Cooler e-source

Magnetized Beam LDRD Progress Report

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Magnetized Electron Source at GTS

- Gun HV Chamber
- Beamline
- Photocathode Preparation Chamber
- Gun Solenoid
- Shield Tube
- Slit
- Viewer Screen
- Viewer 3 Screen
- Beam Dump
- Magnetic field at 400 A
Magnetized Beams on Viewers

• Magnetic field on the gun solenoid was varied with solenoid current varying from 0-400 A (0-1511 G on photocathode).
• All other beamline lenses were turned off.
• The rms beam sizes on 3 viewers were measured and compared with simulation using ASTRA.
Measurement of Rotation Angles

• Beamlets through slit 1 was imaged on viewers 2 & 3
• Beamlets through slit 2 was imaged on viewers 3
• The beamlet images were analyzed for rotation angle with respect to x (+ve) axis as function of gun solenoid field
• A linear least square fit was used for rotation angle evaluation
• Sign convention used:
  – a clockwise rotation w.r.t. x-axis is +ve angle
  – a counter clockwise w.r.t. x-axis is -ve angle
Rotation Measurement

Captured Image

Post-analysis

Angle = 16.4°
Experimental Results:
Beam Size and Rotation Angle

![Graphs showing beam size and rotation angle](image-url)
Beam size on viewers depends on the initial beam size and the angular momentum at the exit of the solenoid field.

Sajini’s work
Beam Sizes on Viewer 1
(measurement vs. simulation)

Sajini’s work
Summary

- Beam sizes and rotation angles were measured for different gun solenoid fields up to 1511 G on photocathode.
- Simulation for beam sizes is underway and shows reasonable agreement with the measurement.
- Simulation for beam rotation will be performed soon.
- Demonstrated 0.5 mA magnetized beam (>1 h) with 1511 G on photocathode.
- Next priority will be to run high current magnetized beam of 5mA.