

Electron Beam Characterization and Gun Laser Stability at FLUTE

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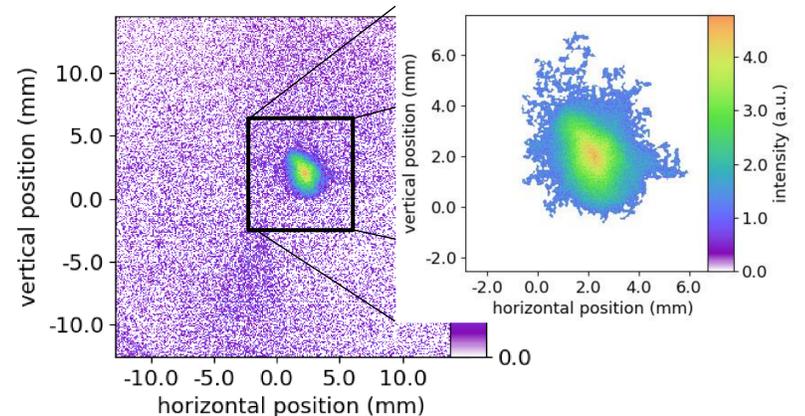
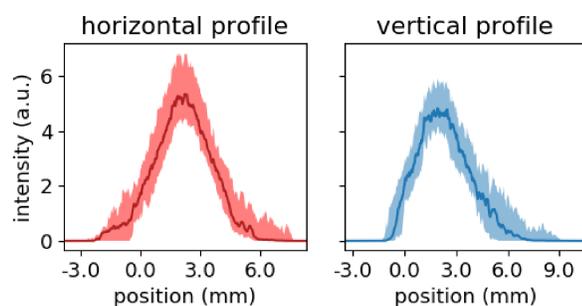
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Beam Measurements with Screen Monitor

- Machine settings: RF power 4.2 MW, repetition rate 1 Hz, bunch charge about 5 pC
- YAG screen used for profile measurements
- Image processing:
 - Dark current background subtraction
 - Region of interest search, including noise level estimation

Statistics for 120 beam profiles:

- Beam position:
 - H: 2.06 ± 0.09 mm
 - V: 2.30 ± 0.14 mm
- RMS beam width:
 - H: 1.41 ± 0.08 mm
 - V: 1.46 ± 0.13 mm

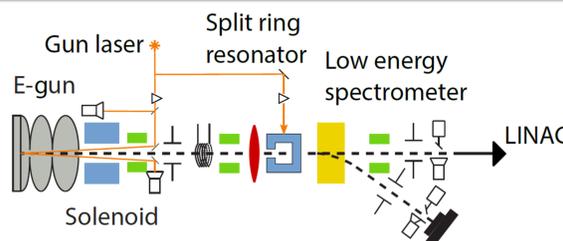


Acknowledgement

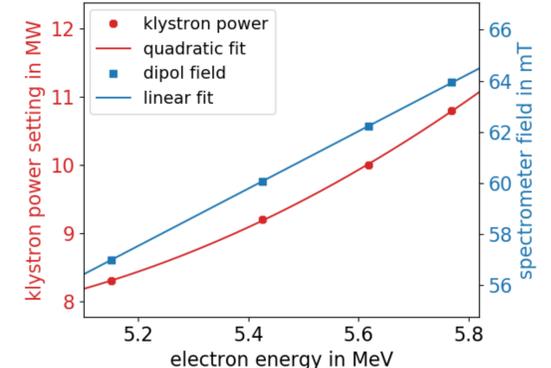
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Energy Measurements with Spectrometer

- First test measurements with low energy spectrometer are done
 - Focused electron beam with solenoid on the screen
 - Spectrometer field set for beam in center on the screen

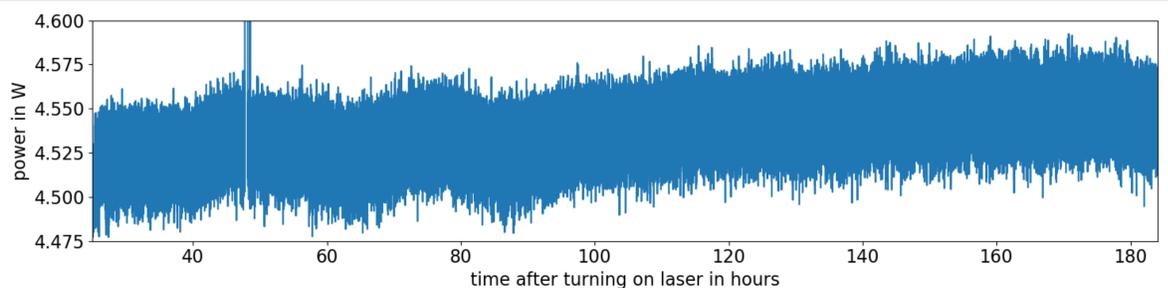


Top: Zoom into injector section schematic. Right: Electron energy in relation to klystron power setting, and the needed magnetic field strength for the measurement.



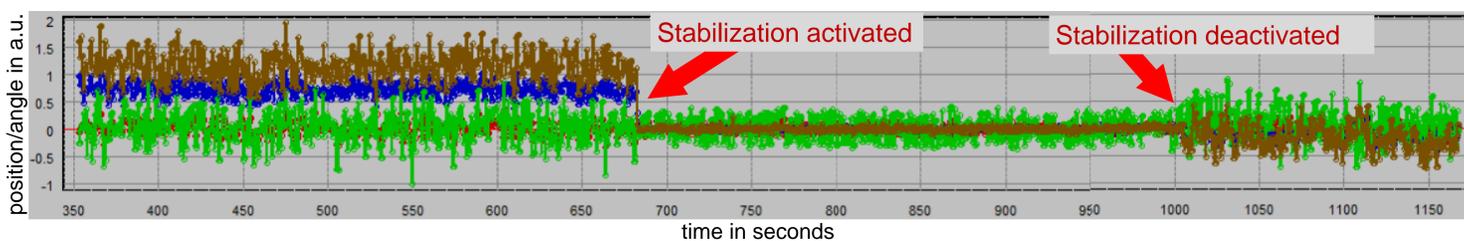
Laser Stability Measurements

- Laser power stability:
 - 25 hours after turning on laser
 - Continuously over 6 days
- Laser power: 4.539 ± 0.014 W
- Oscillations and long time drift visible



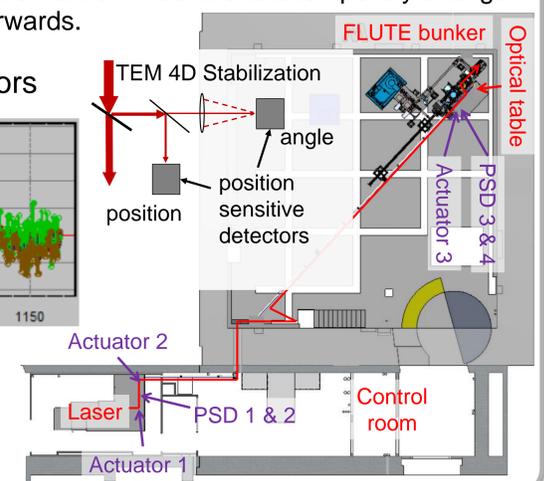
Long time laser power stability measurement, the deviation at 50 h was due to a temporary change during operation of FLUTE and was changed back afterwards.

- Laser transport stabilization system:
 - System from TEM Messtechnik, using two mirrors/actuators and two position sensitive detectors



Top: Detector readback of position (h: green and v: brown) and angle (h: red and v: blue), deviation from center. Before activation, the system was off several days.

Right: Bird's eye view of FLUTE with the actuator positions in the laser transport. Detection schematic of TEM system.



Summary & Outlook

- Screen monitor system is operational, measurements with varying machine settings are in progress.
- Energy spectrometer shows first good results, systematic energy scan is planned.
- The laser transport stability is improved, long term drifts of laser power are under investigation.

Partner:

