The PITZ Plasma Source

WG1 – Plasma targets, diagnostics and plasma beam transport

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LAOLA Workshop
Plasma Cell Design

Design: Gerald Koss

- Thermal Insulation
- Heating Coils
- Cooling Sleeve
- Electron Window
- Laser Window
- Helium Distribution
- Ionization Laser Path
- Heating Coils
ASTRA simulations: electron beam scattering impedes focusing into the plasma

Maximal agreeable scattering angle: 0.2 mrad

8\textmu m Kapton foil for first experiments \rightarrow expect 1 mrad
Pre-experiment #1: Screen station

- Purpose: Find quadrupole settings for best focusing

- Best result: <100μm spot size (100 pC bunch charge; 22 MeV; no scattering foil)
Purpose: test of interaction electron beam ↔ electron window foils
Pre-experiment #2: Dummy Plasma Cell

Purpose: test of interaction electron beam ↔ electron window foils

Capturing of tightly focused beam behind plasma cell (at that time only 2 Quads available for beam capturing)
Summary

- PITZ beamline was remodeled for plasma experiments

- Several preparatory experiments have been performed
  - 1) Beam dynamics: <100μm focusing into plasma cell was achieved
  - 2) Electron beam – plasma cell interaction: 8μm Kapton foil could be used for first experiments

- Simulation shows strong scattering, but beam passed plasma cell intact
Pre-experiment #3: Electron Beam Scattering

Purpose: Find maximal allowable window foil thickness

Result: $\approx 3\mu m$ (to be checked: gas diffusion)