

ACCELERATOR SEMINAR

Adrian Oeftiger

GSI

Thursday, 23. June 2022 at 4 pm

Hybrid-Seminar

Zoom: (ID: 646 8698 0568 / PW: 398947)

or

KBW Lecture Hall, GSI

The Space-Charge Limit of SIS100

As the key synchrotron of FAIR, SIS100 should be operated at the 'space charge limit' for light- and heavy-ion beams. While delivering maximum intensities, the beam losses due to space-charge-induced resonance crossing should not exceed a few percent during a full cycle. The one-second-long injection plateau poses the most critical challenge in terms of beam dynamics -- in particular for the U28+ beams. Based on the recent progress on cold bench measurements of the SIS100 dipole and quadrupole magnets, as well as the newly established GPU-accelerated SIS100 tracking simulation suite, we are now in position to realistically model and explore the space charge limit of SIS100.

This talk presents the recently published extensive results on SIS100 performance at the space charge limit. We discuss the magnet field error model and the correspondingly driven betatron resonances. A key aspect is the comparison of 3D space charge models, validating the fast approximative solver results with fully self-consistent computations, for the first time for long-term conditions. We identify the achievable maximum beam intensity from simulations covering the full duration of the injection plateau. We conclude with discussing several countermeasures to increase the space charge limit: beta-beat compensation, double-harmonic rf bunch flattening, and finally the promising novel technique of space charge compensation with electron lenses.



Coordinator: Claude Krantz, Janet Schmidt

Secretary: Larissa Birli

<https://indico.gsi.de/categoryDisplay.py?categId=359>

