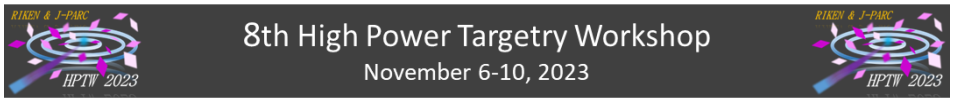

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Survivability of proton beam degraders and beam stop: experience at Brookhaven Linac Isotope Producer

Thursday, 9 November 2023 10:00 (15 minutes)

Brookhaven Linac Isotope Producer (BLIP) operated by Brookhaven National Laboratory (Upton, NY, USA) and funded by US DOE Isotope Program (IP) uses high energy proton beam for isotope production. The proton beam is generated by the Linac and directed to the BLIP target station located 30 feet underground. The incident proton energy is incrementally tunable (30-33 MeV increments) in the range from 0-200 MeV, with the lowest practical incident energy of 66 MeV.

Designed and dedicated solely for isotope production, BLIP continuously receives 200 MeV beam to meet Isotope Program needs. The targets are stacked for irradiation: a typical target stack is comprised of production targets, beam degraders, water channels for cooling, and a beam stop designed to ensure that all 200 MeV is stopped in the stack. The number of targets and degraders in the stack depends on the proton energy required for optimum isotope production. With operational beam currents routinely reaching as high as 165 μA with maximum excursions up to 178 μA, the total beam power deposited in the target stack can reach up to 35 kW (average incident power density 9.1 W/mm2). The heat load on individual components of the stack reaching as high as 5-6 kW.

The above-mentioned operational conditions require a rigorous evaluation approach towards the design of targets and degraders for continuous irradiation. This talk will focus on the current approach toward the design of targets, modeling tools, challenges as well as observed performance of the beam components as related to their suitability as materials to sustain extended irradiation periods.

An upgrade to the entire cooling system is in progress, which will increase the volumetric flow rate and velocity of cooling water over the target faces by a factor of 2.5X. This will double the film heat transfer coefficient to provide a larger safety margin for target survival and allow for future upgrades to beam energy, current, and ultimately increase isotope yield.

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Themes for the contribution

7 Operation of targets and beam dumps:

Primary authors: MEDVEDEV, Dmitri (Brookhaven National Laboratory); KIM, Dohyun (Brookhaven National Laboratory); NAYAK, Sumanta (Brookhaven National Laboratory); BELLAVIA, Steven (Brookhaven National Laboratory); REEVES, James (Brookhaven National Laboratory); RAPARIA, Deepak (Brookhaven National Laboratory); CUTLER, Cathy (Brookhaven National Laboratory)

Presenter: MEDVEDEV, Dmitri (Brookhaven National Laboratory)

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