FIRST MEASUREMENT OF EXCITED STATES IN ^{181}Tl*

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Above N = 82, the proton drip line follows closely the outer edge of the well deformed rare-earth region, and the ground states of nuclei lying close to the drip line are expected to have spherical or weakly deformed prolate shapes. A number of recent experimental studies have concentrated in the upper portion of this region, namely the study of excited states in Os (Z = 76) through Pb (Z = 82) isotopes located in the vicinity of the proton drip line. One of the principle motivations has been to characterize the evolution of shape from the well studied deformed region to the near spherical ground states deduced for the proton emitters.

With regards to the Pb isotopes, triple shape coexistence has now been established in ^{186,188}Pb [1,2] while prolate structures are found to dominate the yrast line in ^{182,184}Pb [3,4] for I > 4. The excitation energy of the prolate deformed minimum for even-even Pb and Hg isotopes follows a parabolic shape minimizing at mid-shell (N ~ 102). In addition, structures built on these same three shapes (spherical, oblate and prolate) have also been established for a number of Tl isotopes, namely, ^{183,185,187,189}Tl [5-7]. For these odd-A Tl isotopes, the excitation energy of the $13/2^+$ prolate state continues to decrease as one approaches mid-shell (N = 102). In contrast, the oblate structure built on the $h_{9/2}$ orbital minimizes in excitation energy at N = 108. Before our study, no information was available on excited states in odd-A Tl nuclei beyond the mid-shell (N < 102) except for the proton emitting isomer established in ^{177}Tl. Our new studies show that the excitation energy of the prolate band in ^{181}Tl does rise relative to both the spherical and oblate states, reversing the trend observed in the heavier odd-A Tl isotopes. The implications of this observation as well as new information on the α-decay of ^{181}Tl will be presented.

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