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Improvement of beam transport in high energy transfer lines using Gabor-lenses

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Transfer lines provide the beam transport from accelerators to experimental areas. In the study presented in this paper, commonly used beam optics are supplemented by Gabor-lenses (GL) to investigate their effect on the luminosity for fixed-target experiments.
With GLs it is possible to confine a pure electron plasma with densities up to 10E15 m-3. The self-field of the homogeneous electron density provides a focal strength, whereas the space charge forces of the beam are fully compensated. The performance of GLs was numerically investigated in the GeV range (p, π+, K+) in the past. The weak but continuous radial focusing improved the acceptance of the whole transfer line.
The preparation of the experiments is planned in two steps. First, a GL (GL2000) which provides a 2m long electron column was commissioned successfully at the Van-de-Graaf beam line at Institute of Nuclear Physics of Goethe-University. Beam transport measurements to investigate the stability of the confined electron column were performed using He+, Ar+ and Xe+ beams in an energy range of 0.5-2MeV. In a second step the implementation of several GLs in an existing transfer line at GSI Darmstadt was investigated numerically. The beam transport simulations using TraceWin shall take into account, that existing focusing devices and beam instrumentation should not be affected by the implementation. This enables the possibility to provide and compare the beam transport with and without electron atmosphere.

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