RADIOACTIVE DECAY STUDIES OF NUCLEI PRODUCED FROM BOMBARDMENT BY INTERMEDIATE-ENERGY NEUTRONS

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We have recently installed a pneumatic solid target transport (rabbit) system for neutron irradiation of gram quantities of target material. The "rabbit" projectile consists of a 2.7-cm delrin sphere which contains the target material and can be positioned within 1 cm of the back of the Faraday cup in the isotope production area beam dump. The arrangement is depicted schematically in Figure 1. Over the past few months we have measured the neutron flux, Φ_n, on target for a variety of proton beam energies and focusing conditions, by bombarding Al samples and using the known cross section[1] for the production of 15-hour ^{24}Na by the $^{27}Al(n,\alpha)^{24}Na$ reaction. Optimum focus of the proton beam on the center of the Faraday cup is accomplished by minimizing the current signal from an annular stop (immediately upstream of the Faraday cup stop) while maximizing the Faraday cup current. The results for Φ_n accumulated so far are summarized in Figure 2, where we compare the specific neutron flux (n/cm^2/sec per μA of proton beam) with that obtained at the Brookhaven Medium-Energy Intense Neutron (MEIN) facility[1]. It is clear that as the proton beam energy increases and the effective radiating center of the Faraday cup moves closer to the target irradiation position, the close geometry of this facility results in 6 to 10 times the specific neutron flux available at the MEIN facility.

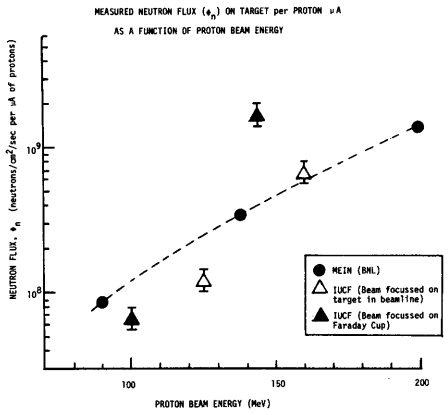

Figure 2.

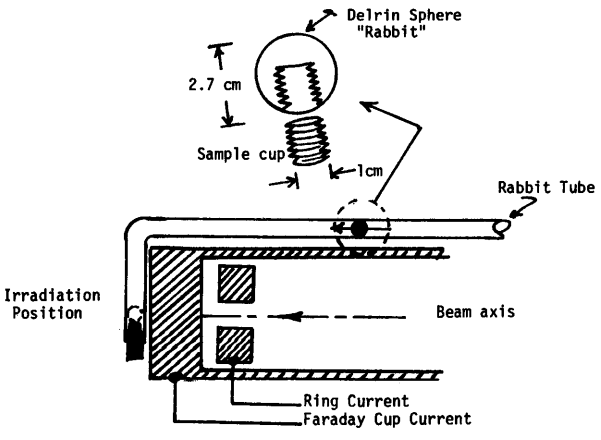

Figure 1.

We have performed some preliminary irradiations of ^{159}Tb and ^{89}Y and have observed the residual activity off-line. Our objective in these particular bombardments is to "map out" the neutron-induced yields over a wide mass range as groundwork for eventual production and study of as-yet undiscovered neutron-rich isotopes. Most of these latter studies await the installation of more complete radiochemistry facilities in the trailers southwest of the

isotope production area.

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1) S. Katcoff et al., Nucl. Instr. Meth. 129, 473 (1975).