

LOW ENERGY BEAM TRANSPORT USING SPACE CHARGE LENSES *

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Gabor lenses provide strong cylinder symmetric focusing for low energy ion beams using a confined nonneutral plasma [1]. They need drastically reduced magnetic and electrostatic field strength or a reduced installation length to provide a given focal length compared with conventional LEBT – systems like quadrupoles and magnetic solenoids. The density distribution of the enclosed space charge is given by the enclosure conditions in transverse and longitudinal direction [2]. For homogeneous charge density distribution the resulting electrostatic field and therefrom the focusing forces inside the space charge cloud are linear. Additionally in case of a positive ion beam the space charge of the confined electrons causes compensation of the ion beam space charge forces. Hence all resolving forces on the beam ions are linear and thus the transformation is linear as well and the aberrations are minimal. Therefore space charge lenses are a serious alternative to inject space charge dominated low energy heavy ion beams into a RFQ.

To study the capabilities of a Gabor double lens system to match an ion beam into a RFQ a testinjector was installed at IAP and put into operation successfully. Furthermore to verify the beam focusing of bunched beams using this lens type at beam energies up to 500 keV a new high field Gabor lens was build. It will be installed behind the RFQ.

The first experimental results will be presented together with numerical simulations.

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1. J.A.Palkovic Measurement on a Gabor lens for neutralising and focusing a 30keV Proton beam., University of Wisconsin, Madison, 1982
2. J. Pozimski et al., A Double Gabor Plasma Lens System for HIDIF, GSI-98-09,(1998)