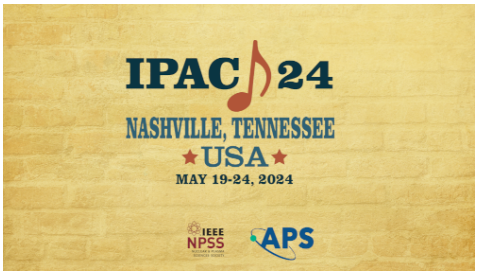

Contribution ID: **746** Contribution code: **THPR03** Type: **Poster Presentation**

Power ramp up and minimization of beam losses at the facility for Rare Isotope Beams

Thursday, 23 May 2024 16:00 (2 hours)

The Facility for Rare Isotopes Beams started operation nearly two years ago and ramped up beam power by a factor of 10 from 1 kW to 10 kW. The main contributions to the beam losses are due to the beam halo generated in the ion source and low energy beam transport, the effect of the stripper, and multiple charge state acceleration. The linac tuning procedure includes setting both RF cavity fields, phases, and beam optical devices based on pre-calculated values followed by Courant-Snyder parameters matching based on profile measurements in several linac sections. The simultaneous acceleration of multiple charge states of heavy ion beams is routinely used to minimize the beam power deposition on the charge selector slits after the stripper and provide higher power on the target for the heaviest ions with limited intensity from the ion source. Recently, we added acceleration of dual charge state beams, which is a significant challenge due to the absence of the central charge state but highly desirable for light ions (Z<50) to reduce controlled beam losses on the charge selector. The optics at the Beam Delivery System are optimized to simultaneously focus all charge states into the required phase space on the target. The transverse and longitudinal envelop mapping is applied for each charge state to confirm low-loss linac tuning. The uncontrolled beam losses for any ion species from neon to platinum at the entire linac are well below 1e-4.

Footnotes

Funding Agency

Work supported by the U.S. Department of Energy Office of Science under Cooperative Agreement DE-SC0000661, the State of Michigan and Michigan State University.

Paper preparation format

Word

Region represented

North America

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Session Classification: Thursday Poster Session

Track Classification: MC4: Hadron Accelerators: MC4.A08 Linear Accelerators