

Conceptual Design Studies for a Heavy Ion Linac for Potential Upgrade of the HRIBF

Y. Zhang,^{*} G. Alton
Physics Division, Oak Ridge National Laboratory[†]
Oak Ridge, TN USA

ABSTRACT

Conceptual design studies have been completed for light-ion driver and heavy-ion post-accelerator systems for enhancing the number and intensities of radioactive species for research at the Holifield Radioactive Ion Beam Facility (HRIBF). Even though a low charge-state acceleration scheme is more costly than that for a high charge-state counterpart, it is preferred for use at the HRIBF because of the inventory of successful low charge-state ion sources that have been developed for radioactive ion beam generation. For these reasons, both low and high charge-state systems are described in this report. Each system is respectively comprised of a room temperature RFQ, followed by Inter-digital H-type (IH) linac that injects into super-conducting (SC) linac. The layout and beam transport systems for both linacs are essentially identical and occupy the same physical space. The systems are designed to post accelerate beams from the 25-MV tandem that serves as the present post RIB accelerator or to bypass the tandem in which case, the beam is directly accelerated by the linac system to the desired energy. The heavy-ion post accelerator can be installed in modular increments at points in time whenever budgetary restrictions prevent completion of the maximum energy device. In combination with a 200-MeV proton linac that will be the subject of a future report, the heavy-ion linac will increase the production of short-lived species. Since the device accelerates positive-ion beams, the number of elements that can be delivered for research is increased by a factor of ~ 3 and the intensity of a given species is increased by a few to several orders of magnitude over those of the present tandem-accelerator-based HRIBF. The details of the beam transport optics and facility layout schemes for the two heavy-ion linac systems will be presented in this report.

^{*} Visiting scientist, China Institute of Atomic Energy, Beijing, China.

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