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Optimization of the electron beam properties of Dresden EBIT devices for charge breeding

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ABSTRACT: This paper summarizes the results of studies to enhance the performance of Dresden Electron Beam Ion Traps regarding aspects which are important for charge breeding, i.e. the injection of externally produced low charged ions and their conversion to highly charged ions. The properties of the electron beam of this compact room-temperature operated EBIT were investigated via position sensitive X-ray detection. A detailed analysis of the spatial distribution as well as the energy of the X-ray photons emitted from the electron beam region allowed for the determination of the source parameters needed to guarantee optimal ion trapping conditions and ionization rates. The parameters found in this investigation were applied for the successful realization of charge breeding with the Dresden EBIT.

KEYWORDS: Ion sources (positive ions, negative ions, electron cyclotron resonance (ECR), electron beam (EBIS)); Instrumentation for radioactive beams (fragmentation devices; fragment and isotope, separators incl. ISOL; isobar separators; ion and atom traps; weak-beam diagnostics; radioactive-beam ion sources)

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