also performed on ^{232}Th and ^{248}Cm targets in order to test the ability of existing models to describe band structures built on vibrations. In particular, octupole vibrations were investigated in detail and were compared with RPA calculations.