

SIS100/300 Extraction System Design Beam Dynamics and Technological Challenges

N. Pyka, U. Blell, C. Mühle, A. Saa-Hernandez, P. Spiller, J. Stadlmann;

Proceedings of PAC 2009, Vancouver, BC, Canada

Abstract

The FAIR heavy ion synchrotrons SIS100/300 will provide heavy ion and proton beams with variable time structure. The design of the extraction systems has to allow fast extraction of compressed single bunches from SIS100, fast beam transfer between SIS100 and SIS300 and slow extraction from SIS100 and SIS300. High average beam intensities and the generation of an uninterrupted linac-like beam are enabled by combining both heavy ion synchrotrons in different operation modes (fast acceleration and stretcher operation). In order to reduce beam loss at slow extraction of intense heavy ion beams and to minimize the beam load in subsequent accelerator structures, dedicated ion optical settings of the basic lattice functions and higher order corrections will be applied. However, the tight geometrical constraints in the rather short straight sections and the need to extract from both synchrotrons, fast and slow, at the same position and in parallel to the beam transport system, require operation parameters of the extraction devices close to the limits of technical feasibility. Higher order beam dynamics simulations and technical developments on the magnetic septa will be presented.

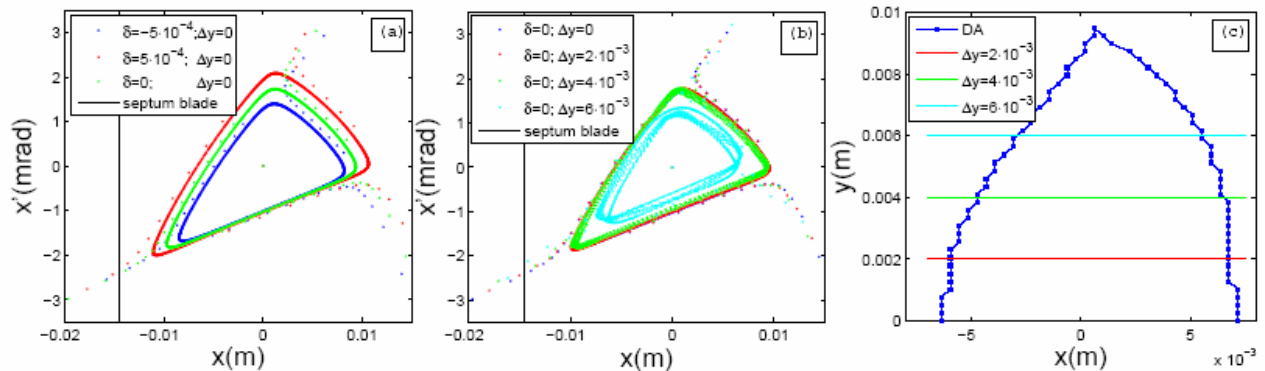


Figure 2: Slow extraction tracking simulations with Hardt condition for the working point Q_x/Q_y : 13.32/9.27 after implementing the optimization code results: (a) for $\Delta y=0$ overlapping of the separatrices heading towards the septum for different momenta $\delta=\Delta p/p$; (b) particles with $\Delta y \neq 0$; (c) as projected in (b).