ACCELERATOR SEMINAR

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Thursday, 5. September 2019 at 4 pm

KBW Lecture Hall
Planckstraße 1, 64291 Darmstadt

Intensity limitation due to space charge for the fast bunch compression in SIS-18

In the SIS-18 and the future FAIR SIS-100, the bunch compression achieved via a 90° fast (non-adiabatic) bunch rotation in longitudinal phase space is a well-accepted scheme to generate short, intense ion bunches for various applications. During the bunch compression, both effects of the space charge (beam intensity) and dispersion (energy spread) are enhanced, which could lead to beam instabilities and particle resonances and limits the beam maximum intensity.
In this talk, a three dimensional (3-D) beam envelope model for bunch compression is introduced. By using the 3-D analytical model, along with particle-in-cell (PIC) simulations, the intensity limitation during bunch compression in the SIS-18 is investigated: potential space-charge driven beam instabilities and the particle resonance phenomena during bunch compression are presented. Especially, the agreement between the 3-D model and PIC results indicates that the stop band of the dispersion instability should be avoided during bunch compression.

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