

MonPE24

Beam Simulation Studies of ECR Beam Extraction and Low Energy Beam Transport for FRIB*

Haitao Ren, Eduard Pozdeyev, Steven M Lund, Guillaume Machicoane, Xiaoyu Wu and Glenn Morgan

Facility for Rare Isotope Beams, Michigan State University, East Lansing, MI, USA 48824

Corresponding Author: Haitao Ren, e-mail address: ren@frib.msu.edu

To meet the beam power requirements of 400 kW at the fragmentation target for FRIB, simultaneous acceleration of two-charge states should be used for heavier ions. These intense multi-charged ion beams will be produced by a 28 GHz electron cyclotron resonance (ECR) ion source at a high voltage of 35 kV. After extraction, the ion beam will be pre-accelerated to 12 keV/u with a 50 kV platform, transported down to an achromatic charge state selection (CSS) system followed by a vertical transport line, and then injected into a radio frequency quadrupole (RFQ) accelerator. The TRACK code developed at ANL is used to perform the simulations of the ECR beam extraction and low energy beam transport (LEBT) for FRIB. In this study, we include the magnetic field of ECR ion source into simulations. Different initial beam conditions as well as different space charge neutralization levels are tested for the ECR beamline. The beam loss in CSS system and the corresponding protective measures are discussed. The detailed results about the beam dynamic simulation and beam loss in CSS system will be presented in this paper.

*Work supported by the U.S. Department of Energy Office of Science under Cooperative Agreement DE-SC0000661 [#wei@frib.msu.edu](mailto:wei@frib.msu.edu)