IDENTIFICATION OF A PROTON-EMITTING ISOMER IN ^{151}Lu

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An isomer of ^{151}Lu was identified by its direct proton radioactivity. It was produced by bombardment of ^{96}Ru with 266-MeV ^{58}Ni from the Holifield Radioactive-Ion Beam Facility, mass separated with a recoil separator and implanted in a double-sided silicon strip detector, which provided signals to correlate each proton decay with a particular implant. The spectra providing identification of the new isomer are shown in the figure.

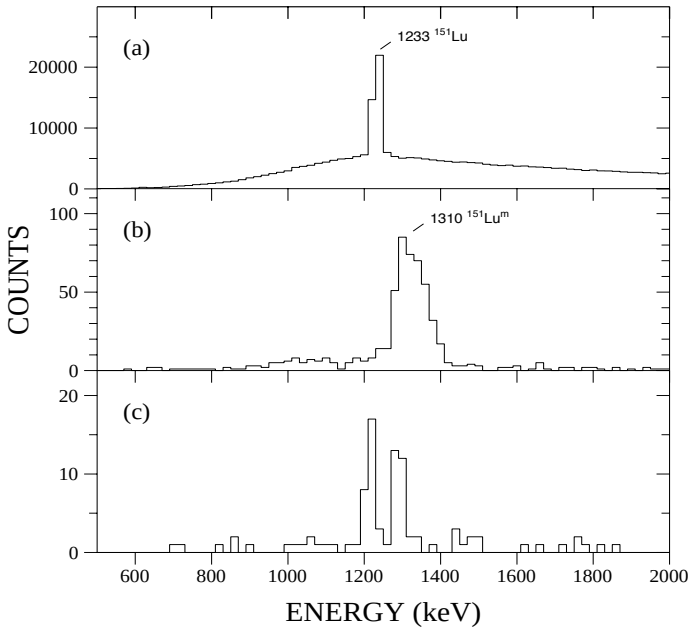

Fig. 1: Charged particle spectra at mass 151 with various time constraints: (a) decays occurring within 400 ms of the implant, (b) decays occurring within 50 μs of an implant, and (c) decays occurring between 50 and 250 μs after an implant. Part (c) clearly shows two proton peaks arising from decay of the ^{151}Lu ground state and the newly discovered ^{151}Lu isomer.

The proton energy and half-life of ^{151}Lu^{m} were measured to be 1310(15) keV and 16(1) μs, respectively. The half-life of the previously known $h_{11/2}$ ground state was observed to be 80(2) ms, in agreement with the previously adopted value of 88(10) ms. Comparison of the half-life of ^{151}Lu^{m} with WKB barrier-penetration calculations leads to the conclusion that the

isomer is a $d_{3/2}$ proton state. A two-potential approach predicts a half-life of 5.5(20) μs which yields an experimental spectroscopic factor of 0.34(13).

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