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Density measurements and simulations on confined electron column in GL2000 Gabor-lens device

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GL2000 Gabor-lens (GL) is a 2m long device built mainly for focusing and space charge compensation of hadron beams in energy ranges up to GeV. The electron cloud is initially produced by cold-cathode method with gradually ionisation of residual gas and is confined in a cylindrical trap much longer compared to previous constructed lenses. Density measurements were carried out at the test-stand in Goethe University in 2024. Outgoing stream of residual gas ions was detected within cylindrical spectrometer mounted on axis outside of the lens. Due to the dependency of the kinetic energy on starting potential, the on-axis potential and therefore confined average charge density can be derived. Measured densities were evaluated in a range of 10^{14} - $10^{15}m^{-3}$. A large scale multi-particles Monte-Carlo-PIC (particle-in-cell) simulations with electrons and ions were carried out to understand collective phenomena in non-neutral plasma and to use the latter for linear and non-linear beam manipulation. Measurements and simulation results will be presented.

Footnotes

Paper preparation format

Word

Region represented

Europe

Funding Agency

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