

Compact electron beam ion sources/traps: Review and prospects (invited)^{a)}

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The Dresden electron beam ion trap (EBIT)/electron beam ion source (EBIS) family are very compact and economically working table-top ion sources. We report on the development of three generations of such ion sources, the so-called Dresden EBIT, Dresden EBIS, and Dresden EBIS-A, respectively. The ion sources are classified by different currents of extractable ions at different charge states and by the x-ray spectra emitted by the ions inside the electron beam. We present examples of x-ray measurements and measured ion currents extracted from the ion sources at certain individual operating conditions. Ion charge states of up to Xe^{48+} but also bare nuclei of lighter elements up to nickel have been extracted. The application potential of the ion sources is demonstrated via proof-of-concept applications employing an EBIT in a focused ion beam (FIB) column or using an EBIT for the production of nanostructures by single ion hits. Additionally we give first information about the next generation of the Dresden EBIS series. The so-called Dresden EBIS-SC is a compact and cryogen-free superconducting high- B -field EBIS for high-current operation. © 2008 American Institute of Physics. [DOI: [10.1063/1.2804901](https://doi.org/10.1063/1.2804901)]