GAMMA-RAY SPECTROSCOPY OF ^{188}Pb WITH RECOIL MASS AND DECAY TAGGING

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In a commissioning run at the Recoil Mass Spectrometer (RMS), we have reexamined ^{188}Pb. Previously, Heese et al.[6] used a Recoil Filter Detector in conjunction with the OSIRIS array mainly to improve the peak/background ratio of the γ-ray spectra by suppressing γ-rays from the strongly competing fission process. Our setup consisted of 6 clover plus 4 Compton-suppressed small-volume Ge detectors at the target, a position-sensitive avalanche counter (PS AC) at the RMS focal plane, and a double-sided Si strip detector in which the recoils were subsequently implanted.

The spectra obtained for mass 188 recoils by appropriate gating on X_{PSAC} and Y_{PSAC} confirm the prolate yrast band in ^{188}Pb (341, 370, 434, 499, 558 keV, etc)[6], and provide a definitive mass assignment of the observed transitions. Very similar γ-ray spectra are obtained when tagging with the α-line of the ^{188}Pb ground state decay (E_α = 5.98 MeV, $t_{1/2}$ = 24 s, = b_α = 22%)[7]. The feasibility of the Recoil Decay Tagging (RDT) method was in this case perhaps not expected, since the α decay half-life is relatively long compared to the cases where RDT has been applied successfully. However, the chance for uncorrelated events is greatly reduced by the beam rejection and recoil identification capabilities of the RMS. As we move on to lighter isotopes or to nuclei with higher-Z, RDT measurements become more favorable because of shorter half-lives and larger α-branching ratios.

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