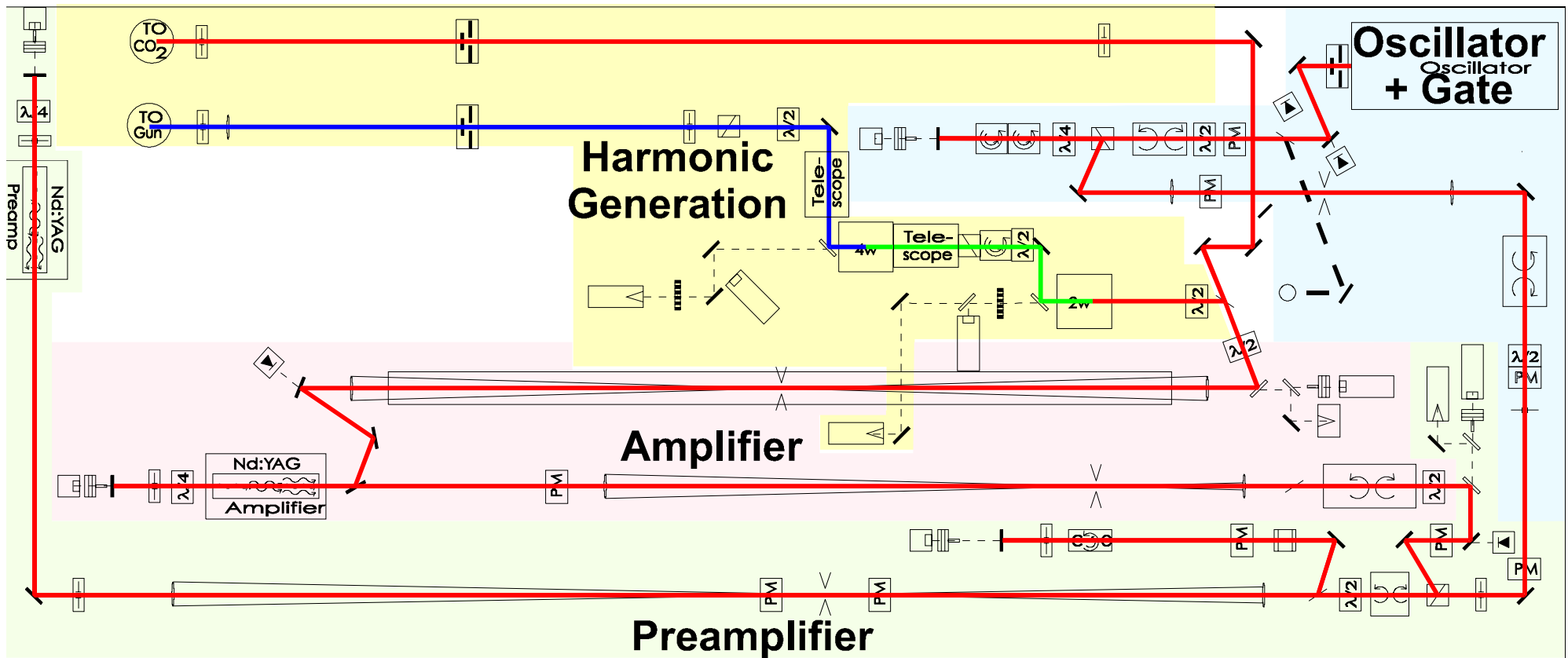


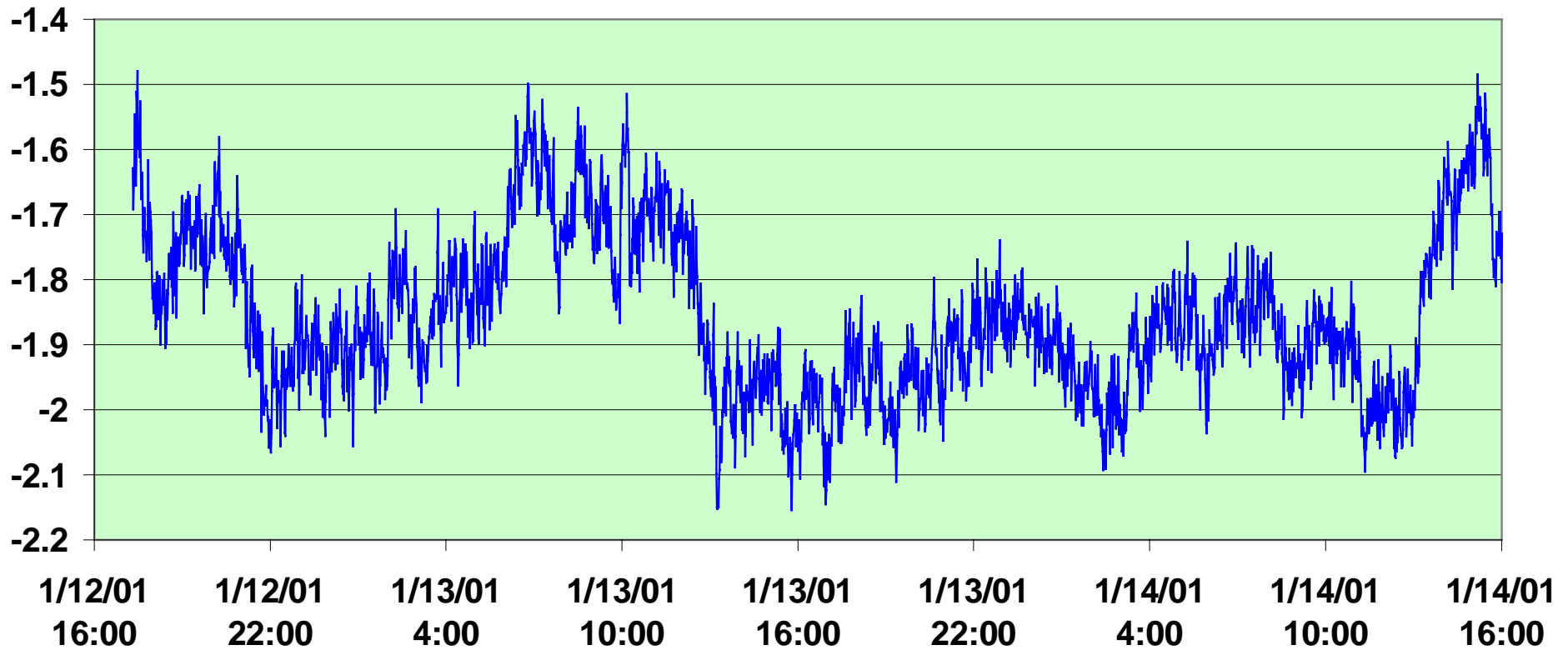
ATF Nd:YAG Laser - functional units and beam path



Operations Data

Phase Drift

ATF Laser Oscillator-to-Clock Relative Phase [ps]



- CW phasemeter (DC-10 Hz bandwidth) shown over 48 hours

Current Status

Capabilities

- ~ Photocathode and CO₂ slicing fully available on-demand
- ~ Electron beam-synchronized optical pulses available for users:
 - 10 mJ, 14 ps @ 1064 nm in laser lab (exclusive of slicing)
 - 100 μJ, 10 ps @ 532 nm in laser lab or FEL room
 - 50 μJ, 8 ps @ 266 nm in gun hutch and laser lab
- ~ Exceptional availability: deliver light ~130 days/year, for a total of 1500 running hours.
- ~ High reliability: system typically ready for gun operation within 20 minutes, including daily performance characterization.

Demonstrated ATF Laser Performance

Energy (dual pulse mode)

UV on cathode	0-50 μ J
IR at CO ₂ table	7 mJ
Laser output: total IR	30 mJ
IR into 2 ω	5 mJ / pulse
Green	1 mJ / pulse
UV	200 μ J

Repetition rate 1.5, 3 Hz

Pulse duration (FWHM):

Oscillator IR	7 ps
Amplified IR	14 ps
Green	10 ps
UV	8 ps

Beam \varnothing on cathode (FWHM) 0.2 - 3 mm

Top-Hat Beam Profile Modulation (P-P) <20%

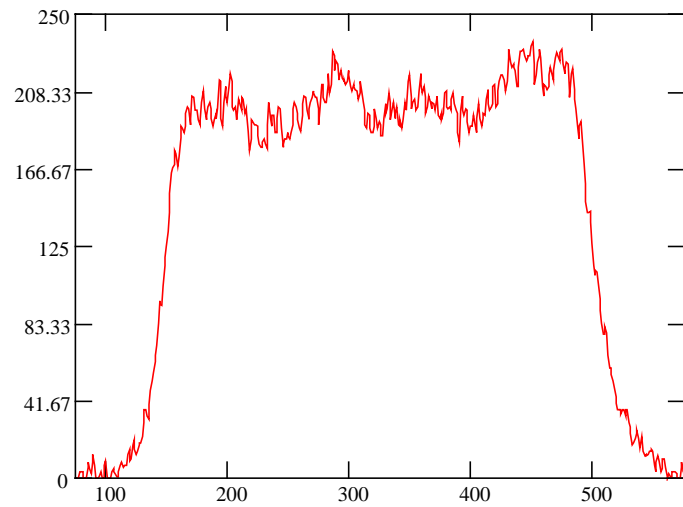
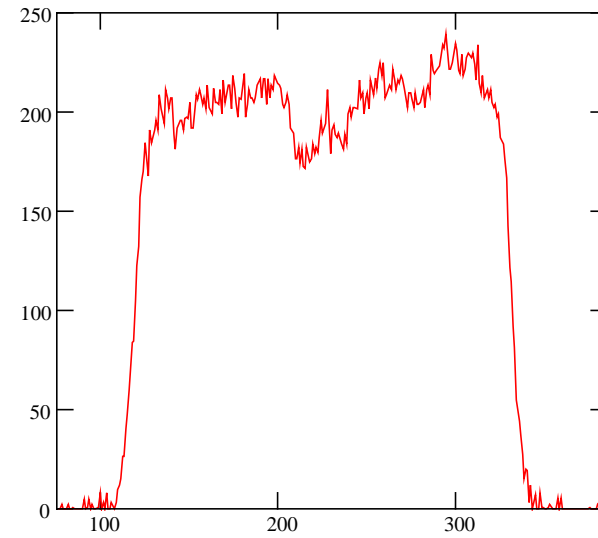
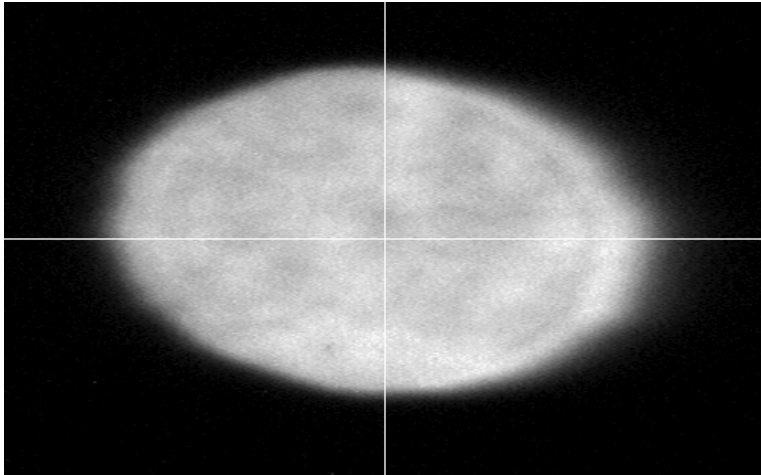
Shot-to-shot stability (rms):

Timing	<0.2 ps
Energy	\leq 2 %
Pointing (fraction of beam \varnothing)	<0.3%

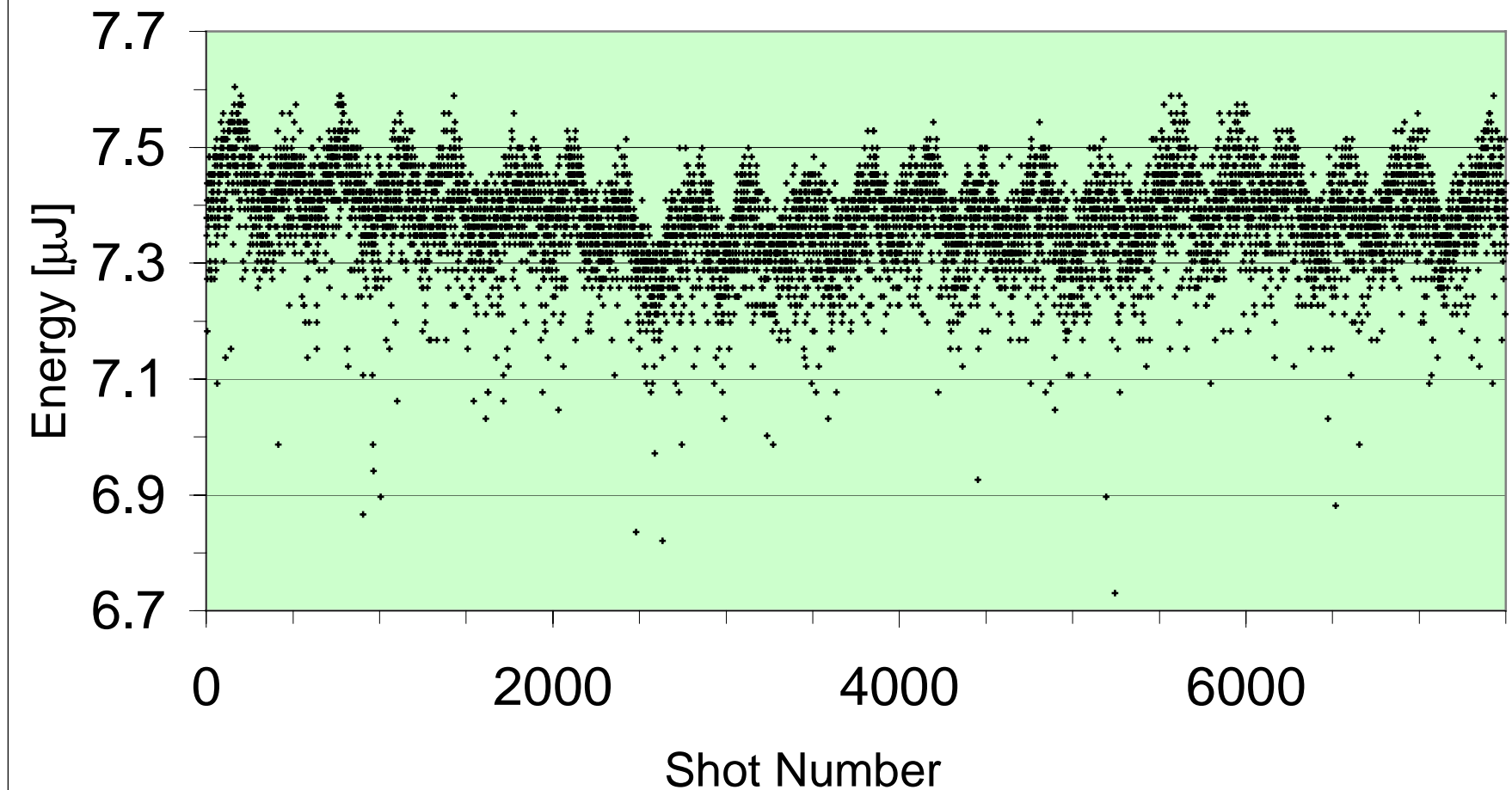
Drift (8 hour P-P)

Timing	<1ps
Energy	<15 %
Pointing (fraction of beam \varnothing)	<1%

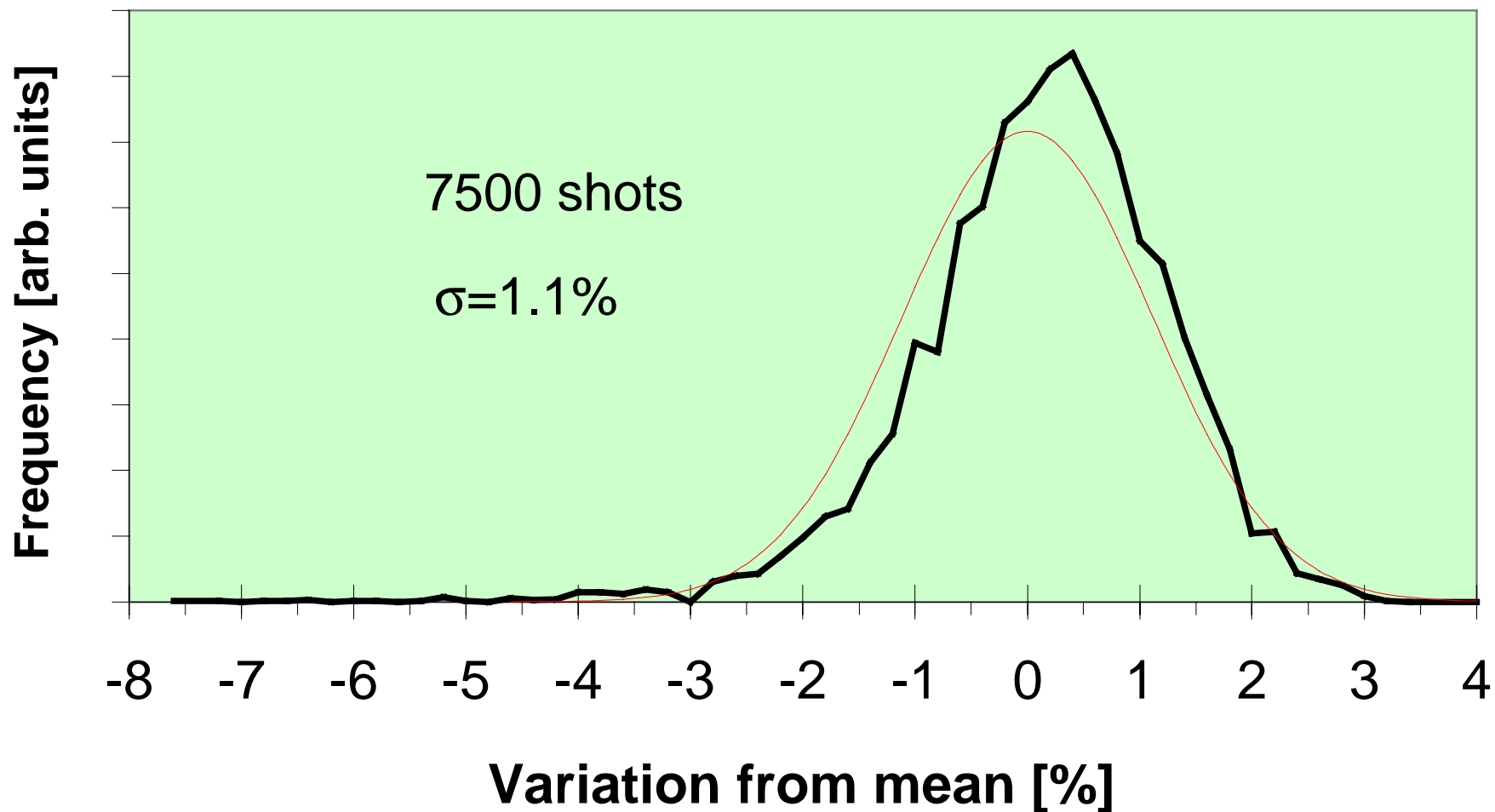
Beam Profile



Laser Energy Shot-to-Shot Jitter



Laser Energy Histogram



Diagnostics

Continuously on-line:

- ~ Scanning autocorrelator for oscillator monitoring
- ~ 14 CCD cameras for transverse mode and position measurement with beam profile analyzer
- ~ 5 pyroelectric energy measuring probes with pickoffs and calibrated readout*
- ~ 7 High speed silicon photodiodes
- ~ Laser-RF Phasemeter*
- ~ 16-channel thermocouple temperature monitoring

Additional:

- ~ 2 ps resolution streak camera (Instrumentation Div.)
- ~ CW laser power meter
- ~ 2 GHz digital sampling oscilloscope

* - output available facility-wide

Long Term Progress

