

Optimization of the SIS100 Lattice and a Dedicated Collimation System for Ionisation Losses

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Abstract

A triplet lattice with six-fold symmetry was originally proposed for SIS100 and presented in the Conceptual Design Report (CDR) [1]. Meanwhile the design strategy for the SIS100 lattice had to be changed and a new lattice was presented in the Technical Status Report. Especially for the planned operation with intermediate charge state heavy ions (U^{28+}), a new lattice design concept was developed. Measurements in SIS18 and theoretical studies have shown that significant beam loss appears by the interaction of beams of these ions with the residual gas. The reason for the importance of the interaction process even at very low residual gas pressures is the large ionization cross section of heavy ions with intermediate charge states. During high intensity operation, beam loss induces a large amount of ion desorption which leads to a fast degradation of the residual gas pressure. Therefore, a new type of collimation system was proposed to control beam loss due to charge changing processes and to confine the generated desorption gas. The optimization of the efficiency of this new collimation concept was chosen as the major lattice design criteria for SIS100. A lattice structure was developed which contributes to an effective stabilization of the dynamic behaviour of the residual gas pressure.

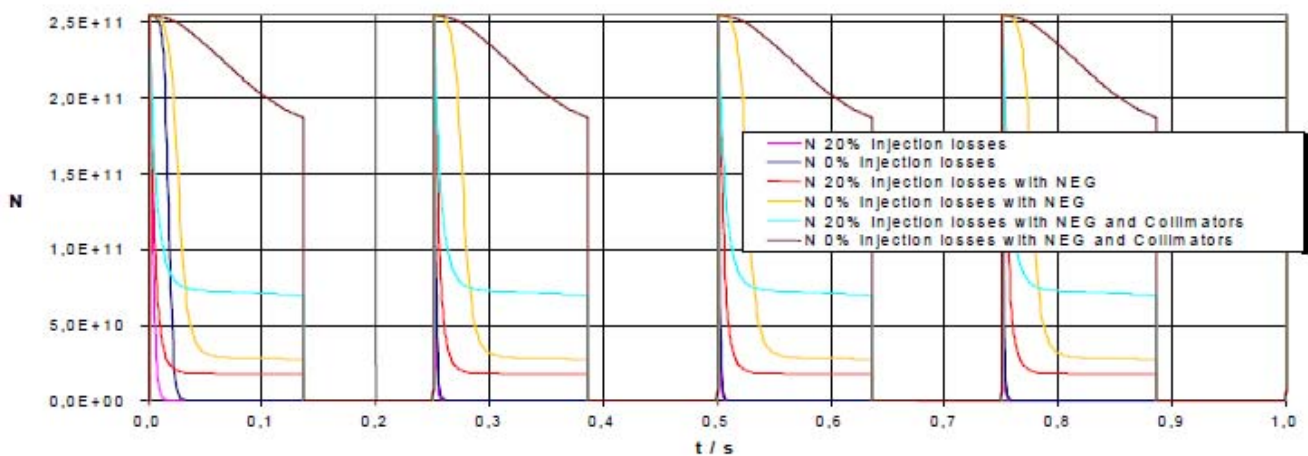


Figure 6: Calculated SIS18 beam intensity evolution during a 4 Hz booster operation. The curves indicate the influence of initial beam losses, the collimation system and the enhancement of the UHV pumping power.