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First Experiments with the Dresden EBIS-SC

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ABSTRACT: The Dresden EBIS-SC is a new superconducting EBIS designed for applications in medicine, basic research and other fields. After mechanical construction and a longer installation period first experiments have been accomplished to understand the source behavior and to get a well-founded sense about the working characteristics of the ion source. In a first step electrical properties were investigated and it was shown that the source works stable over a period of several days with electron beam currents I_e of up to 500 mA at a beam transmission of Ie/Ie $\leq 10^{-3}$. Actually using a cathode of 1.5 mm the source reaches electron beam currents up to 750 mA. All measurements were performed at magnetic fields of 6 T. First ion extraction experiments could demonstrate that the H^{2+} output at a pulse repetition frequency of 330 Hz and an electron beam current of 300 mA is higher than 1×10^8 ions per pulse. This output is sufficient for medical applications, e.g. in so-called CYCLINACs. Furthermore, the corresponding DC beam was measured to about 1 eμA. The beam emittance of extracted carbon ions was determined to (7...25) mm mrad. Extracted ion pulses show pulse FWHM in the order of (4 ... 12) μs.
In this paper first ion extraction spectra of highly charged carbon, argon and xenon ions are presented for different source operation regimes. Additionally energy-dispersive measured X-ray spectra from argon and xenon ions are shown and discussed.

KEYWORDS: Dresden EBIS-SC; superconducting EBIS; ion production; highly charged ions.

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