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(POS-28) Systematic Investigation of the TRIUMF Electron Cyclotron Resonance Ion Source Charge State Booster

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At the Isotope Separator and Accelerator (ISAC) facility of TRIUMF, an Electron Cyclotron Resonance Ion Source is used to charge breed radioactive ion beams before injection into the linear accelerator for post acceleration. The so-called Charge State Booster (CSB) has been used to charge breed radioactive isotopes ranging from potassium to erbium under the regime of single frequency heating since its commissioning in 2010. To improve the overall performance of the CSB, a research campaign has been launched since 2018 to conduct a systematic investigation of the source injection and extraction systems alongside the corresponding beamlines to further understand beam injection and formation from the booster. The well-known quadrupole scan technique was developed to measure the emittance of the beams from the CSB. To further improve the efficiency of the charge state booster, two-frequency heating is being implemented using a unique and unconventional method of the single waveguide. The results of the systematic investigation of the source extraction system, the efficiency of single charge states, the emittance of some selected charge states in comparison to the emittance of some selected background ion species will be presented and discussed.

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