ACCELERATOR SEMINAR

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SB1 1.201 (Lecture Hall)
Planckstraße 1, 64291 Darmstadt

Magnetic field and ion-optical simulations for the optimization of the Super-FRS

The growing demand in the field of discovering and investigating exotic nuclei by means of fragment separators yields challenging restrictions on future facilities. To achieve the best resolution and capture of rare nuclei, maximal beam illumination of the apertures of the ion-optical elements is required. Many fragment separators have a wide operation range of the magnetic rigidity Brho. Moreover, frequent changes of Brho are required during experiments. Often magnets are operated in the saturation region of the iron yokes, leading to local changes of the magnetic field (B-field) distributions and the corresponding particle trajectories. In such cases it is important to have a fast ion-optical model with good predictability, which considers the real field distributions and the saturation. This work describes a general approach to provide a fast and accurate ion-optical model (Taylor transfer map) of large aperture magnets starting from simulated or measured 3D B-field distributions. The method was tested using the analytical field model, based on a configuration of thin wires and a Biot-Savart law, resulting in a high stability against the errors in the input B-field. The rigidity dependent transfer maps were generated for the normal conducting dipole of the Super-FRS preseparator. The ion-optical study of the preseparator in the separator as well as in the spectrometer modes was conducted.

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