Simulation of the long Term Beam Intensity Performance of the NEG-Coated SIS18

P. Puppel, P. Spiller, U. Ratzinger;

Proceedings of ICFA HB (2010) Morschach, Switzerland

Abstract

The StrahlSim code has been developed to simulate dynamic vacuum effects and charge exchange beam loss in the GSI and FAIR heavy ion accelerators. The code accounts for charge exchange cross sections at the actual beam energy, it determines the loss positions of charge exchanged ions, and the pressure rise caused by desorption due to the impact of these ions onto the vacuum chamber. Recently, the modeling of time dependent longitudinal pressure profiles has been implemented in StrahlSim. Thereby, localized pressure bumps during a cycle and the lifetime of NEG-coated surfaces depending on their distance from the local pressure bumps, and the corresponding influence on the beam performance resulting from the saturation process can be simulated. The new code was applied to SIS18 considering two scenarios: 1) the currently available U^{28+} intensity of 2×10^{10} extracted particles per cycle, and 2) the proposed FAIR booster operation with 1.5×10^{11} extracted particles per cycle. The simulations show, that the beam scrubbing effect, which is also accounted by the code, is crucial for a stable booster operation of SIS18, as it stabilizes the dynamic vacuum over long term operation. Already for the currently available beam intensity, the beam scrubbing effect is important, as it prevents an exceeding saturation of the NEG near the injection septum.

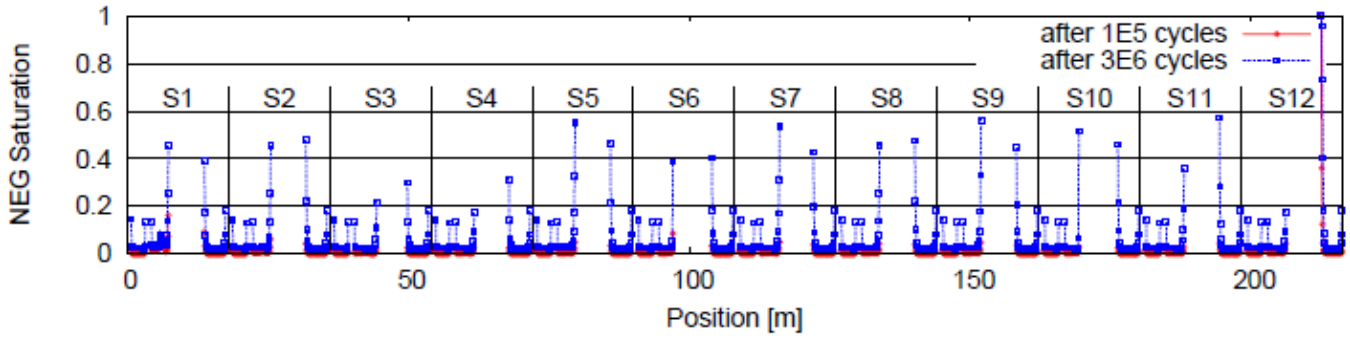

Figure 1: Simulated saturation of the NEG-coated surfaces for the currently available beam intensity including beam scrubbing. A minor saturation can be noticed in sector 12 behind the injection septum (210 m).