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Recent Developments in Low Noise Mevva Ion Sources

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ABSTRACT

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Recent Development of Low Noise Mevva Ion Sources

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The well-known vacuum arc ion source is attractive for a number of fields of application. A negative feature is the relatively high beam noise level. This leads to difficulties in beam transport for accelerator injection as well as to limitations of the noisy beam for nuclear experiments, and the application of the source in the accelerator community has up to now been limited for these reasons. Humphries and co-workers [1] demonstrated the use of a space charge limited mode of "grid-controlled extraction" to substantially reduce the beam noise. We have employed this method in conjunction with an external magnetic field in our development of low-noise metal ion beams, leading to the use of the GSI-Mevva ion source for injection of low-noise heavy metal ion beams into the UNILAC heavy ion linear accelerator system [2]. Here we describe and summarize our recent research aimed at further development of the method, and our investigation of the influence of grid-controlled extraction on the ion beam charge state distribution. The experiments were carried out at Berkeley using the MEVVA-5 ion source. Optimization of operational parameters in the grid-controlled mode provide reduction of the beam noise level as well as enhanced shot-to-shot beam pulse-shape repeatability. The physics and applications of grid controlled vacuum arc metal ion sources are discussed. This work was supported in part by a DOE USA-Russia IPP collaborative research program.

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