Report on FLASH2 Photon Beam Diagnostics

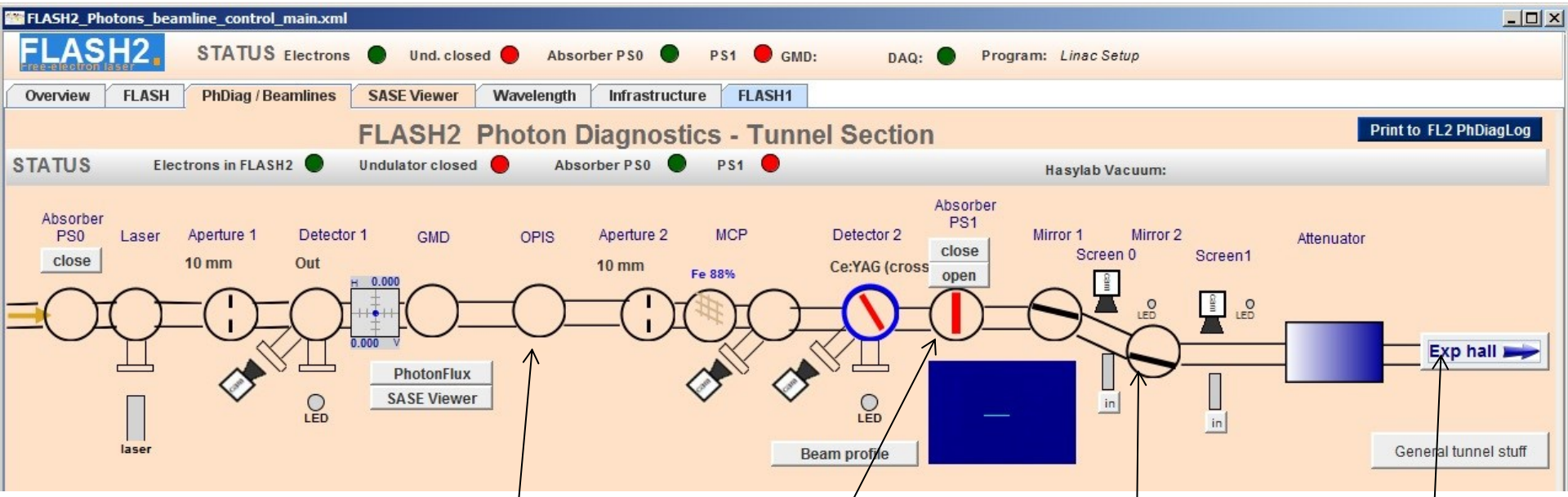
- Overview of FLASH2 Photon Diagnostics.
- What was done in 2016 so far.
- Accomplishments of FEL beam shifts of last weeks.

  OPIS, Grating Spectrometer, Beamlines
- What is next?

  - What is different to FLASH1.
  - Comments on status of operation.
  - Comments on ‘how to operate’ and jddd features.
  - Comments on ‘nice beam’.

Photondiagnostics

Differences to FLASH1



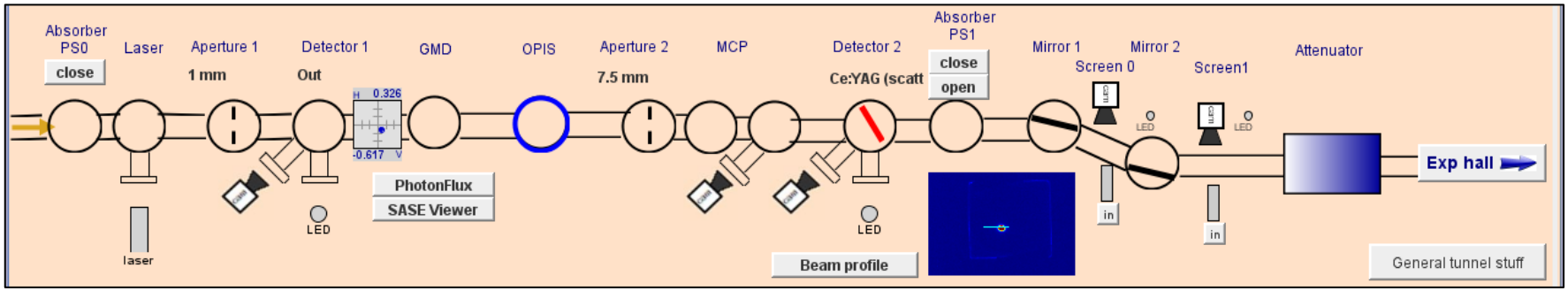
More than one Absorber!

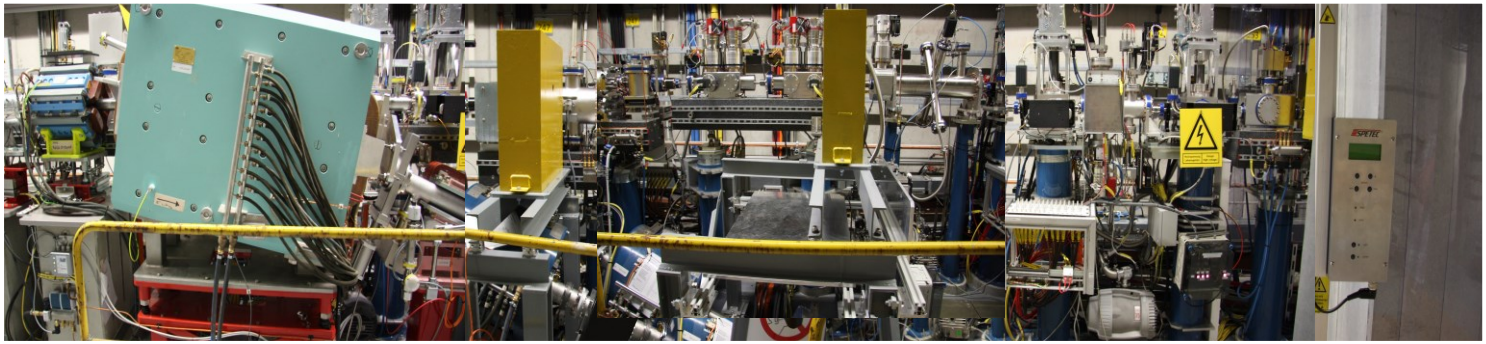
Grating Spectrometer in ExpHall

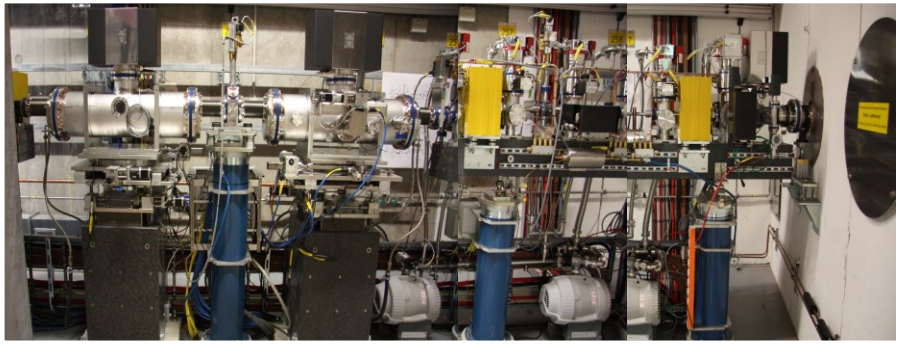
Online wavelengths measurement

Mirrors in the tunnel

FLASH2: Tunnel Section







GMD

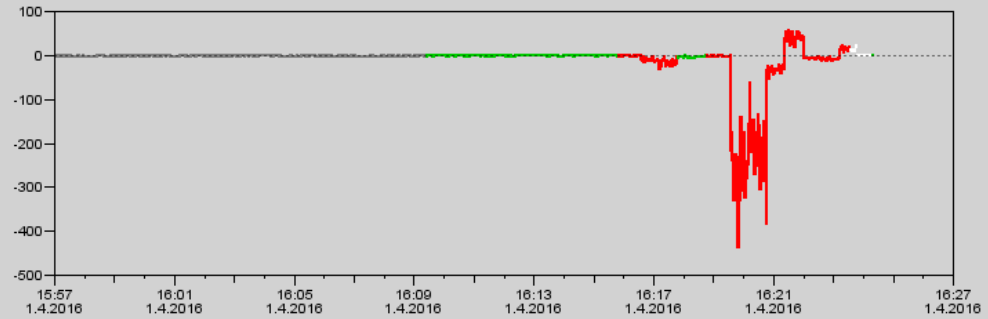
/svn/FLASH/Hasylab/FLASH2/FLASH2_photonflux_xgmd.xml FLASH.FEL/XGM.PHOTONFLUX/FL2.TUNNEL/*

XGMD Photonflux - Developer

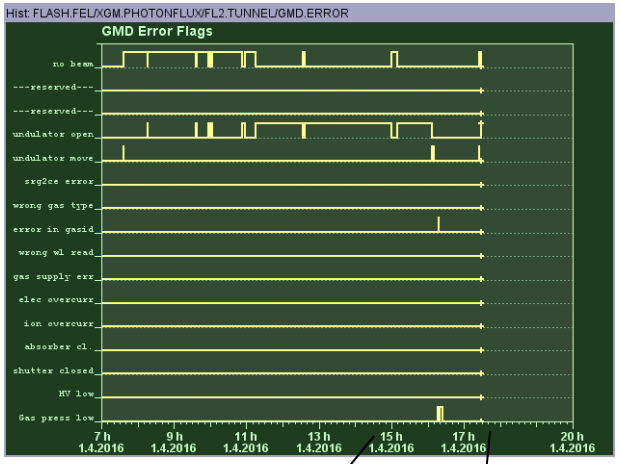
→ Operator View

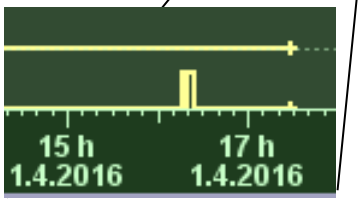
calculating photon flux

Name	Auto	Manual		Used values
Gas Type:	2	---		Neon
Cross-Section:	6.57 Mb	24.87 Mb		6.57 Mb
Gamma:	1.00	2.17		1.00
Current left offset:	---	20.0f A		20.0f A
Current left:	-25.23f A	---		-45.23f A
Current right offset:	---	280.0f A		280.0f A
Current right:	292.38f A	---		12.38f A
Current sum:	---	---		-32.86f A
Detector length:	---	22.90 cm		22.90 cm
Temperature:	24.00 °C	---		24.00 °C
SRG Pressure:	8.42E-7 mbar	---		8.42E-7 mbar
RVC Pressure:	1.79E-6 mbar	---		1.79E-6 mbar
Nr. of Bunches:	1.00	---		1.00
Wavelength:	20.00 nm	0.00 nm		20.00 nm
Undulator open:	0	---		0
Undulator moving:	0	---		0
Frequence:	10.00	---		10.00
Delay:	99.96	---		99.96
Sample:	4248 271 9 1	---		4248 271 9 1
Error Flags:	0x0	---		
Photon Flux:	---	---		-0.12 µJ

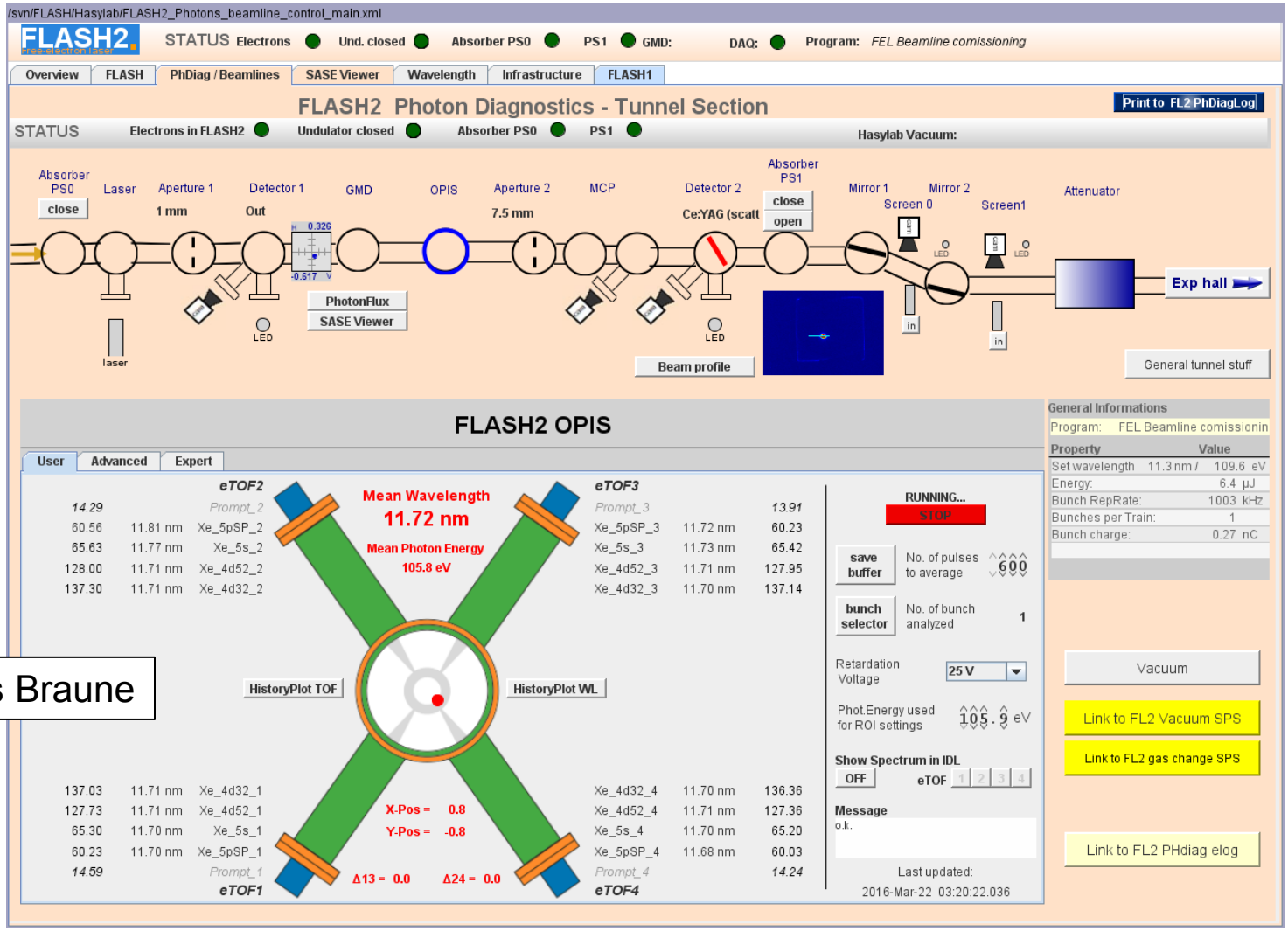


Standard gas change in 6 min.
Larger wavelengths regions to cover.
Automatic error handling.



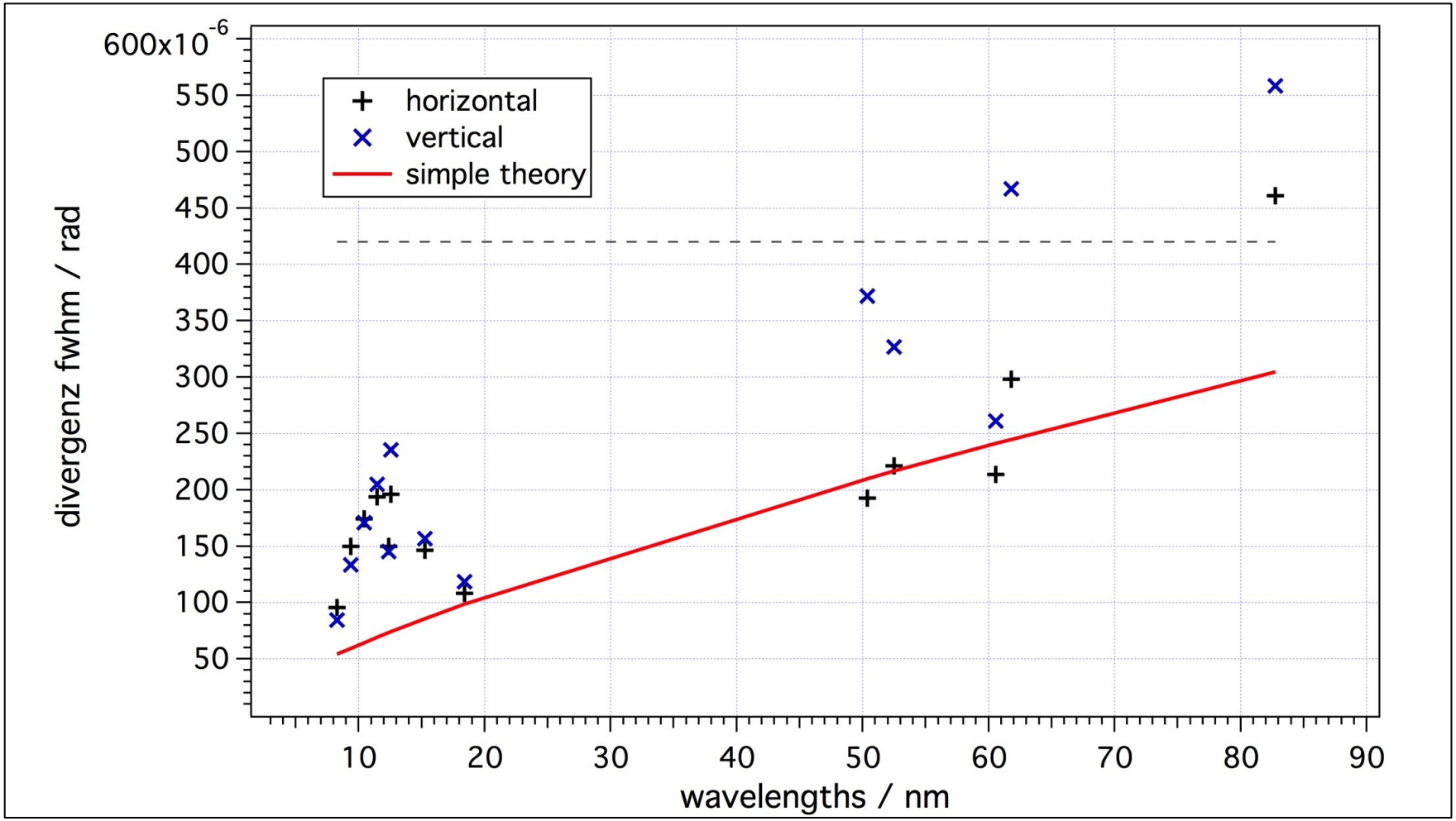


FLASH2: OPIS



Markus Braune

FLASH2 Photon Beam Divergence



(insufficient statistics!)

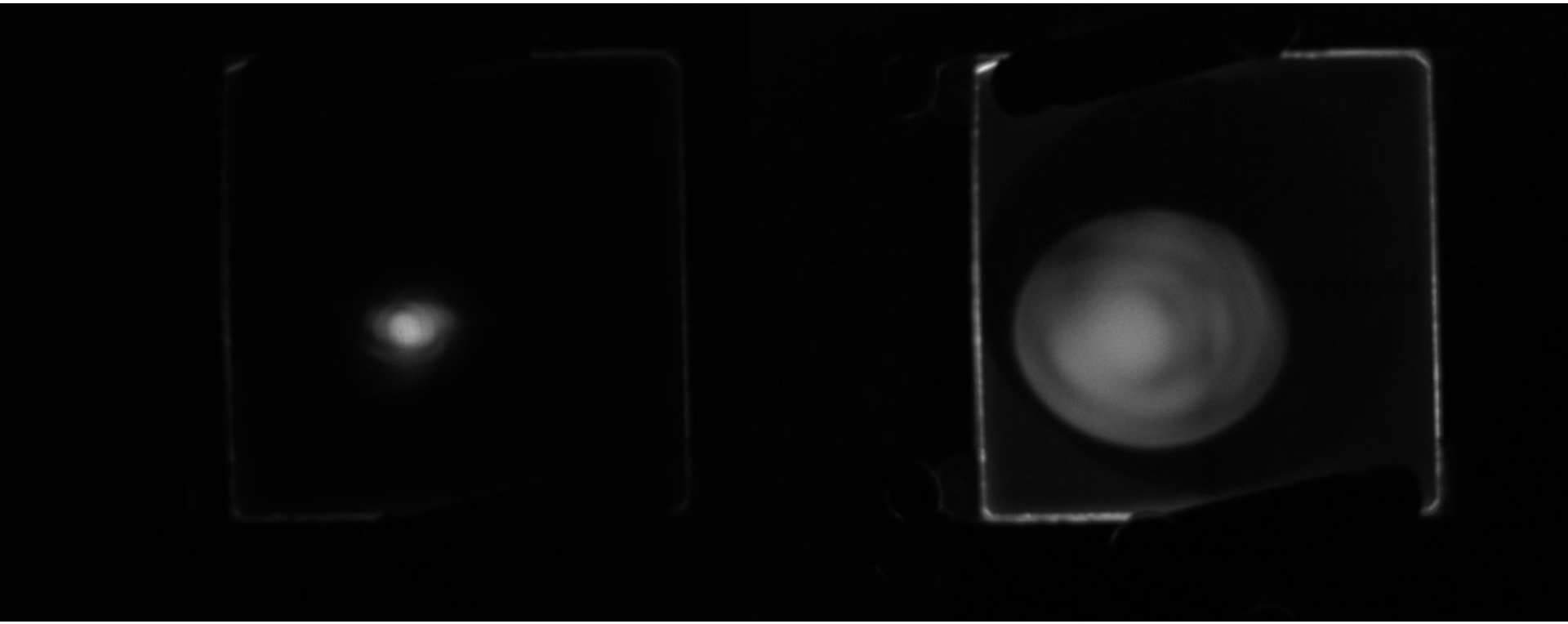
FLASH2 Photon Beam Divergence

FL1 4,2 nm

FL2 8.27 nm (9.3µJ)

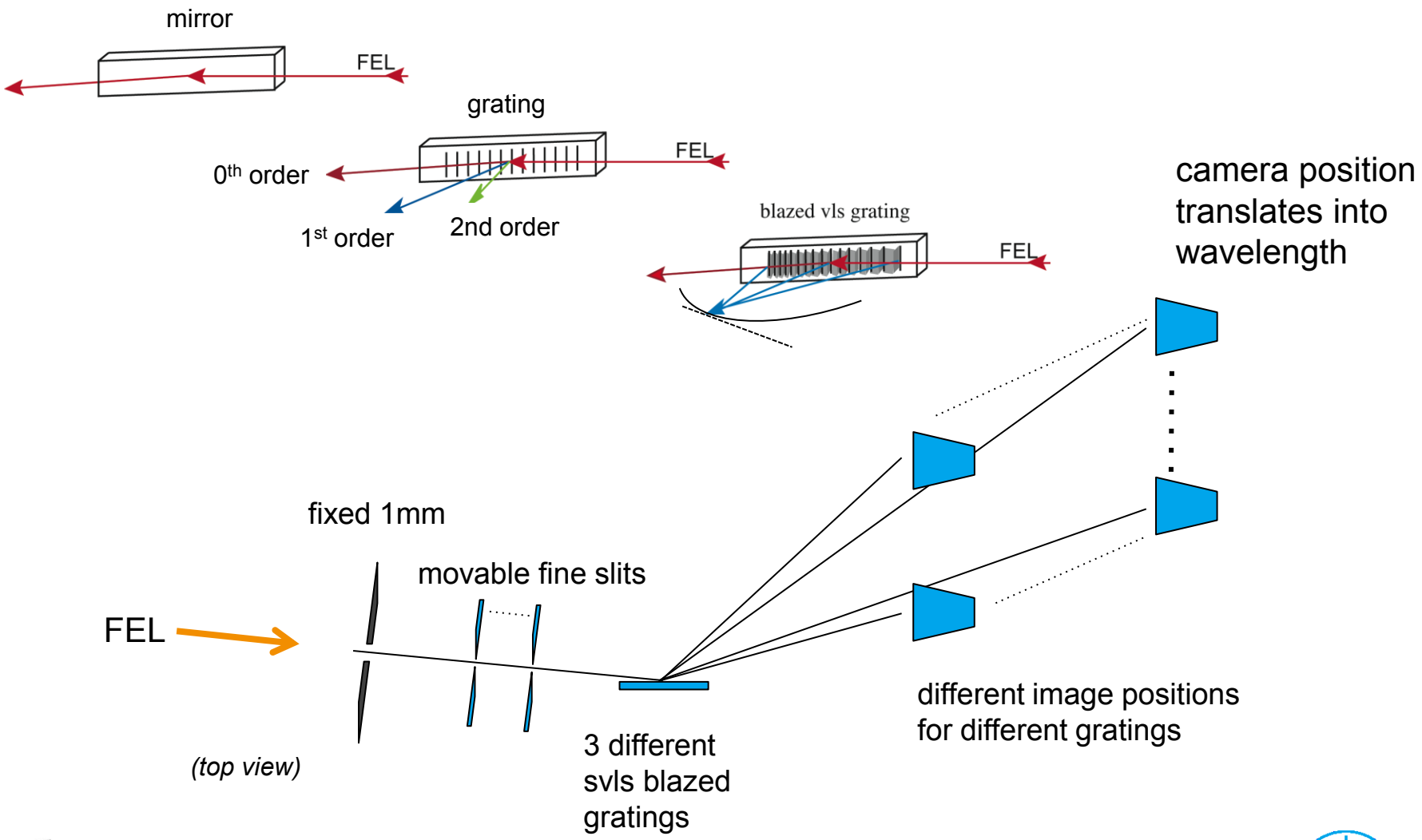
FL2 82,74 nm (100µJ)

FL1 25,8 nm

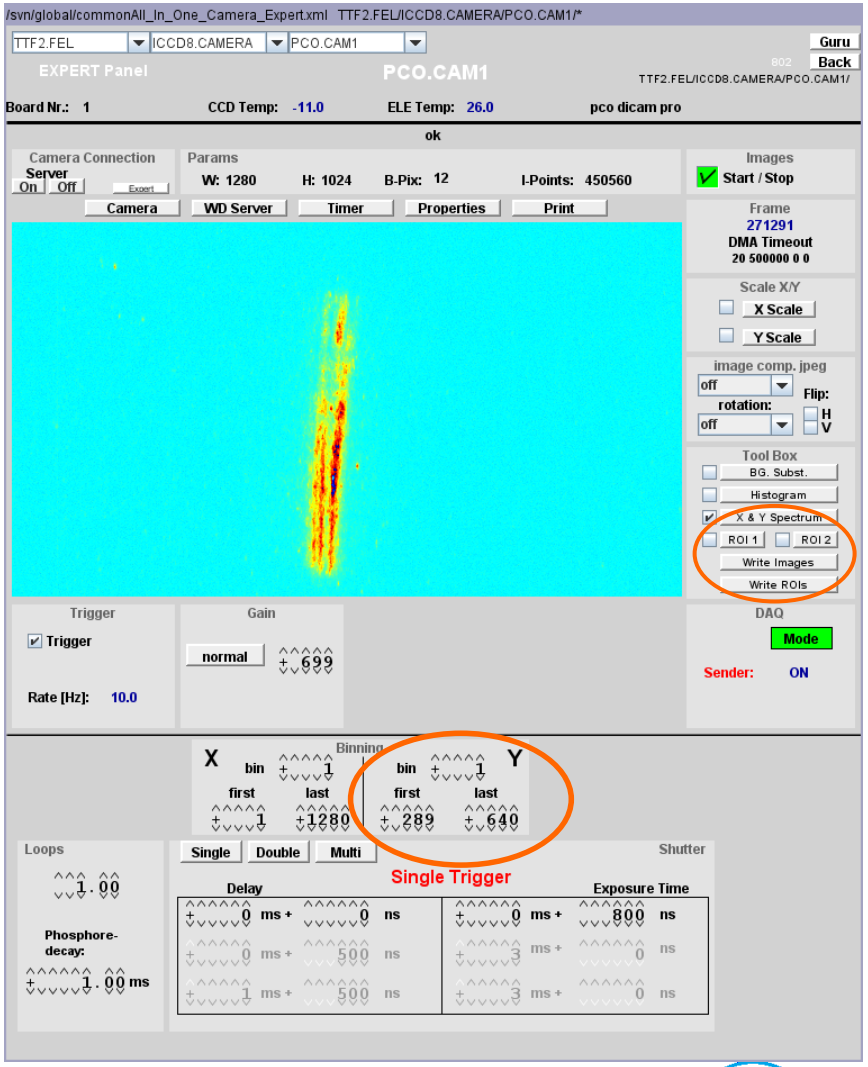


FLASH2 Experimental Hall

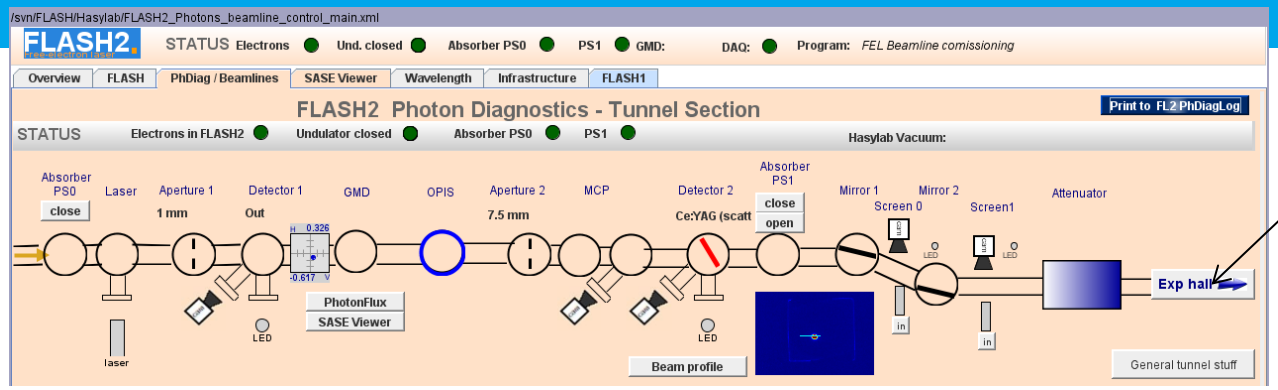
Grating Spectrometer: Concept and Design



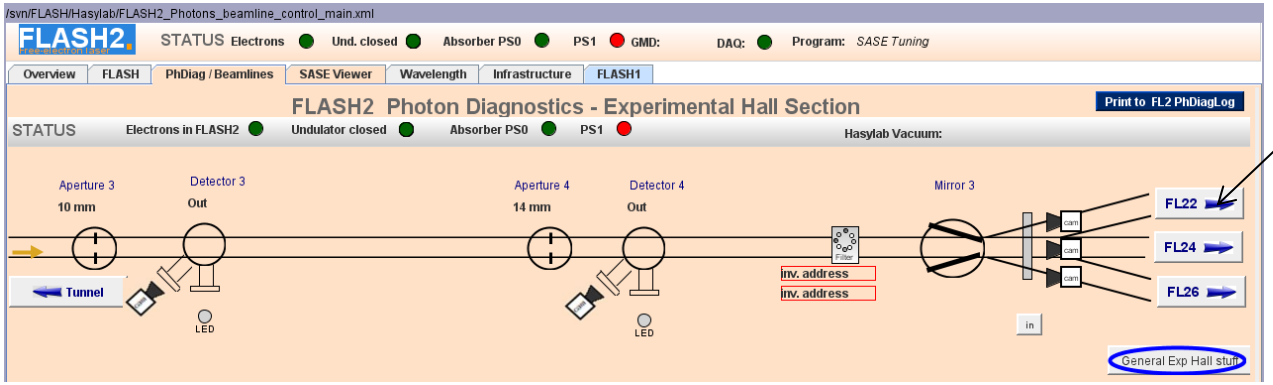
Grating Spectrometer:



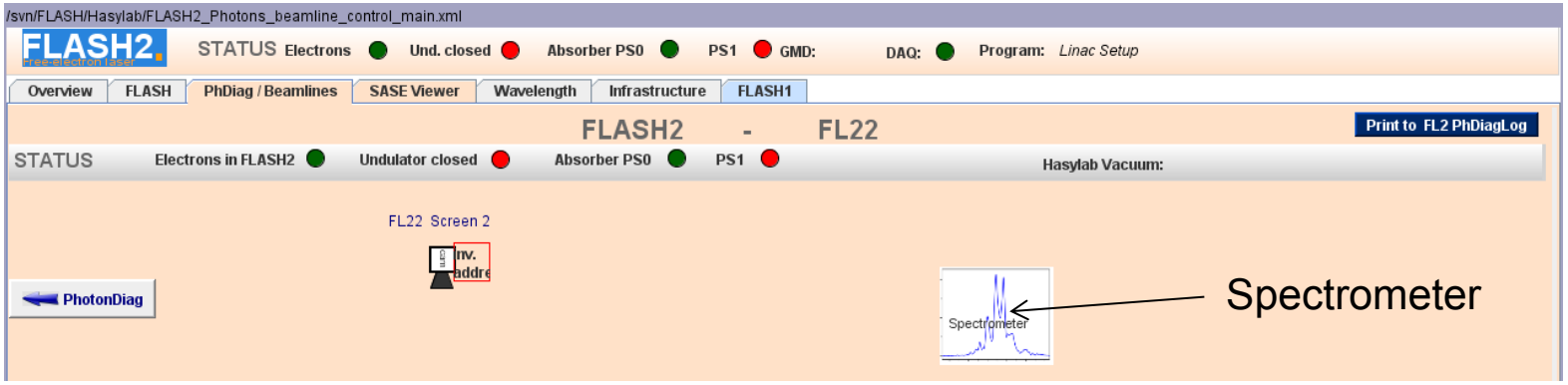
Grating Spectrometer: jddd path



Exp hall



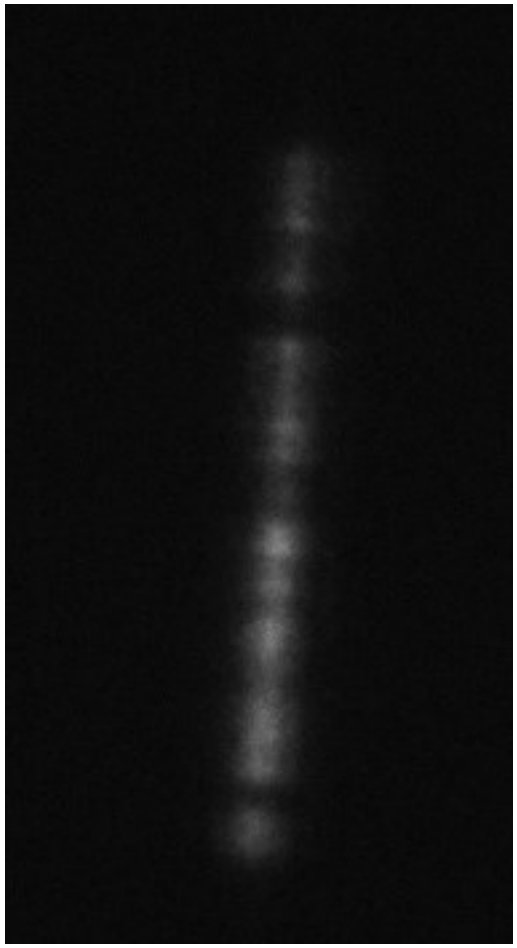
FL22



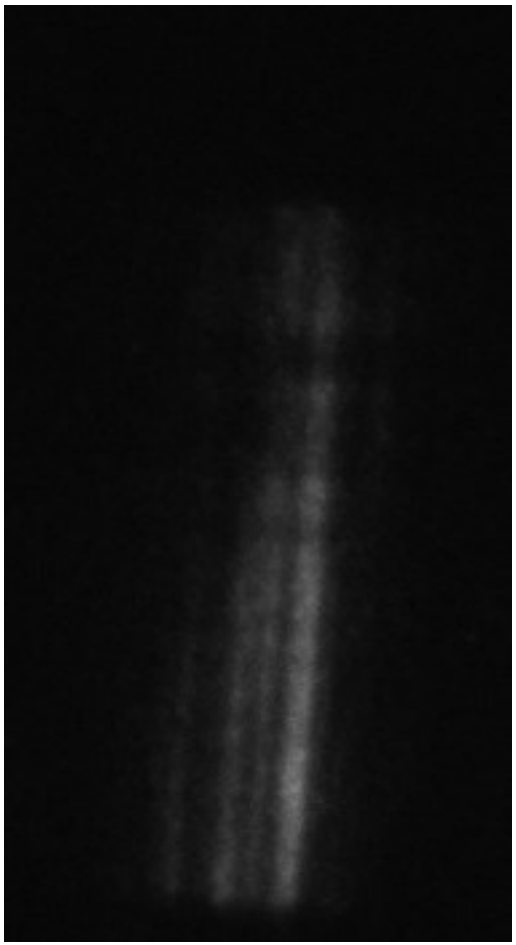
Spectrometer

Grating Spectrometer: Higher Orders

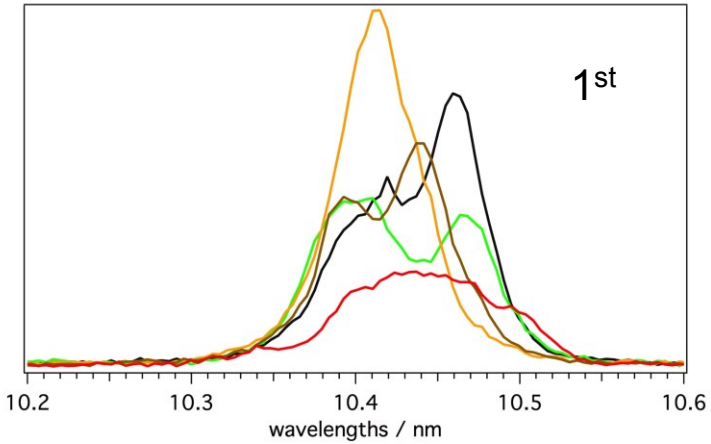
1st grating order

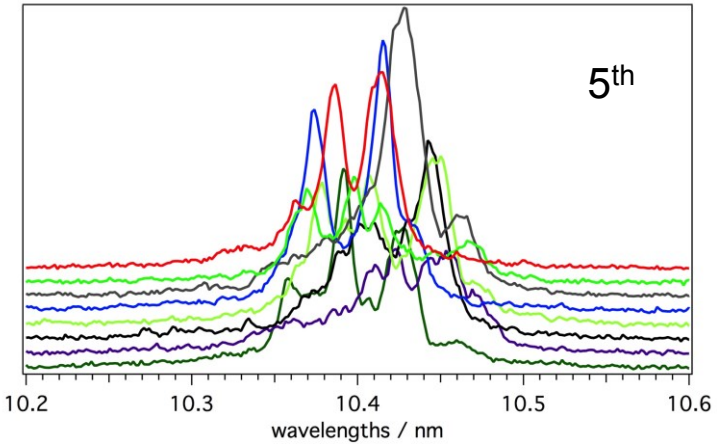


5th grating order



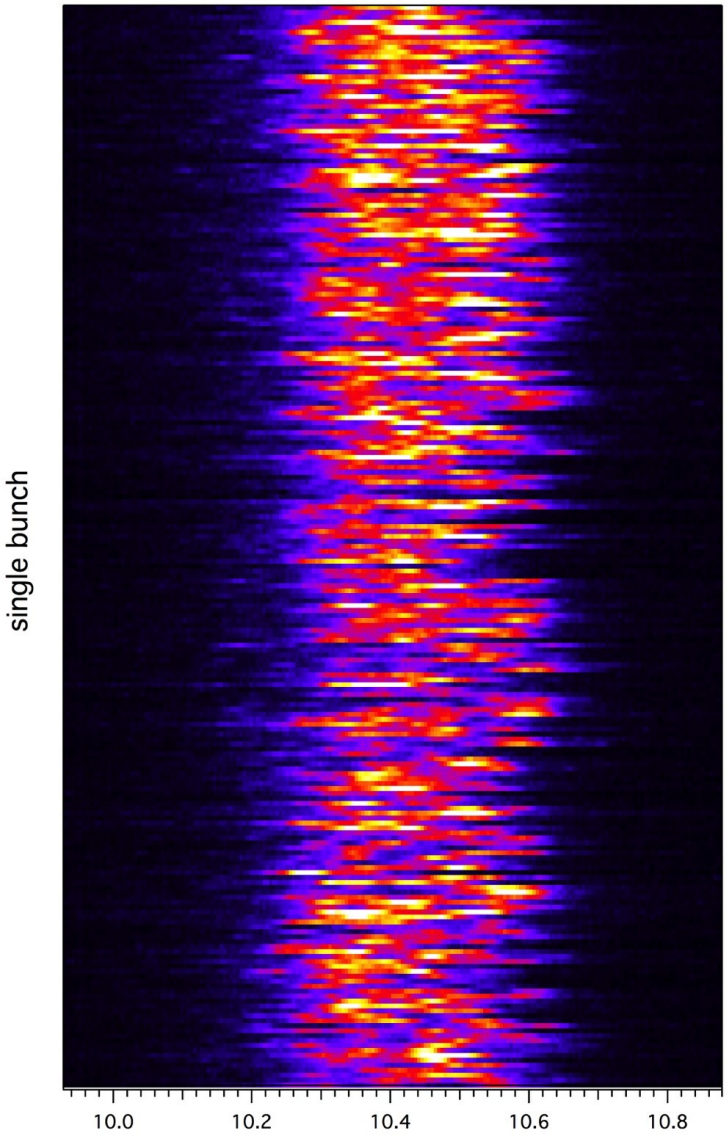
Samples of narrow profiles





center wavelength standard deviation: 0.08nm
average fwhm of single gaussian fits: 0.42nm

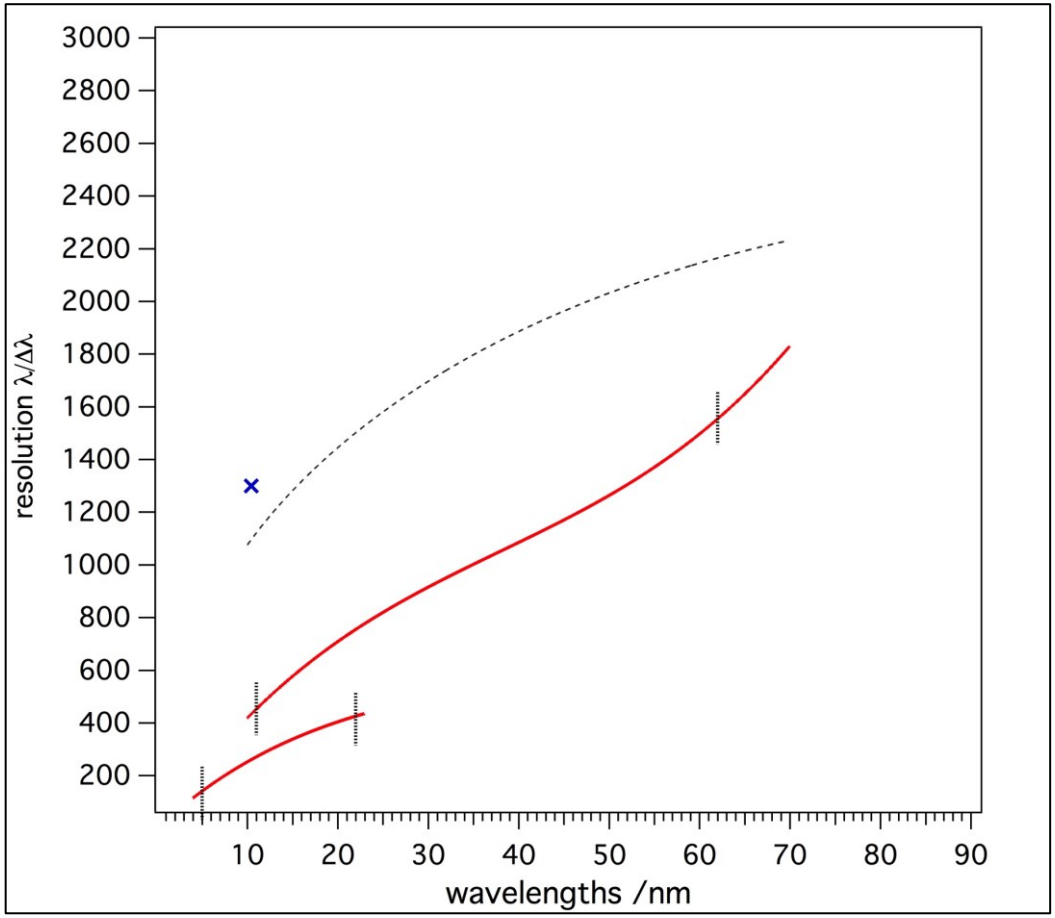
Grating Spectrometer:



narrow profiles of 5th grating order
20s single bunch 10Hz at 10nm setting.

(not normalizised)

Grating Spectrometer: Resolution $\lambda/\Delta\lambda$

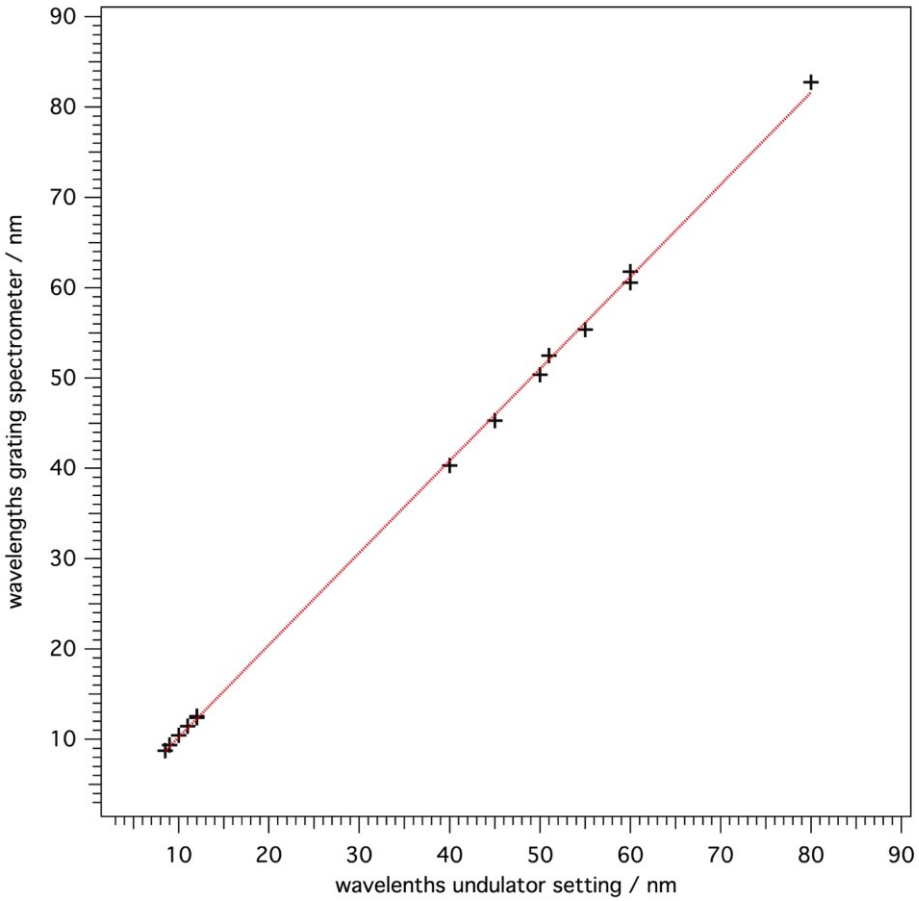


1st order grating (measured)

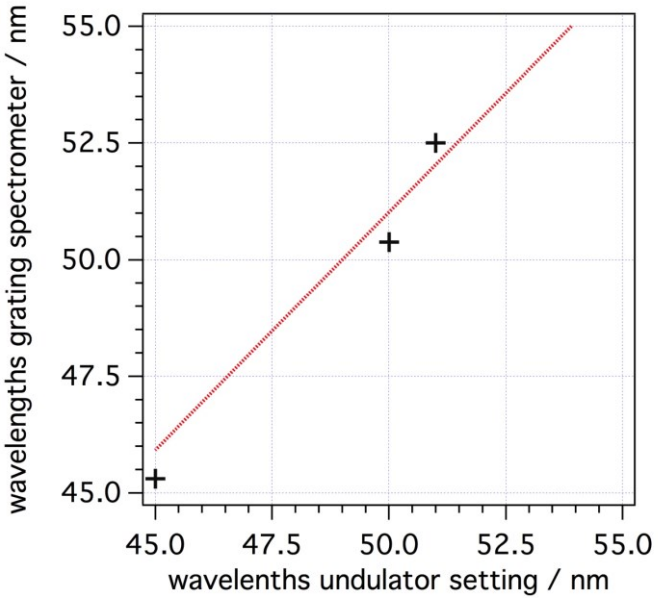
measured 5th order

1st order design theoretical

Grating Spectrometer: Possible Fudge Factor

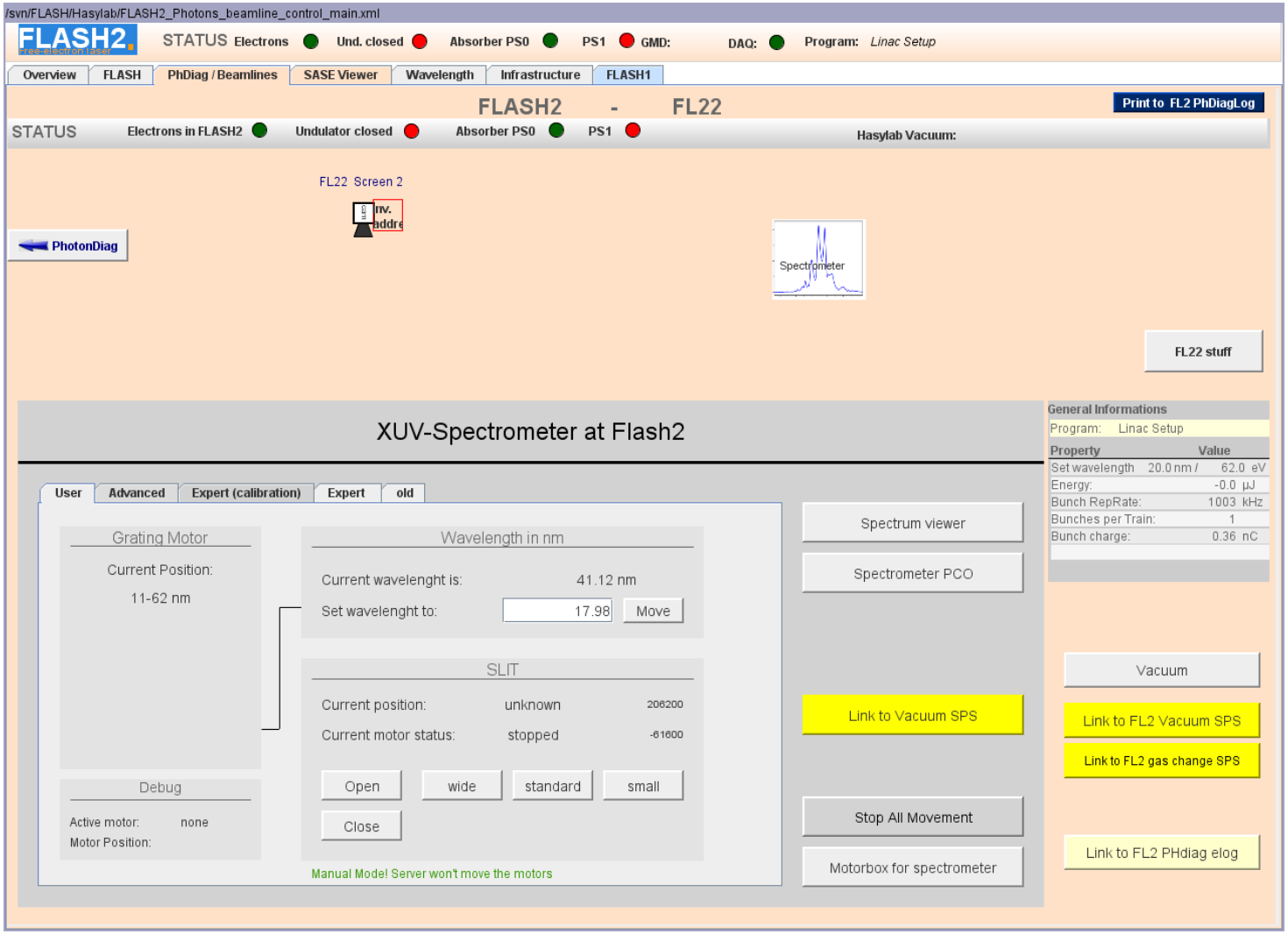


line fit at 1.96%



(insufficient statistics!)

Grating Spectrometer: jddd Operation



Grating Spectrometer: Spectrum Viewer

Grating Spectrometer:

Grating Spectrometer: (34,5h in 7d)

- Tool is in place at FL22 and aligned.
- Operation for Grating 3 [11-62nm] is set up.

- Operation of Grating 1+2 [1-5nm+5-20nm] requires λ<7nm.
- Solve problems with FL20M3.
- Wavelength change by operators.
- Spectrum viewer full operation and grating change by operators.
- DAQ operation on demand.
- Comparison shot to shot with OPIS.
- High μJ operation.

- Encoder for translation movements.
- Change to camera objective as in the original design.
- Build in FL21M1

What is next on the list of FLASH2 Photondiagnostics

User Run	Treusch, Duesterer, Toleikis, Braune, Kuhlmann Brachmanski, Grunewald, Müller,
More Beamline Setup and Alignment	Treusch, Duesterer, Kuhlmann, Brachmanski, Grunewald, Müller, Bican, Toleikis, Weigelt
FS-BT	Degenhardt, Steffen, Hans,
More Grating Spectrometer	Kuhlmann, Grunewald, Kreis,
More OPIS	Braune, Jastrow, Grunewald,
Setup GMD H and Attenuator	Jastrow, Tiedtke, Degenhardt, Bican,
First Wavefront Measurements	Keitel, Plönjes, Kuhlmann,
GMD at Experiment	Tiedtke, Jastrow, Sorokin, Bican, Bonfigt,
Compact Spectrometer	Dziarzhytski,
Preparation Pulselengths Diagnostics	Ivanov, Duesterer,