Contribution ID: **26** Type: **Invited Talk**

Low current irradiation experiments at BLIP to address nuclear data needs

Tuesday, June 27, 2023 9:40 AM (30 minutes)

The efficiency of the isotope production process relies critically on the accuracy of the underlying nuclear data. Knowledge of nuclear excitation functions is particularly important for prediction and optimizing irradiation yield and radionuclidic purity of the desired radioisotope. This work is part of US DOE Isotope Program initiated joint effort between BNL, LANL and LBNL to address nuclear data needs for the proton-induced reaction relevant to the production of medical radioisotopes.

The project focuses on measuring nuclear excitation functions for several medical isotopes The proton energy regions of interest for the excitation functions measurements were designated between the collaborating institutions to take advantage of their proton-generating capabilities. The BNL LINAC delivers up 200 MeV protons with maximum current of 200 μA. The energy is incrementally tunable to deliver 200, 180, 160, 117, 66 MeV energy protons. The measurements of excitation functions were therefore carried out at proton energies between 100-200 MeV at BNL.

The stacked foil activation technique was employed for cross section measurements at each facility. The foils were intermingled with the beam monitors, foils, and degraders made either out of Al or Cu. BLIP experiments required either adaptation or development of housing to isolate the foils from cooling water. The foils were irradiated at 100-200 nA currents for 1-2 h. The activation of foils was measured nondestructively using gamma spectroscopy.

The obtained excitation functions were in good agreement with experimental data reported previously. Details of the experimental set up, post irradiation analysis and results will be discussed during presentation.

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Session Classification: Talks