

Lasing at 4.x nm

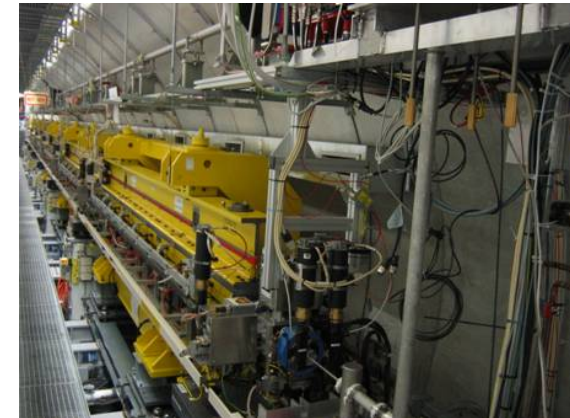
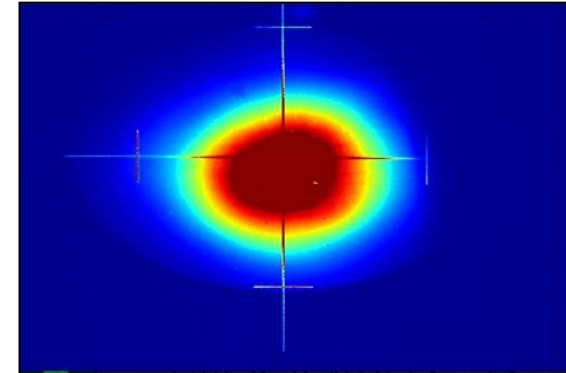
- »First at 4.45
- »First at 4.6
- »First at 4.12

SASE Characterization at 4.6 and 4.12 nm

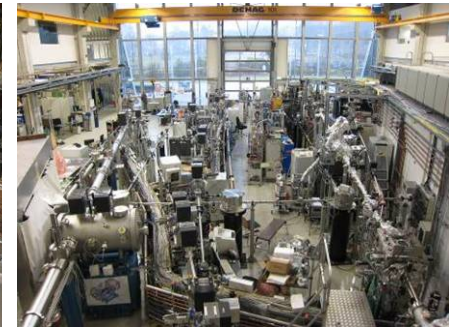
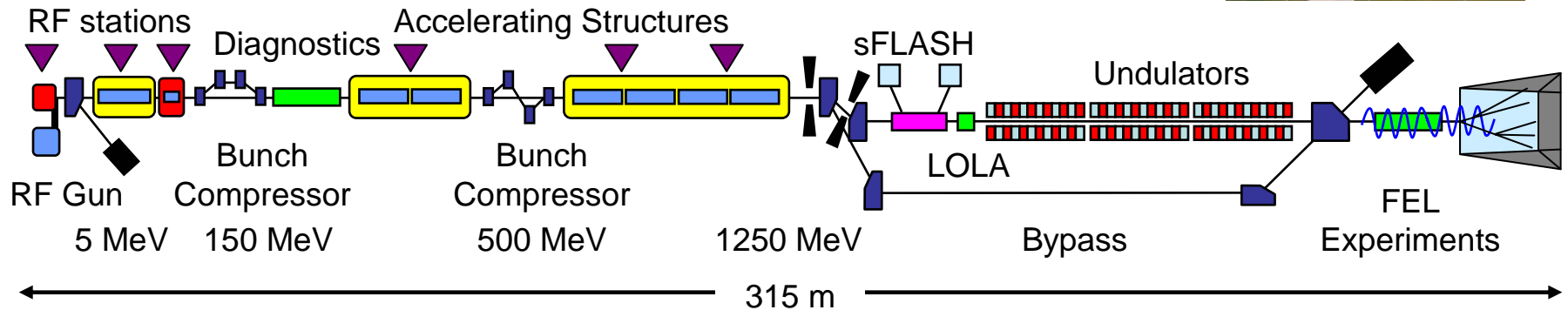
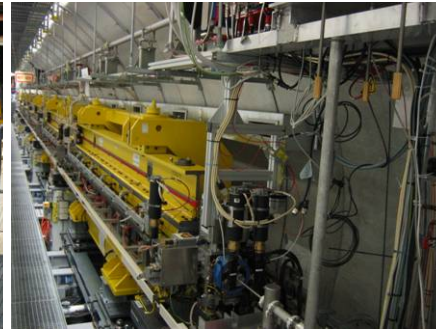
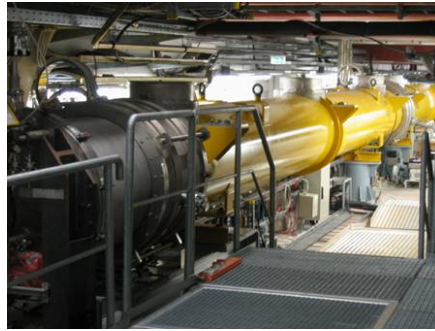
Bart Faatz
DESY

FLASH Seminar

9-Nov-2010

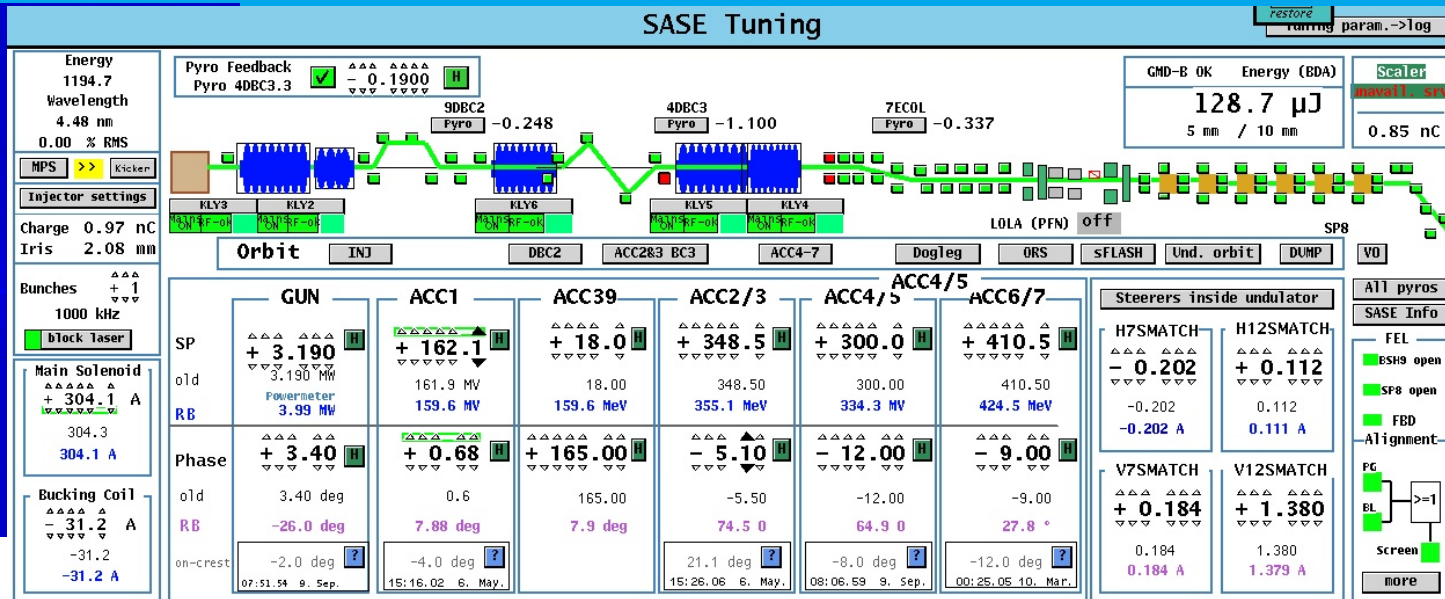


The new FLASH layout



- ✓ Intensity
- ✓ Spectrum
- ✓ Gain curve
- ✓ Transverse Coherence
- ✓ Pulse length
- ✓ SASE fluctuations/Statistics
- ✓ Harmonics (intensity/spectrum)

FLASH.
Free-Electron Laser
in Hamburg

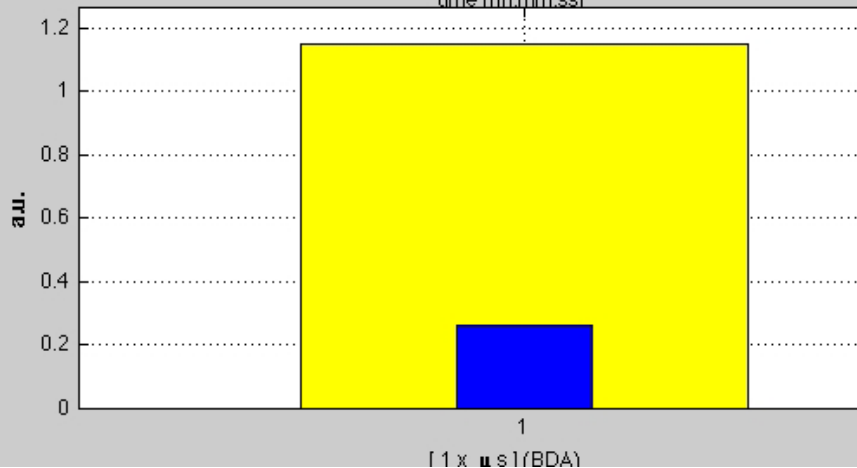
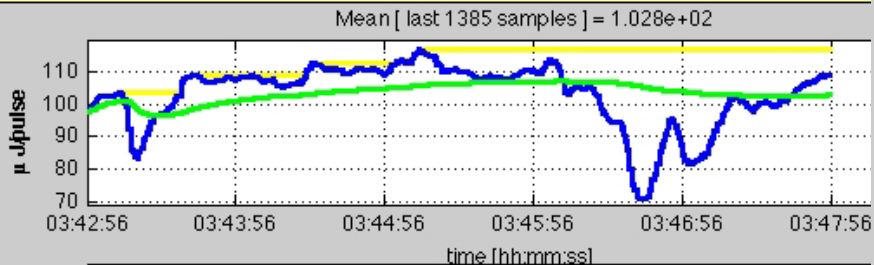


First lasing in June

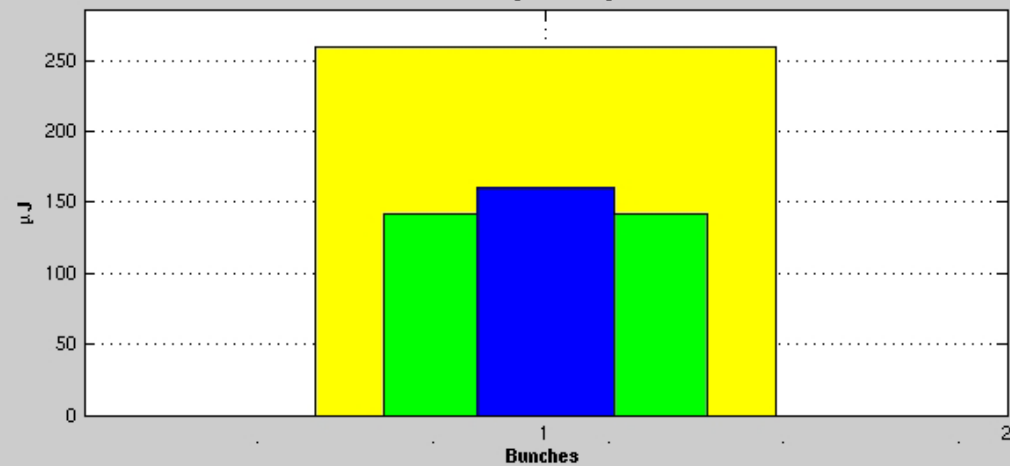
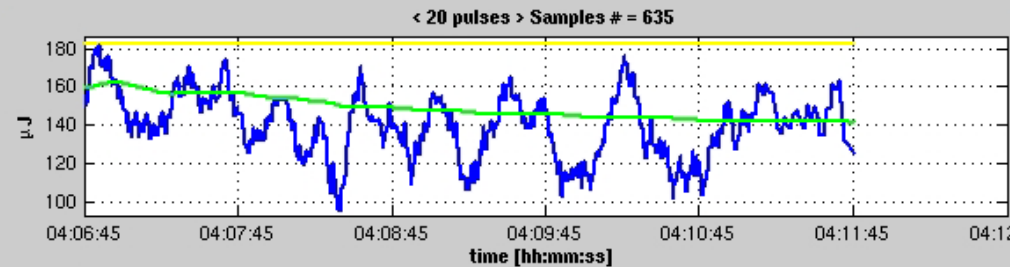
>12% loss due to MCP mesh

Wrong calibration?

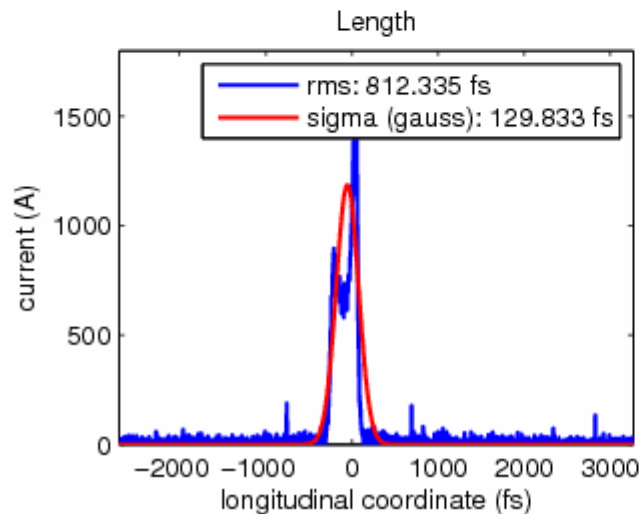
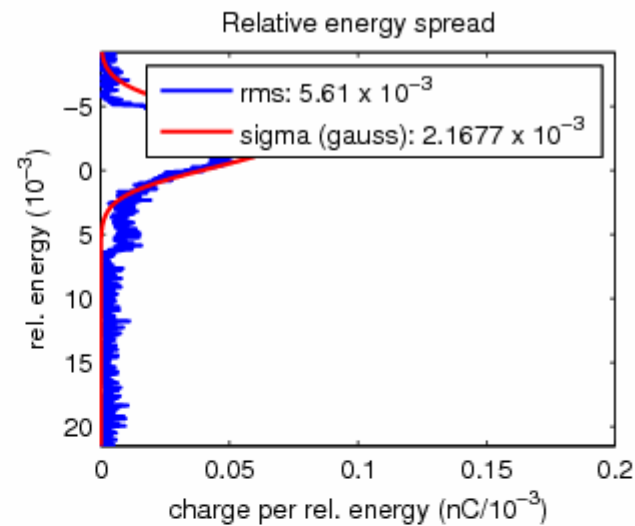
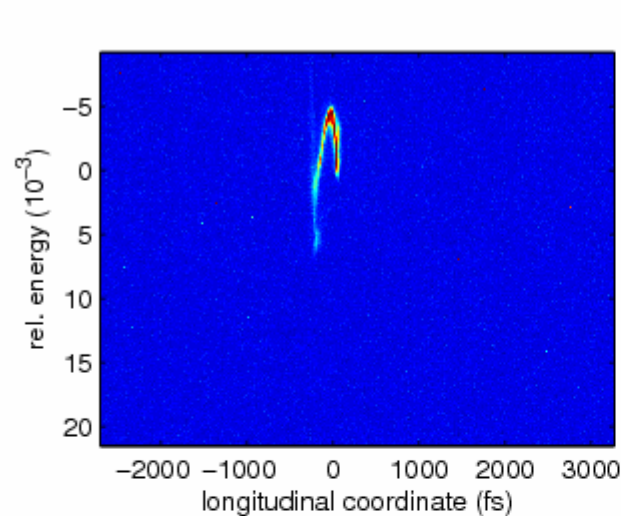
Charge: # 0.73993 Aperture I = 5 mm
Charge: 0.73993 Aperture II = 10 mm
Pyro for max. -0.001958
Start Stop 2010-06-08 Print Counter
03:47:55 1397 1397



0.84833 0.84833 2010-06-08 04:11:45 Start Stop
#MCP3: Angle: Fe88 calibrated 2010:06:07:22:57:52

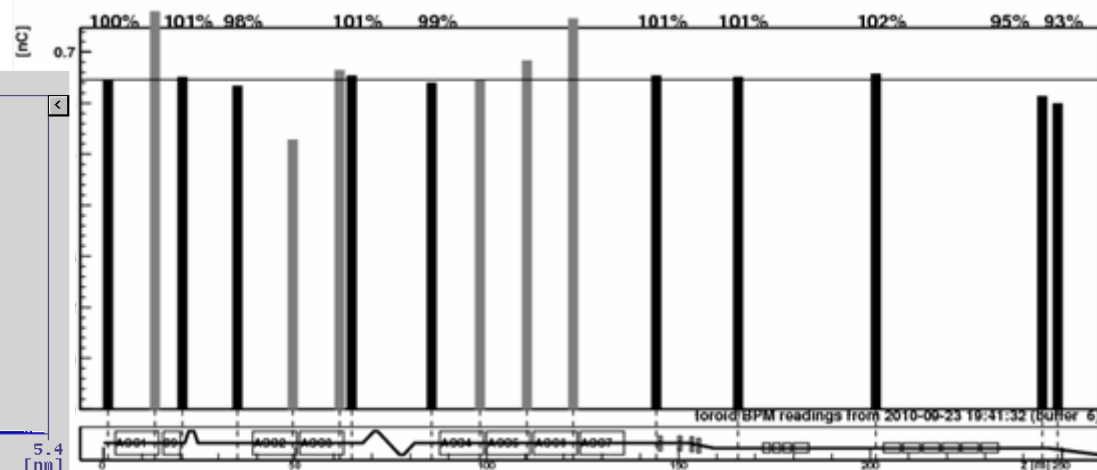
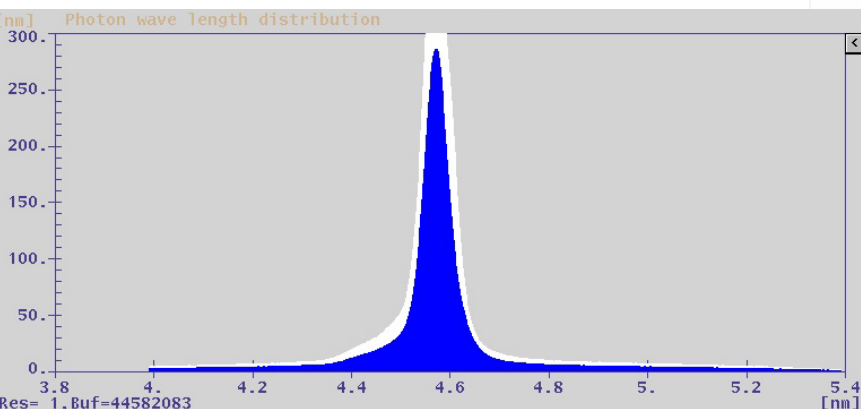
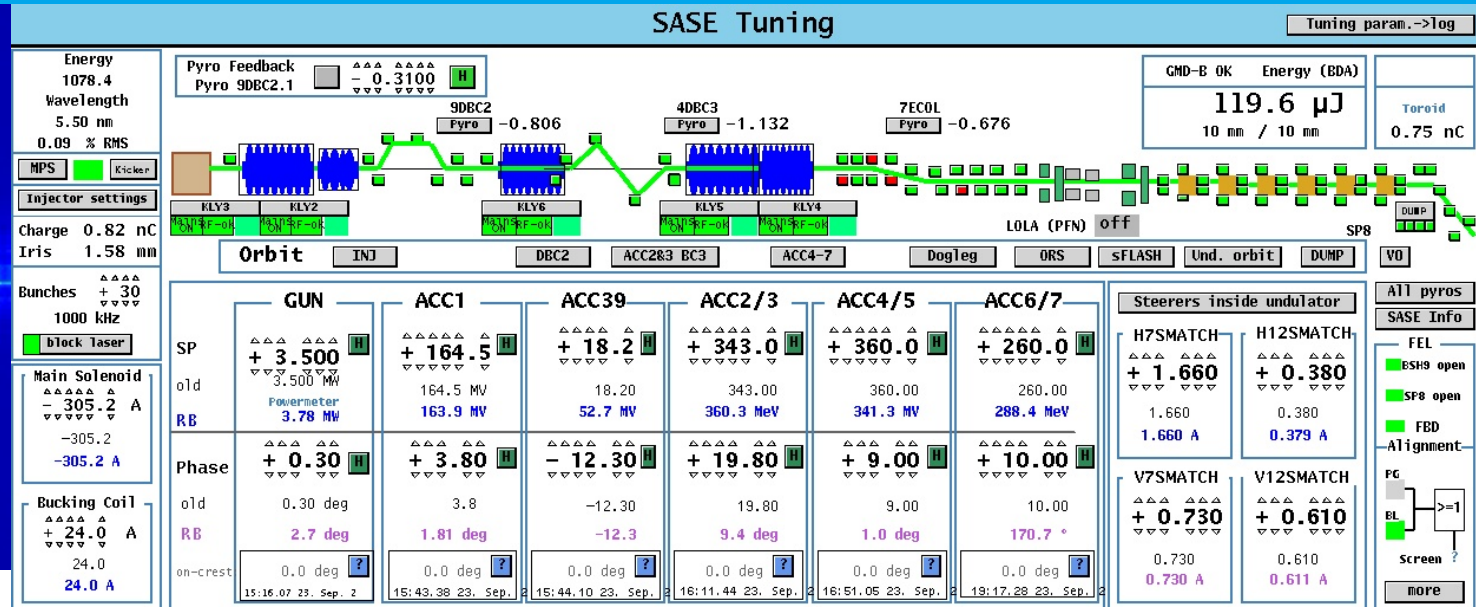
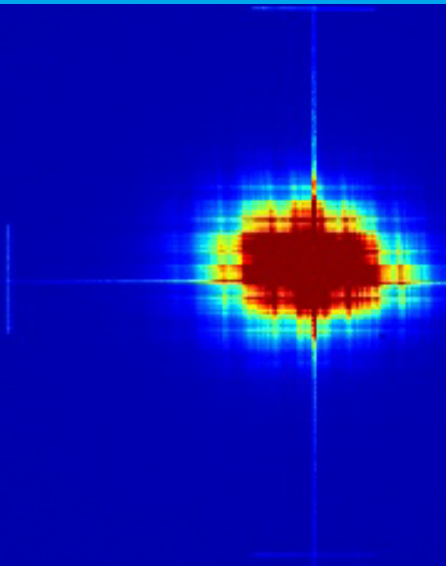


First lasing in June: what part is lasing?

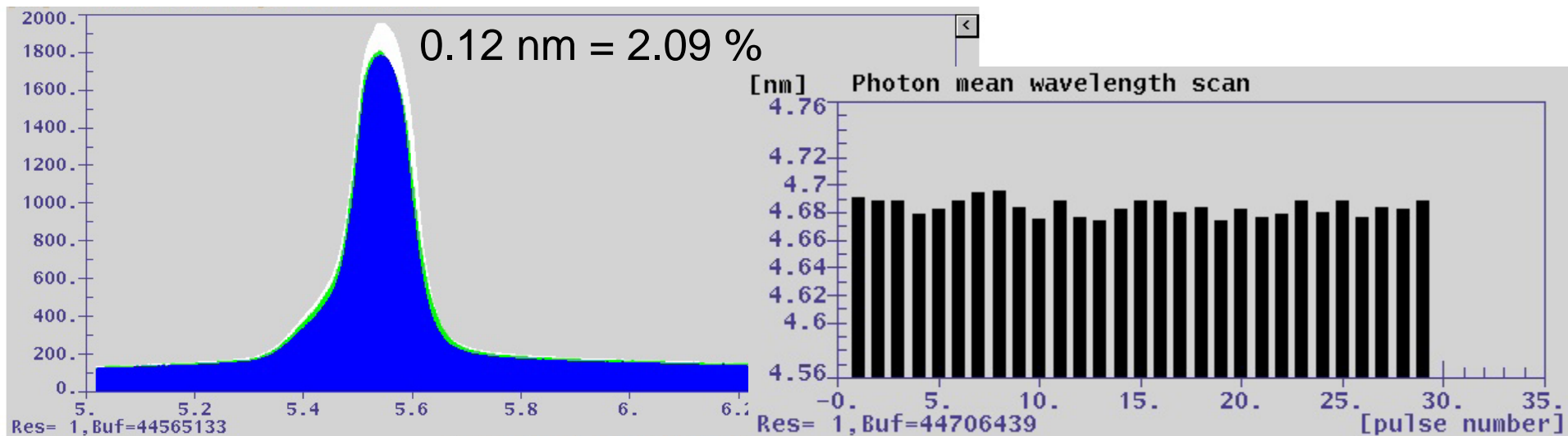
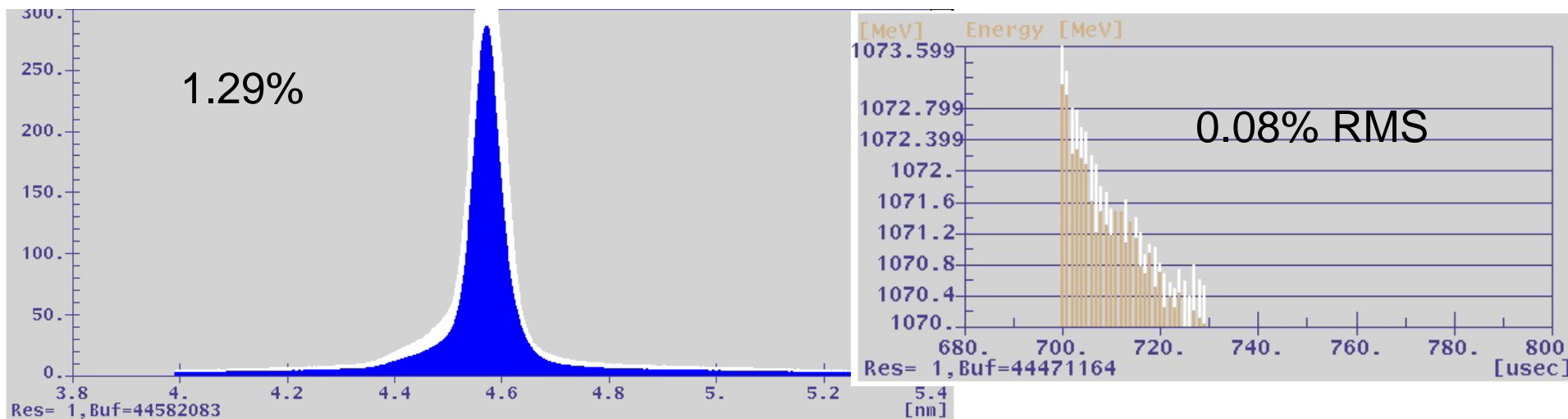


During SASE conditions at 4.4nm with about 20uJ. - image 1

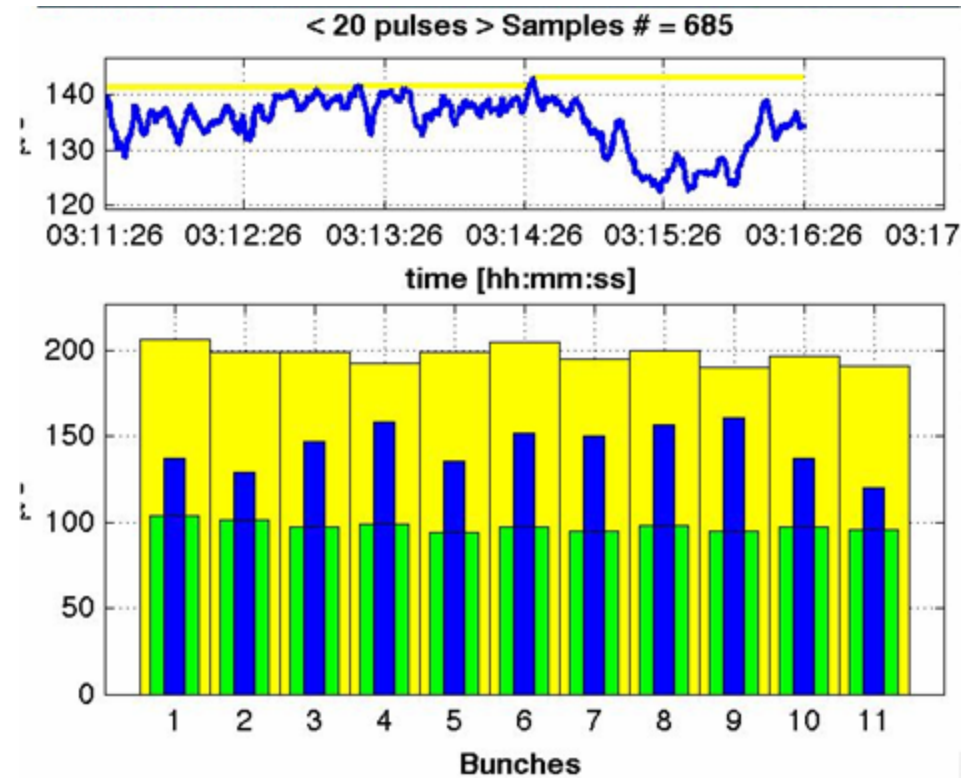
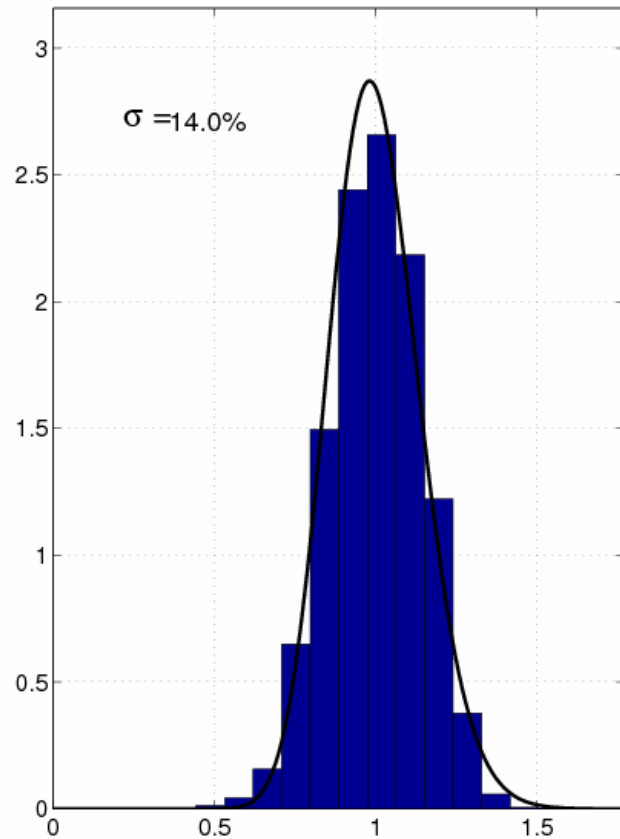
Characterization September at 4.6 nm



Data of Characterization in September

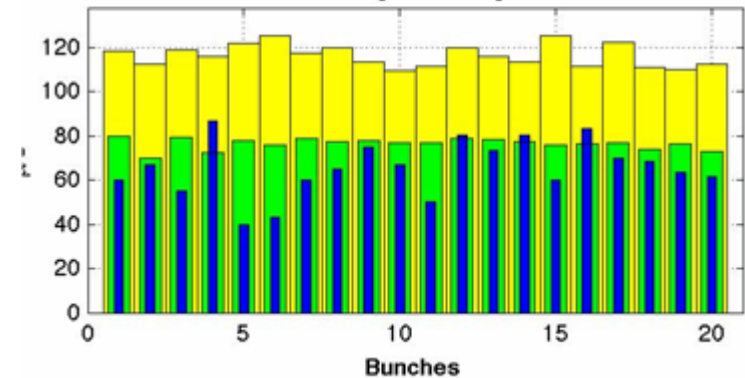
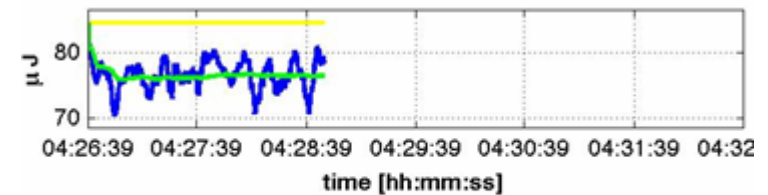
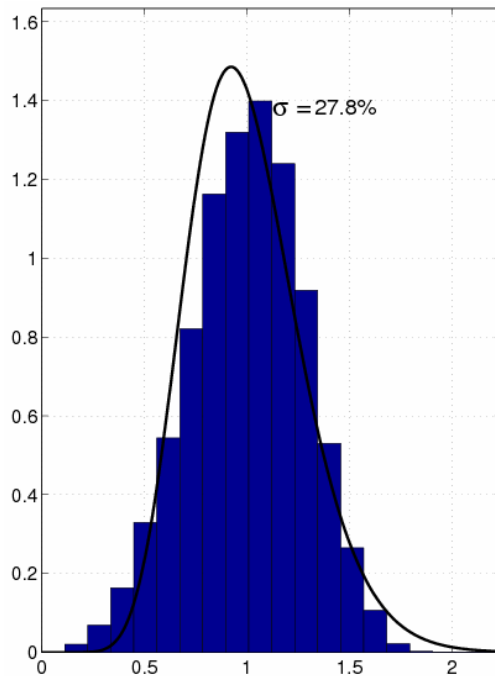
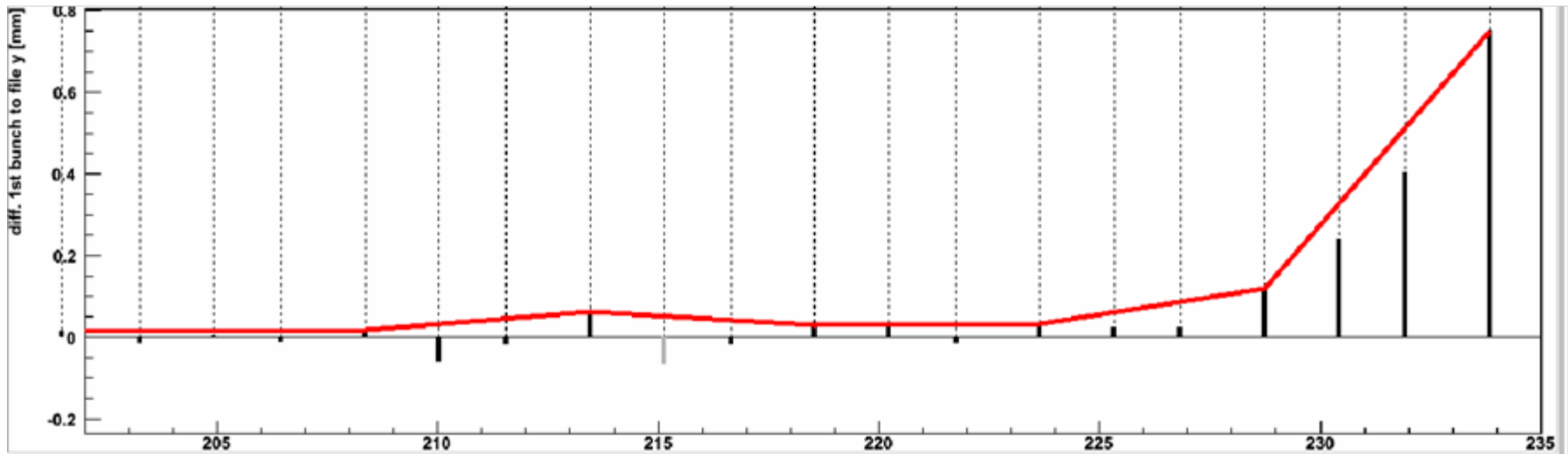


Gaincurve at 4.6 nm: 6 undulator segments

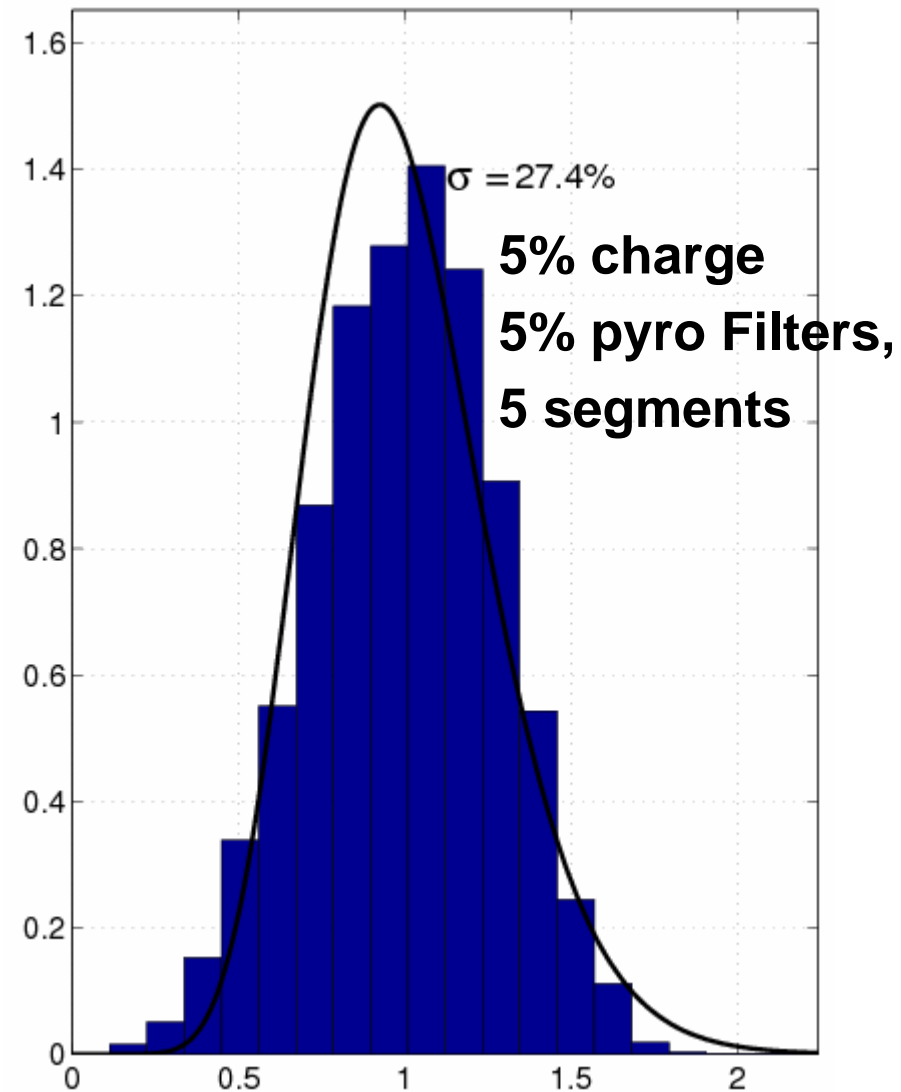
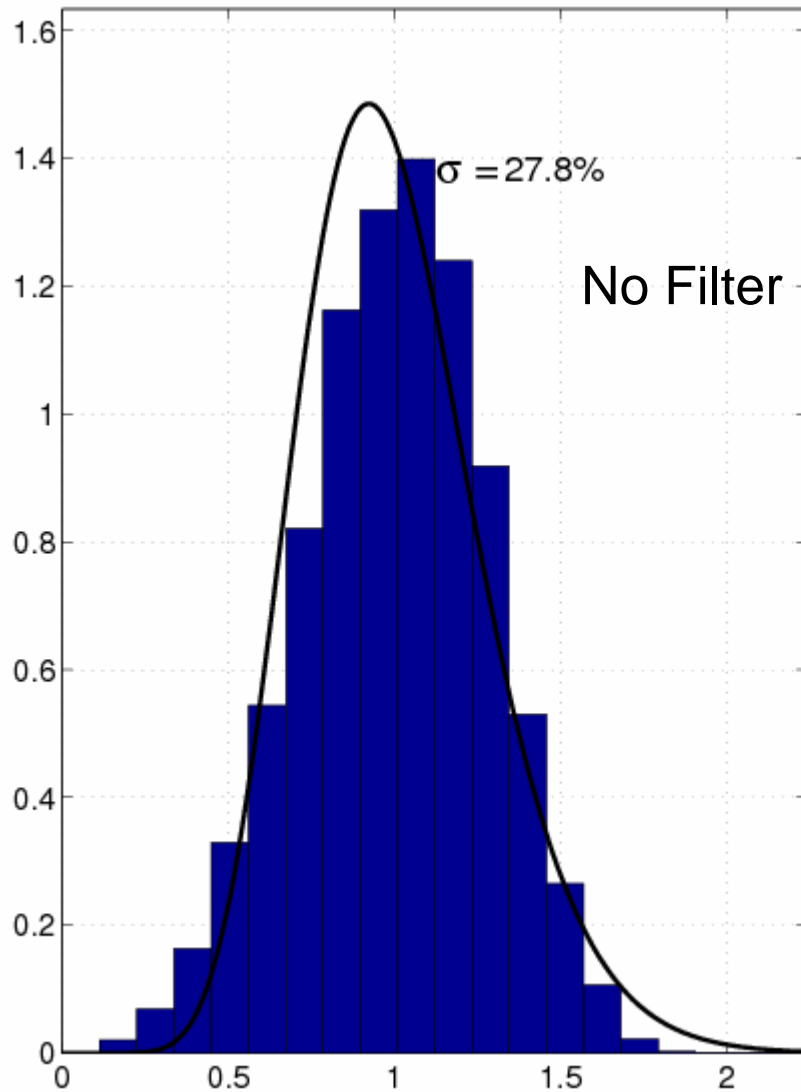


SASE Intensity and Statistics

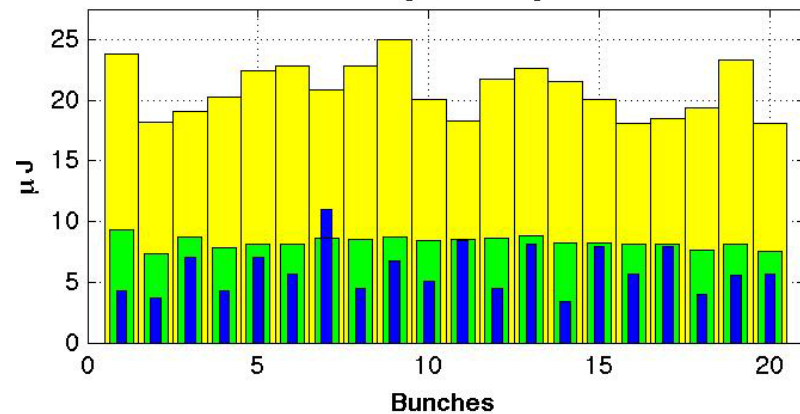
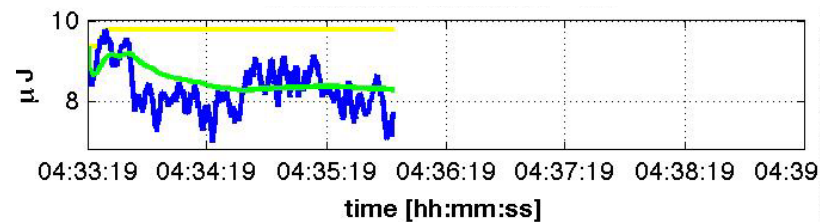
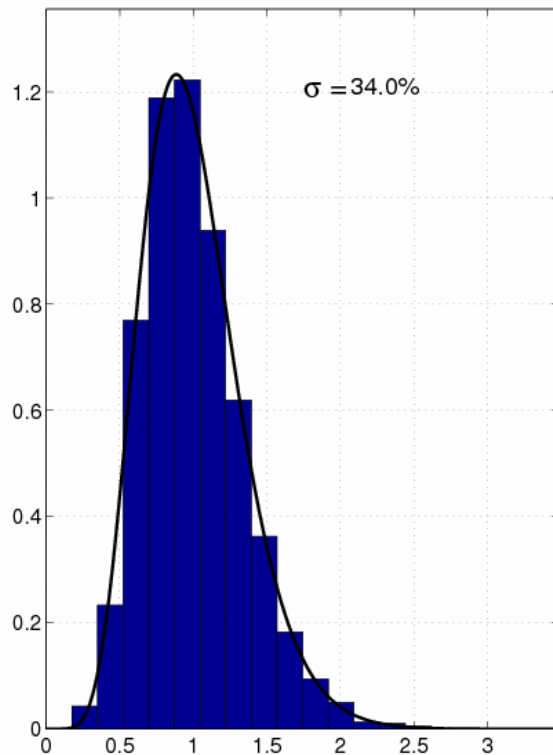
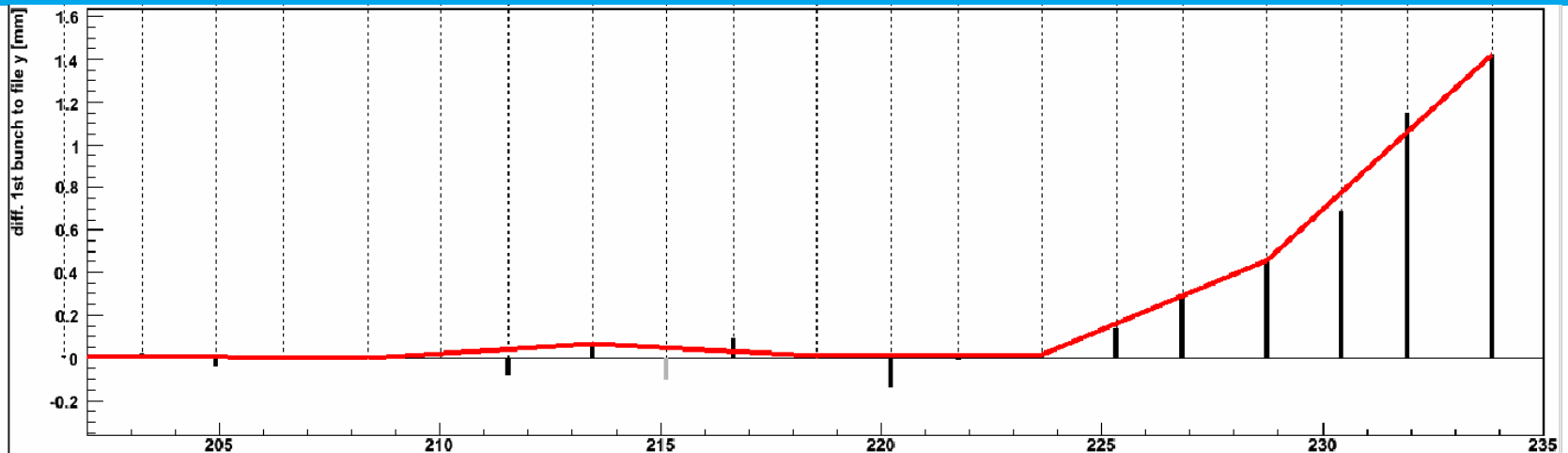
Gaincurve at 4.6 nm: 5 undulator segments



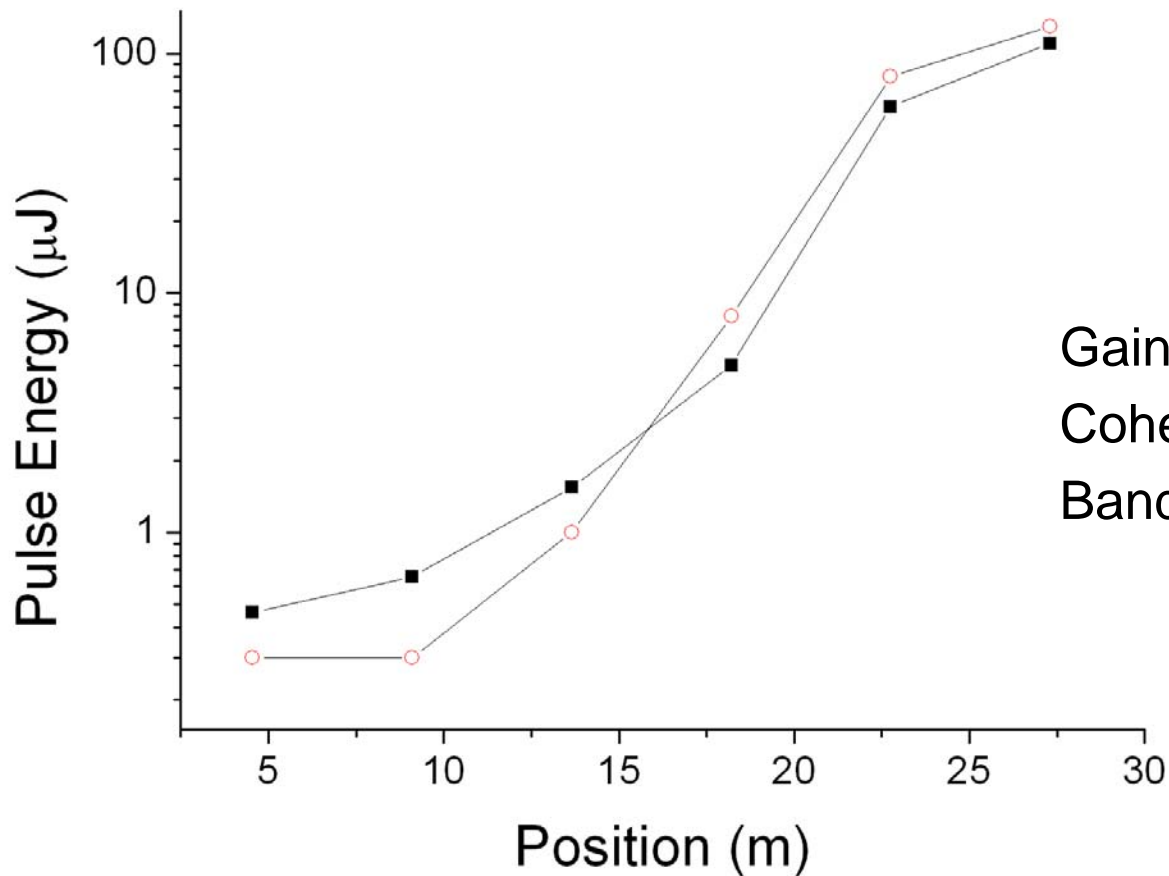
Separate SASE fluctuation from machine instability



Gaincurve at 4.6 nm: 4 undulator segments



Characterization in September at 4.6 nm



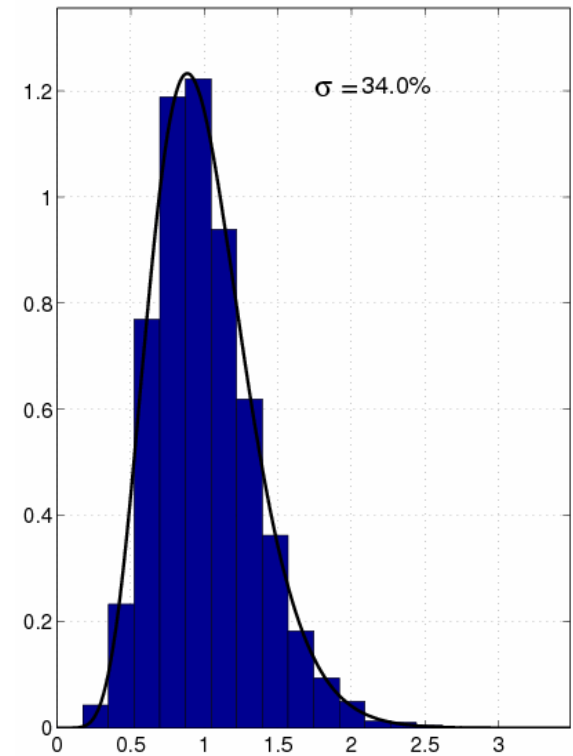
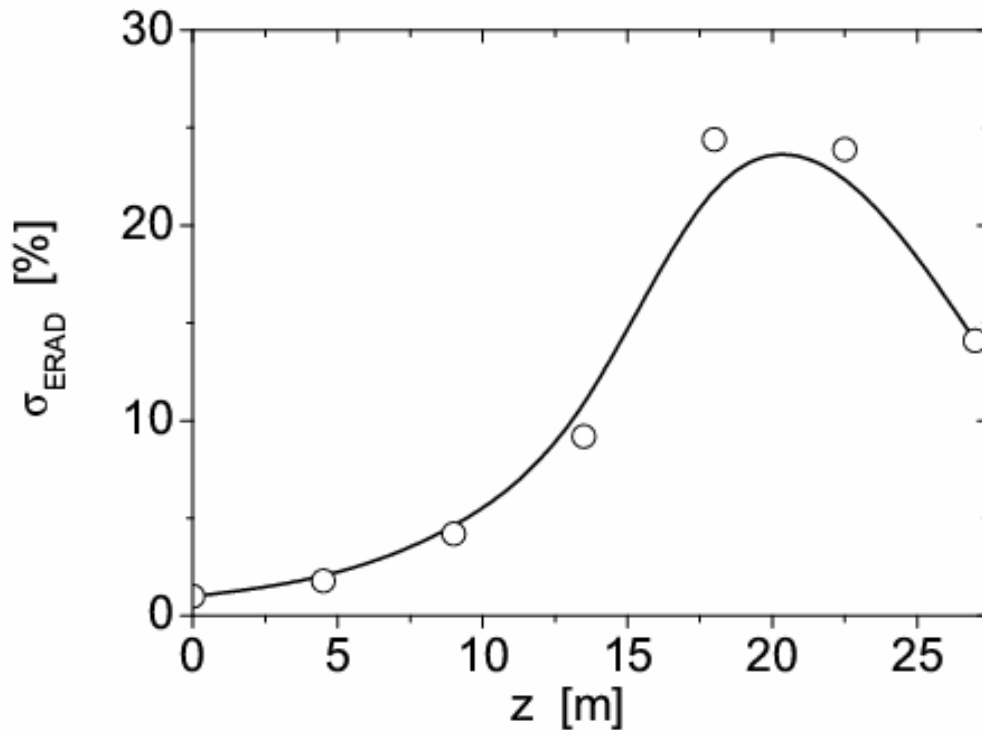
Gain length (m) = 2.4 to 2.7 m
Coherence time (fs) = 3 fs?
Bandwidth = 0.5%?

Comparison of 2 measurements at 4.6 nm

Characterization in September at 4.6 nm

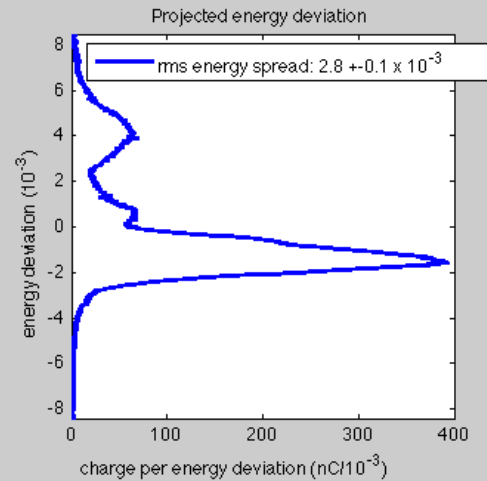
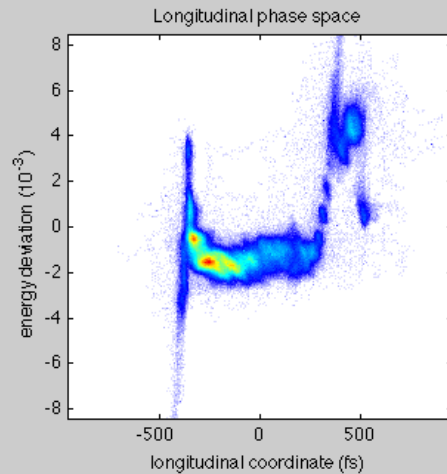
25% fluctuations \rightarrow M=16 modes

33% fluctuations \rightarrow M=9 modes



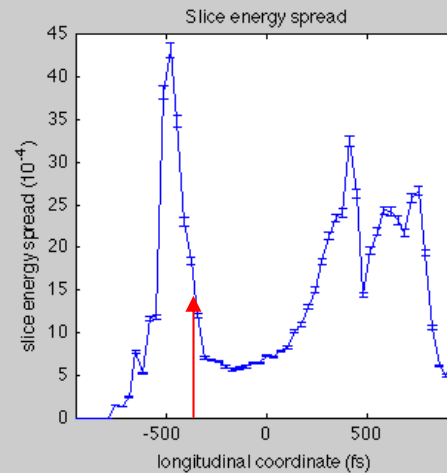
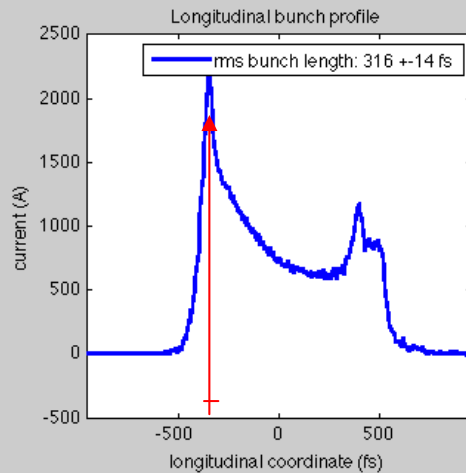
Pulse Length 30 to 50 fs?

Characterization in September at 4.6 nm



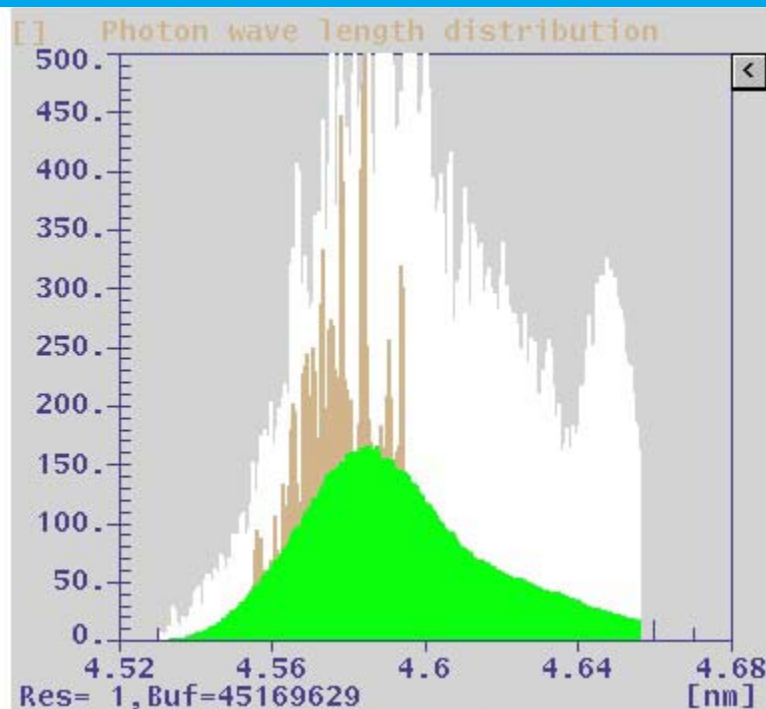
Pulse Length measurement with LOLA

What part is Lasing?

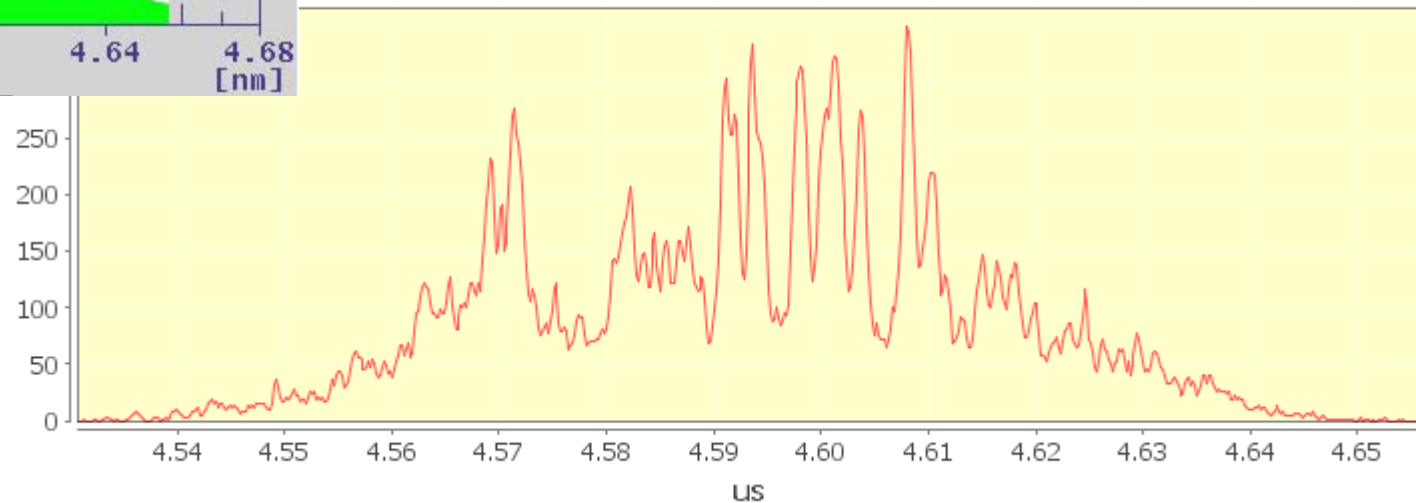


Characterization in September: PG Spectra

Spectrum measured at PG2 beamline
(lines are spikes, not noise)

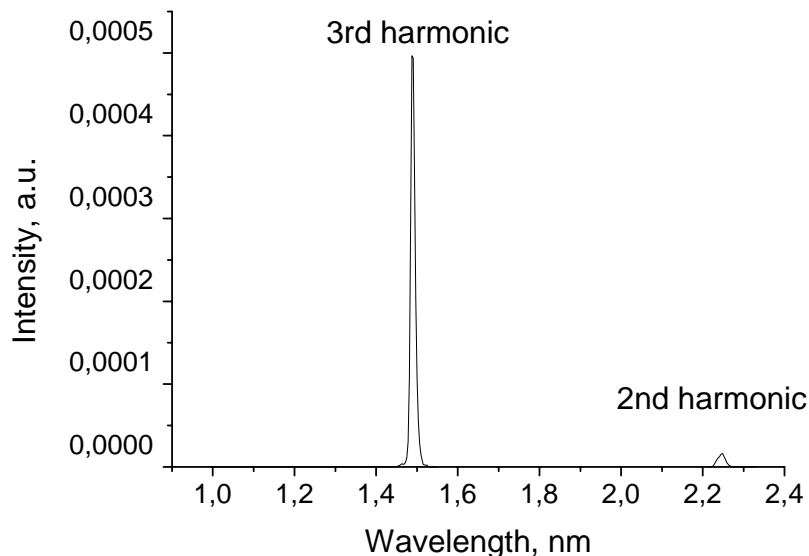
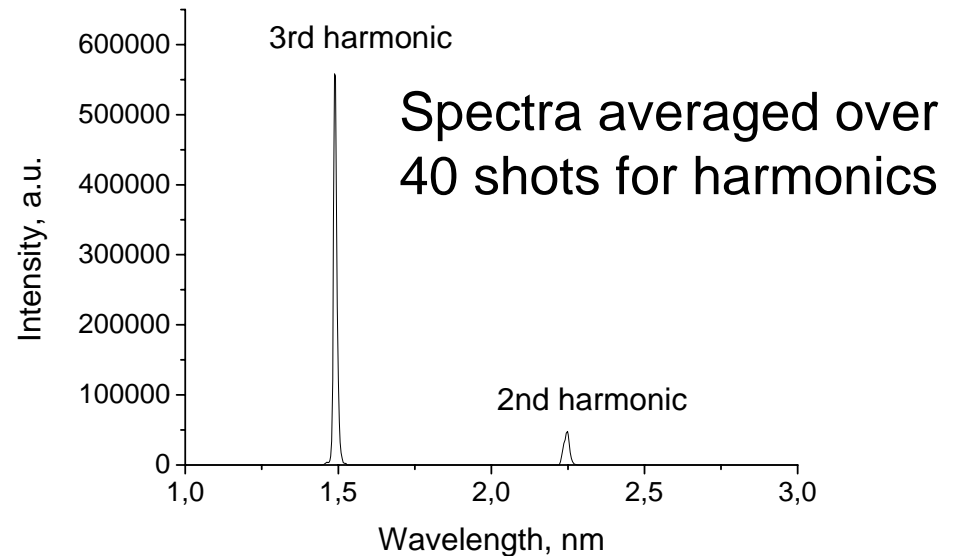
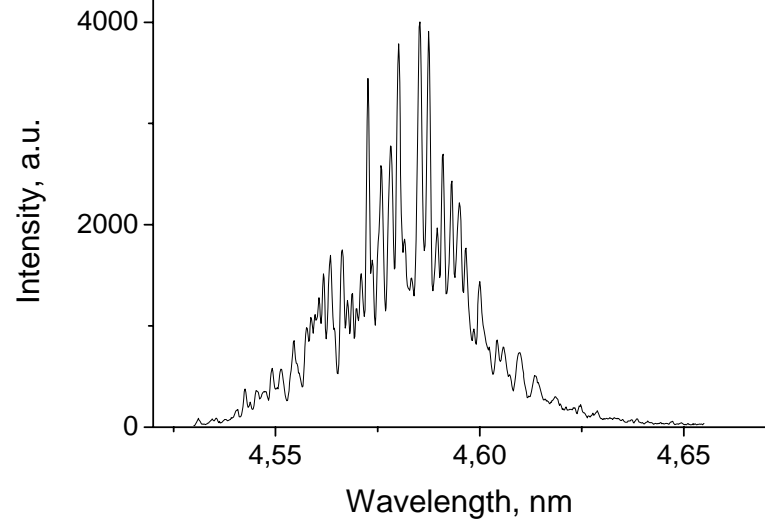


EXP1.PHOTONEN.ML/PHOTON_WAVE_LEN



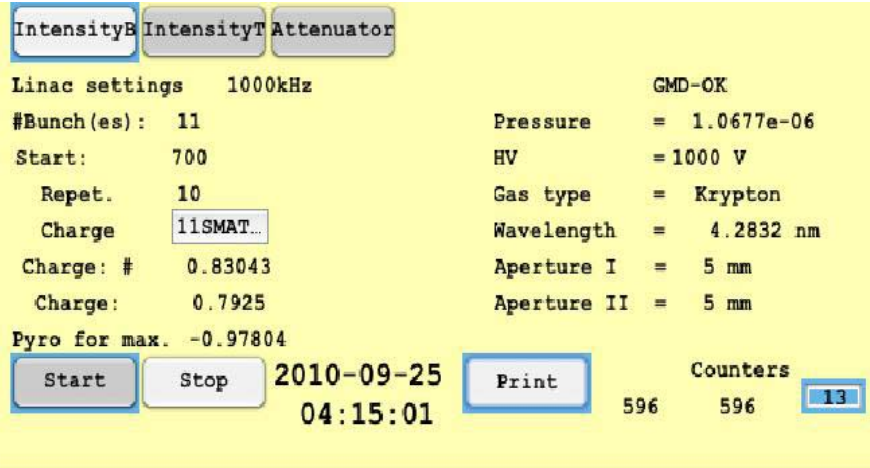
Characterization in September at 4.6 nm

At fundamental single shot



this is spectra after correction by
calculated beamline transmission + Al
700nm filter + spectrometer response
(in terms of intensity), and normalized
to fundamental (=divided by max
Intensity of fundamental)

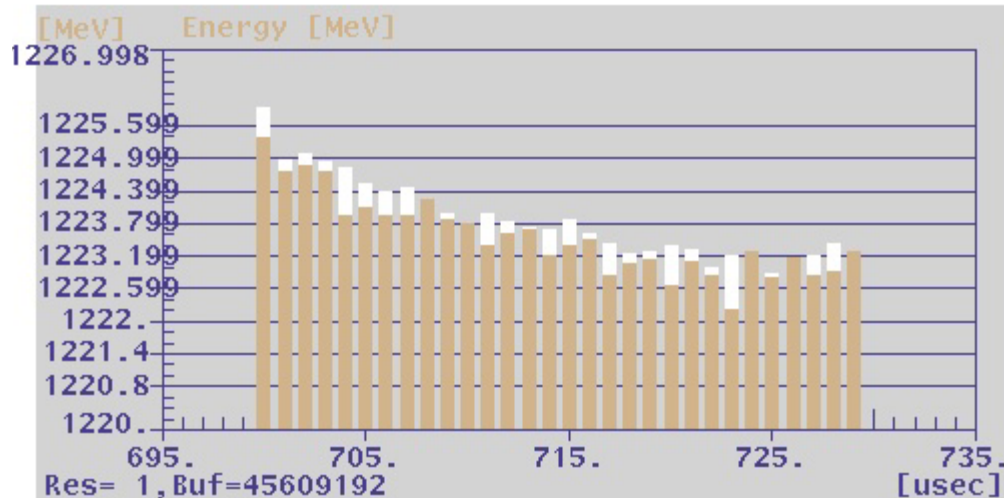
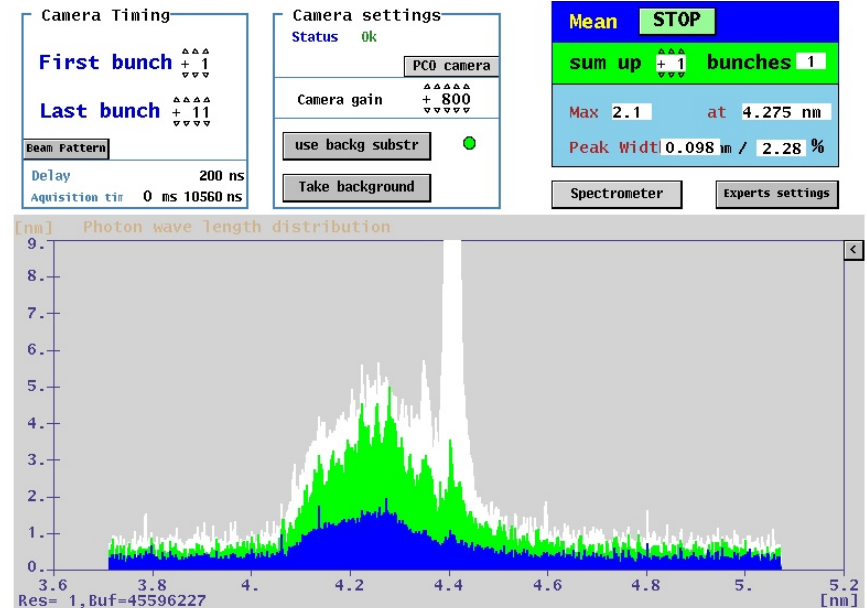
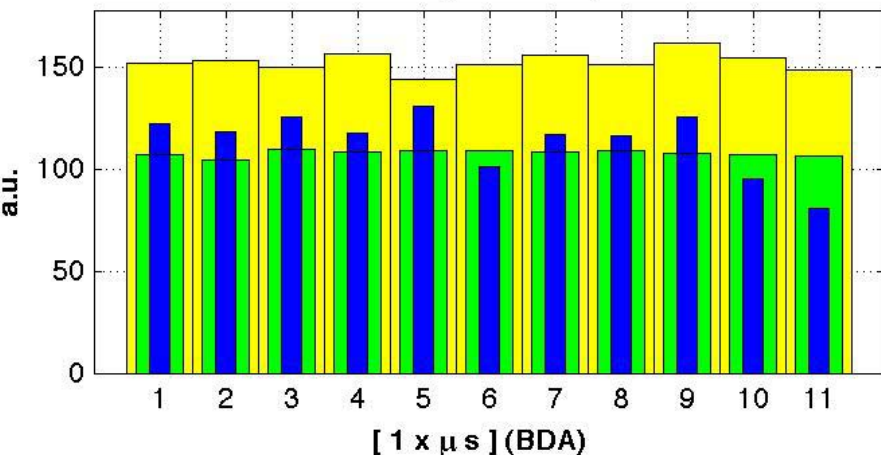
Characterization in September at 4.28 nm



Mean [last 596 samples] = 9.196e+01

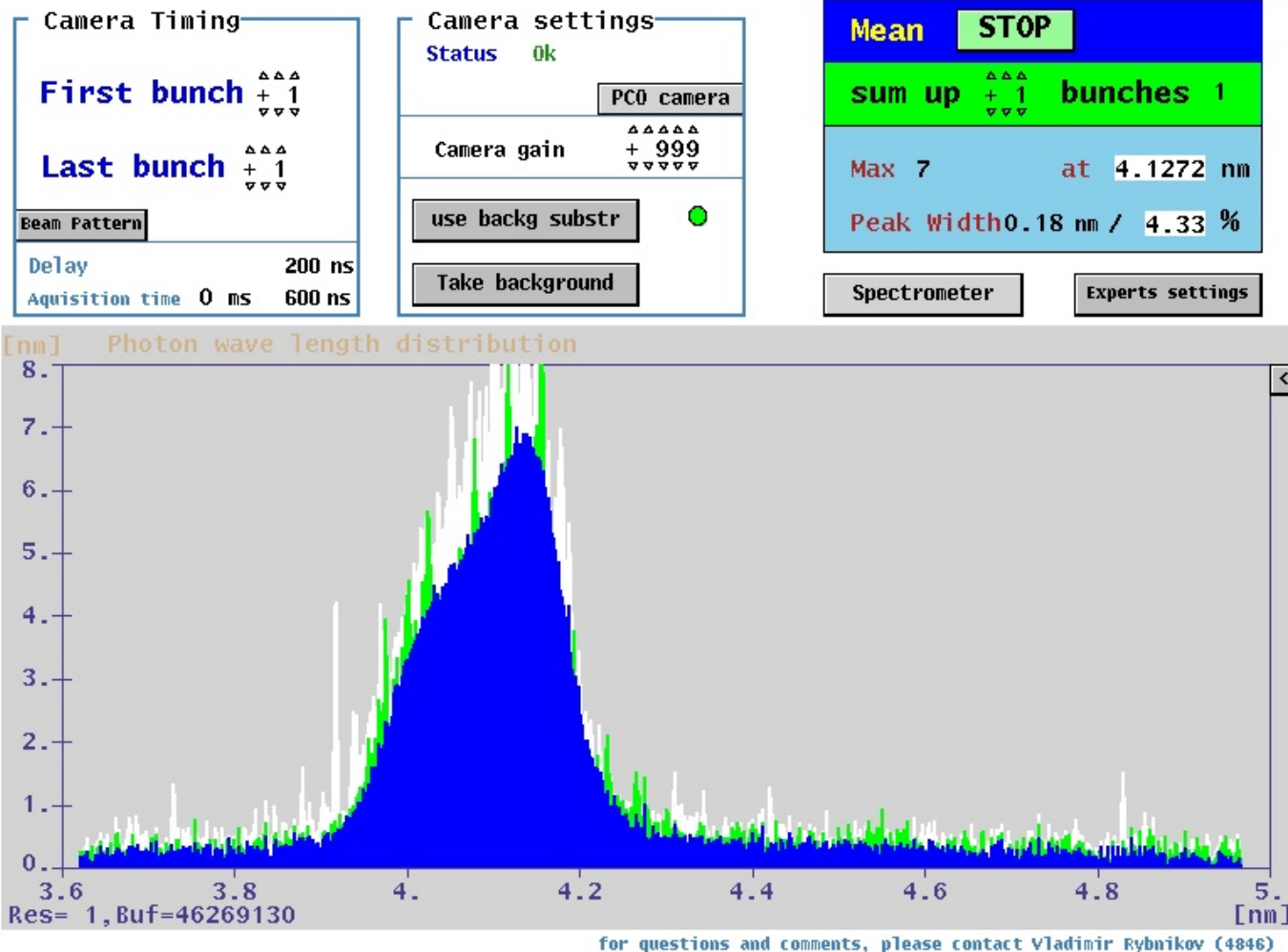


time [hh:mm:ss]

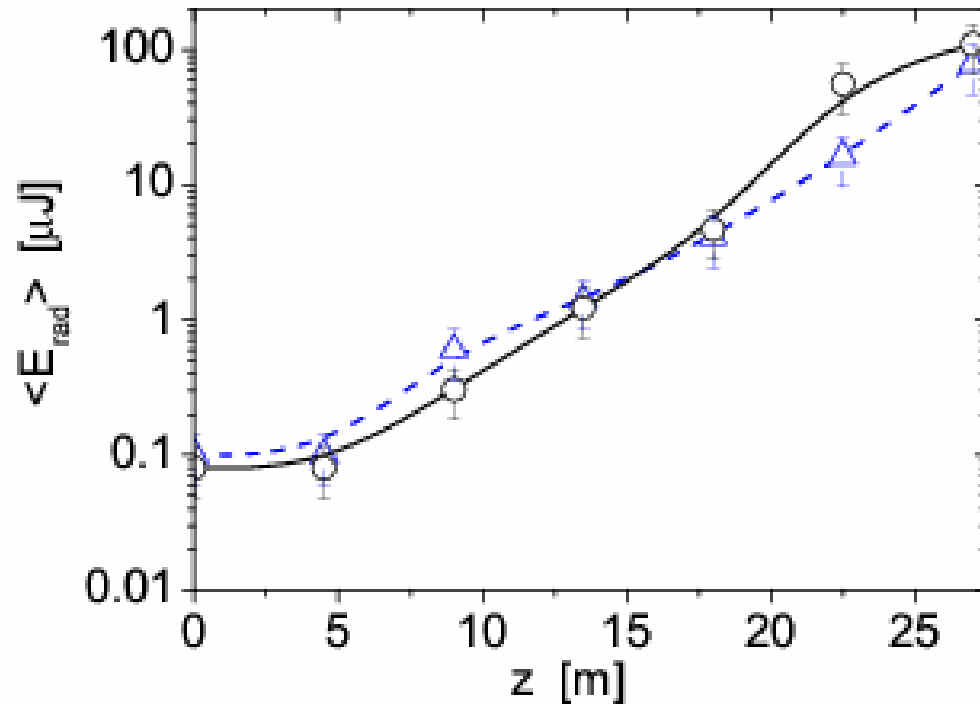


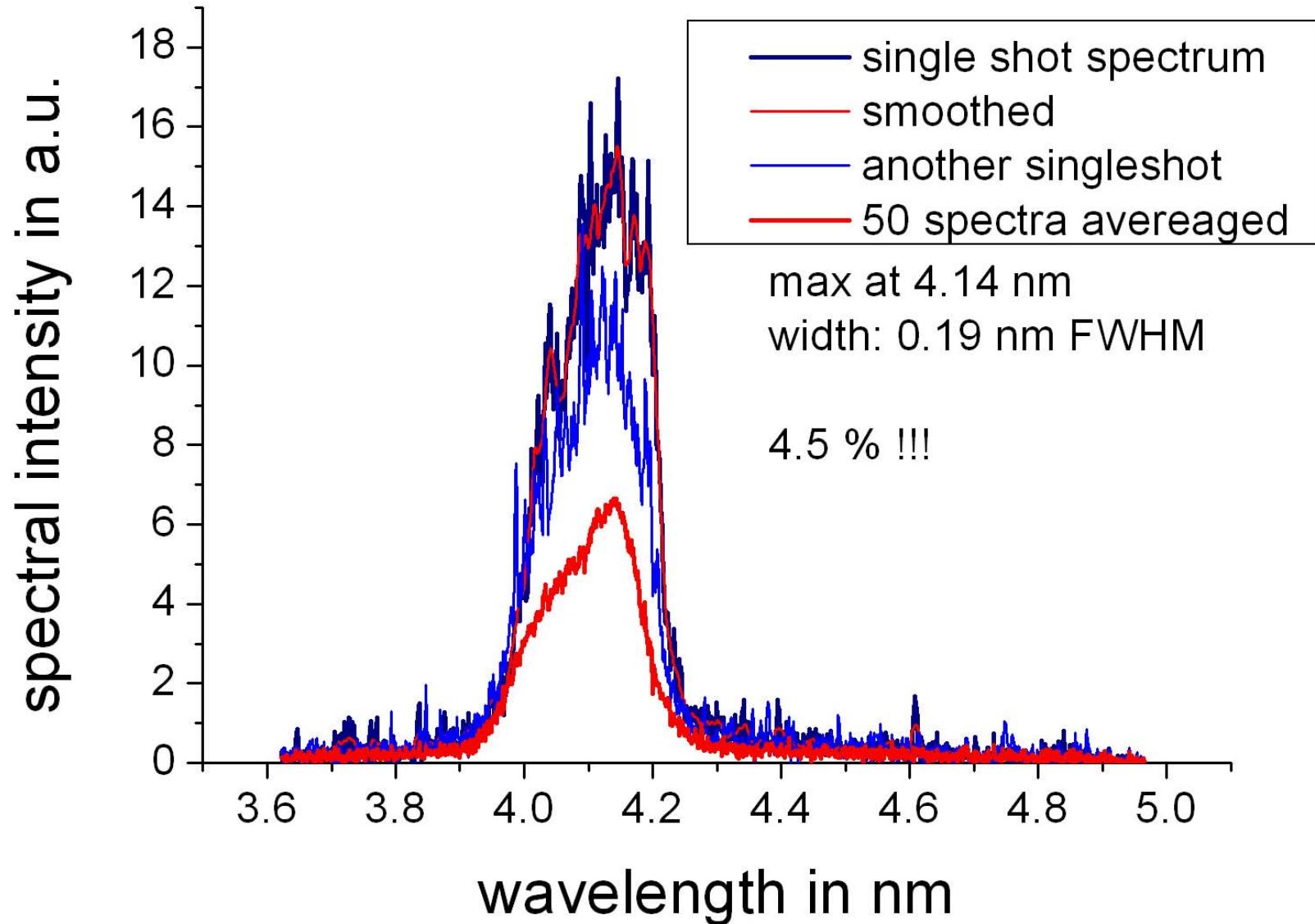
Characterization in September at 4.12 nm

FLASH photon wavelength distribution (via DAQ)



Gain curve at 4.6 and 4.12 nm





- > Looking at the data: interpretation not finished
- > 4.6 nm has a complete set
- > 4.12 nm has only a partial set
 - No saturation
 - Only spectrum at fundamental because transport to high resolution spectrometer including harmonics not possible
- > More studies in 10 days for final measurements