Structures of ^{201}Po and ^{205}Rn from β-decay studies

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One of the major goals in nuclear structure studies is to understand the interplay between collective and single particle states. However, information on single particle structures in the Z>82 and N<126 region is very scarce [1]. We attempt to bridge this gap by investigating β-decays of ^{201}At and ^{205}Fr at the CERN on-line isotope mass separator (ISOLDE) facility. In the experiment, a 1 GeV proton beam from the CERN PS-Booster impinged on a UC_2 target with the isotope separator set to select the A=205 reaction products, among which ^{205}Fr has the highest extraction efficiency from the ion-source. The experimental setup comprised two HPGe detectors to record gamma rays emitted after the β-decay and a mini-orange spectrometer to detect conversion electrons.

We present the first observation of beta-decay of ^{205}Fr into ^{205}Rn. The β-delayed gamma rays were *Z*-identified using X-rays and conversion electron spectroscopy. Half-lives for five gamma transition were extracted and compared with the half-life of ^{205}Fr, known from its α-decay [1].

Also, several gamma rays following the β-decay of ^{201}At (which was populated in the α-decay of ^{205}Fr) into ^{201}Po were identified for the first time, again on the basis of X-rays and conversion electrons. Attempts have also been made to assign the configurations using $f_{5/2}$, $p_{3/2}$, $p_{1/2}$, and $i_{13/2}$ orbitals coupled to 0^+ and 2^+ levels in neighboring even-even nuclei. The states observed in the present study were inaccessible to the previous work with heavy-ion fusion-evaporation reactions [2].

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