Contribution ID: **155** Type: **Oral**

The low-lying structure of ^{211}At

Lifetimes of low-energy states in ^{211}At have been measured using the recoil-distance Doppler shift, Doppler-shift attenuation, and fast-timing methods at the University of Cologne. The obtained reduced transition probabilities have been compared to two shell-model calculations, a large-scale shell-model calculation using the Kuo-Herling residual interaction and a calculation using a single-j approximation for protons in the $0h_{9/2}$ orbital. The large-scale calculations, which account only for single particle-hole excitations, significantly overestimate some of the ground-state transition probabilities, especially the $B(E2;13/2_1^- \to 9/2_1^-)$ value. This discrepancy has been attributed to the presence of higher-order particle-hole excitations in the wave function of the ground state, which are not accounted for by the Kuo-Herling intaraction. The effects of those excitations on the transition rates, however, are weaker in ^{211}At than they are in ^{210}Po. A modification to the $(h_{9/2}, h_{9/2}|\hat{V}|h_{9/2}, f_{7/2})_{J=2}$ two-body matrix element has been introduced which leads to a considerably better description of the structure of ^{210}Po and ^{211}At. However, the origin of this effect needs to be further investigated. The newly obtained reduced transition probabilities are described very well by a single-j calculation. This, together with the fact that the energy spectrum of ^{211}At is also well described, indicates that seniority can be regarded as a good quantum number in ^{211}At. It would be of interest to continue the same study along heavier $N = 126$ isotones, where information on most $E2$ transitions in even-even and odd-even nuclei is still missing.

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Session Classification: Poster Session

Track Classification: Poster Presentations