

Towards the High Intensity Limit in the FAIR Project – Present Status and Future Challenges

P. Spiller

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Abstract

In order to reach the desired intensities of heavy ion beams for the experiments of FAIR, SIS18 and SIS100 have to be operated with intermediate charge states. Operation with intermediate charge state heavy ions at the intensity level of about 10^{11} ions per cycle has never been demonstrated elsewhere and requires a dedicated upgrade program for SIS18 and a dedicated machine design for SIS100. The specific problems coming along with the intermediate charge state operation in terms of charge exchange processes at collisions with residual gas atoms, pressure bumps by ion induced desorption and corresponding beam loss appears far below the typical space charge limits. Thus, new design concepts and new technical equipment addressing these issues are developed and realized with highest priority.

The upgrade program of SIS18 addressing the goal of minimum ionization beam loss and stable residual gas pressure conditions has been defined in 2005. A major part of this upgrade program has been successfully realized, with the result of a world record in accelerated number of intermediate charge state heavy ions.

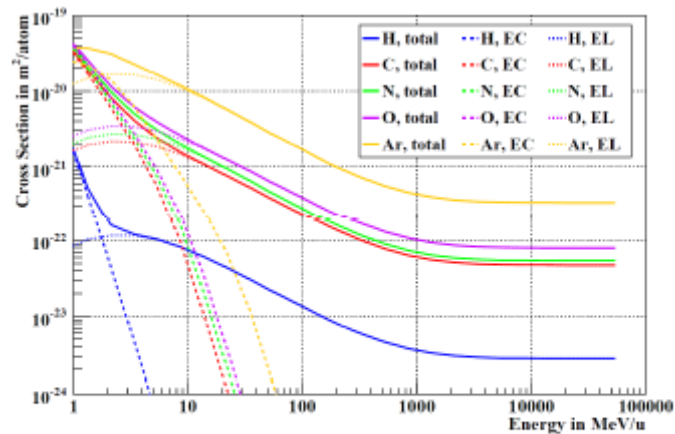


Figure 3: Calculated cross sections for ionization and electron capture of U^{28+} -ions as a function of beam energy for various target (residual gas) atoms.