

Abstract Submitted  
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**Feeding of the  $1^-$  isomer in  $^{176}\text{Lu}$  in neutron induced reactions**

N. FOTIADES, M. DEVLIN, R.O. NELSON, LANL — The  $(n, n'\gamma)$  reaction was used to measure  $\gamma$ -ray excitation functions in  $^{175,176}\text{Lu}$  with a  $^{nat}\text{Lu}$  target. The data were taken using the GEANIE spectrometer comprised of 26 Ge detectors. The pulsed neutron source of the LANSCE/WNR facility provided neutrons with incident energies from 1 to 300 MeV, determined using the time-of-flight technique. The excitation functions for 111  $\gamma$ -rays from several reaction channels were determined, among them two transitions feeding directly the  $1^-$ , 3.664h isomer, and one transition feeding directly the  $7^-$ ,  $3.76 \times 10^{10}y$  ground state in  $^{176}\text{Lu}$ . Both states  $\beta$ -decay to  $^{176}\text{Hf}$ . The Lu-Hf radioactive decay system, with a half-life of  $\sim 37$  billion years from the ground state, is a chronometer for dynamic processes on a stellar time scale. Recent anomalies have questioned the accuracy of this chronometer, one possible explanation being that astrophysical  $(n, n')$  reactions populate the  $1^-$  isomer and reduce the effective half-life of  $^{176}\text{Lu}$ . The excitation functions for the three  $^{176}\text{Lu}$  transitions from the present experiment can be compared to nuclear reaction model calculations that predict the  $^{176g}\text{Lu}(n, n'\gamma)^{176m}\text{Lu}$  cross section, thus providing an important check for such models. Attempts to improve the experimental results to obtain absolute partial  $\gamma$ -ray cross sections for more  $\gamma$ -rays feeding the isomer and ground state of  $^{176}\text{Lu}$  in future GEANIE experiments will be discussed. This work was supported by U.S. DOE DE-AC52-06NA25396.

Ronald Nelson  
LANL

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