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Advanced charge selector for stripped heavy ion beams

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A new charge selector is currently under development at FRIB to intercept unwanted charge states of higher-power 17 - 20 MeV/u stripped heavy ion beams. The charge selector is located in the first bending segment of the FRIB linac, where high dispersion separates charge states to allow for their selection. The design concept is based on rotating graphite cylinders that act as an intermediate heat transfer medium, efficiently absorbing beam power and radiating it to a water-cooled heat exchanger. The power in the beam spot of up to 5 kW and the rms spot width as small as 0.7 mm present significant design challenges. Beyond thermal stress, the proposed design addresses the effects of radiation damage and implantation of the intercepted ions. The challenges of the engineering design associated with high temperatures, thermal expansion, rotation and linear actuation feedthrough into vacuum, as well as radiation shielding and remote handling, will be discussed. A comprehensive exploration of these challenges aims to contribute to the broader field of beam interception technology.

Footnotes

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