A HIGH-CHARGE-STATE ACCELERATION SCHEME FOR POTENTIAL UPGRADE OF THE HRIBF

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Conceptual design studies have been completed for light-ion driver and high-charge-state post-accelerator system for enhancing the number and intensities of radioactive species for research at the Holifield Radioactive Ion Beam Facility. The upgrade for the HRIBF includes a new driver accelerator to replace the ORIC and a high-charge-state post acceleration system for accelerating radioactive ion beams to research energies. The high-charge state linear accelerator system consists of a room temperature RFQ, followed by Inter-digital H-type linac that injects into super-conducting linac. The voltage gain of the linac system will reach 60 MV making possible the acceleration of ions with masses, $M \leq 150$, above the Coulomb barrier. The system is quite flexible in that negative-ion beams can still be injected into the existing 25-MV tandem post accelerator, when desirable, and the output beams either directly used for research or injected into the linac post accelerator for boosting their energies. Alternatively, the tandem accelerator can be bypassed by accelerating high-charge-state ion beams, thus, overcoming the species and intensity limitations imposed by the present negative-ion post accelerator. The chosen heavy-ion post accelerator can be installed in modular increments at points in time whenever budgetary restrictions prevent completion of the maximum energy device. The energies and intensities available from the light-ion driver will increase the production of a broader range of short-lived species by several orders of magnitude over the present ORIC-based driver. Details of the heavy-ion linac system, transport optics, and facility layout scheme will be presented in this report. The light-ion driver will be the subject of a future report.

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