PAUL SCHERRER INSTITUT

PSI

Wir schaffen Wissen - heute für morgen

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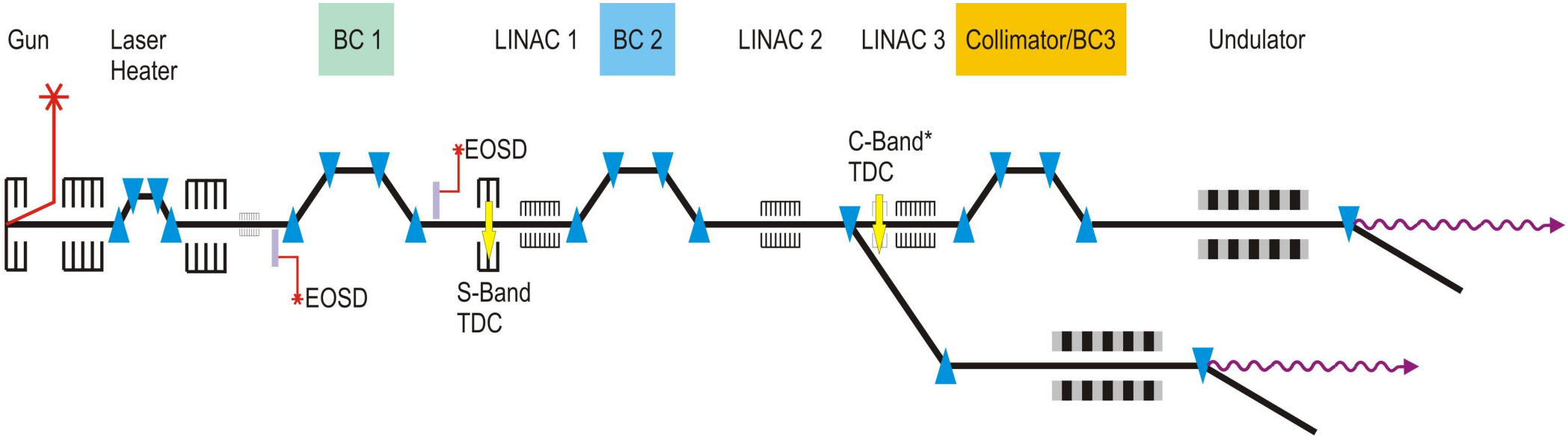
Mini-workshop on Longitudinal Diagnostics for FELs

Electro-Optic Experiments at PSI

OVERVIEW

- Electro-optic longitudinal bunch profile monitors at SwissFEL
- Technical scheme of EO monitor implementation
- EO system status at SITF
- EO experiments
- Summary

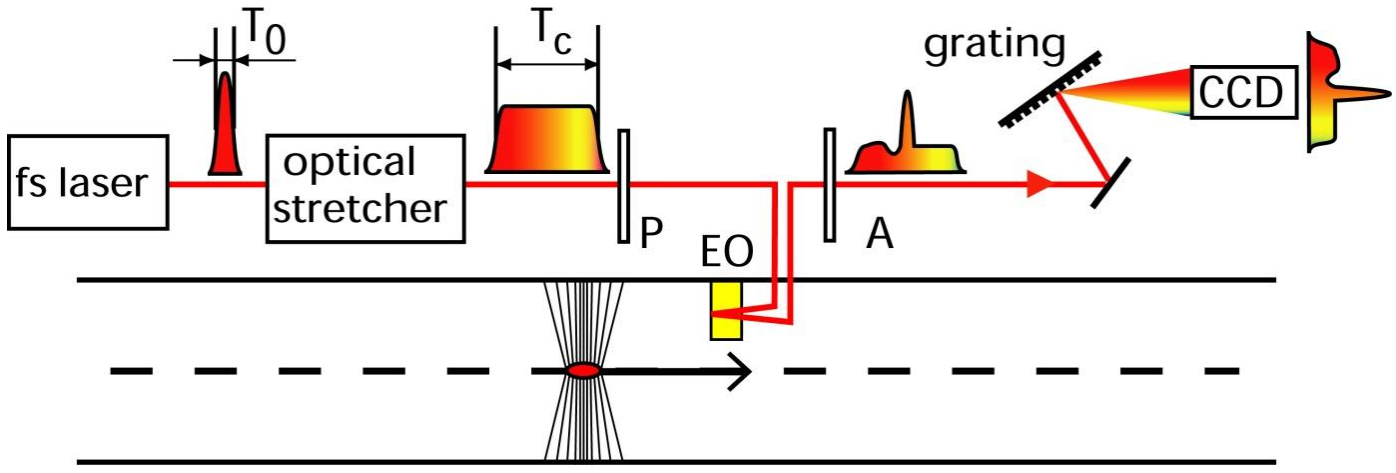
EO BUNCH LENGTH MONITORS AT SWISSFEL



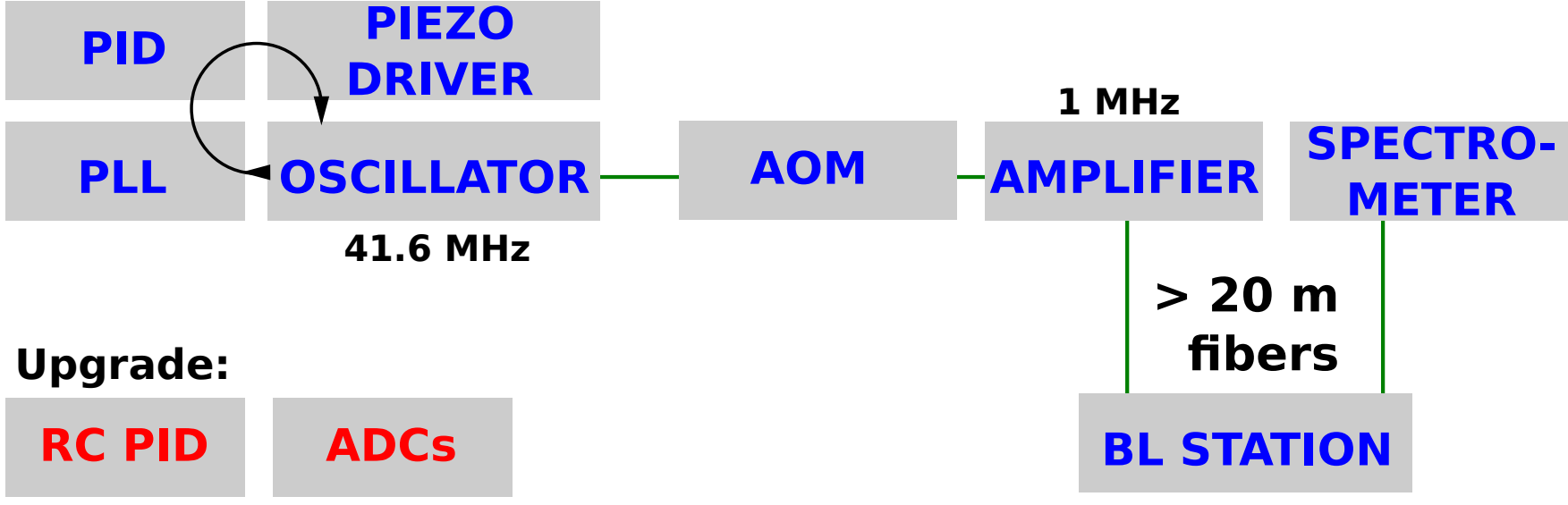
- Spectral decoding technique
- Phase 2 (2016)
- Experiments at SwissFEL Injector Test Facility

SCHEME OF IMPLEMENTATION AT SITF

- Spectral decoding technique

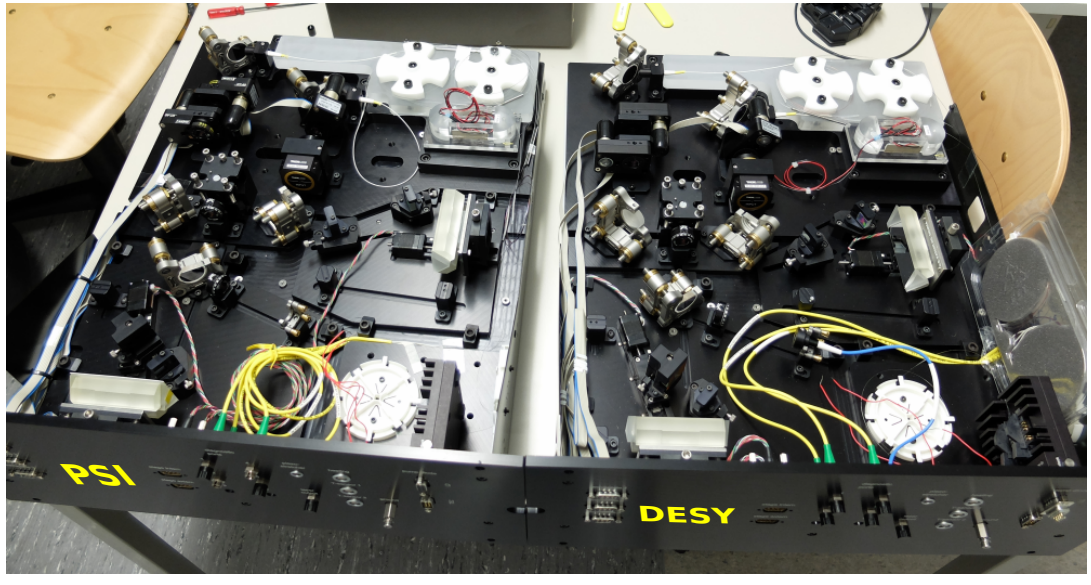


- EO system scheme



EO MONITOR STATUS

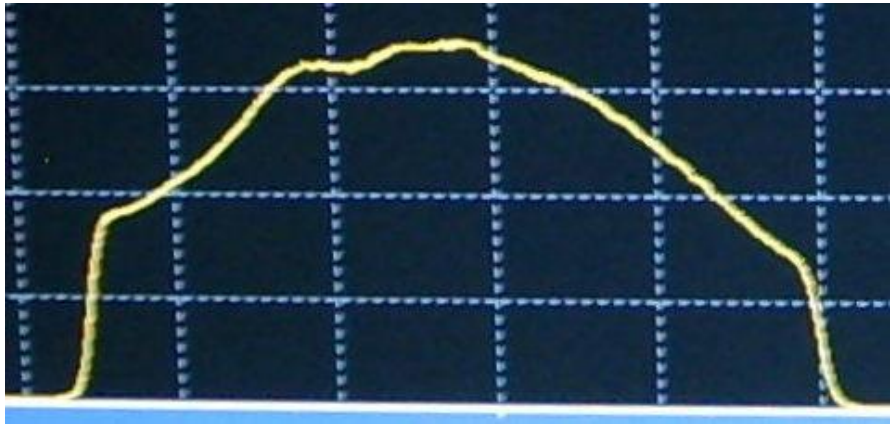
- Oscillator of EOM1 (before compression) was moved to EOM2, EOM1 is out of operation.
- EOM2 (after compression) is running and used for tests and investigations.
  The GaP crystal was exchanged.
- A new oscillator was assembled for PSI at DESY.

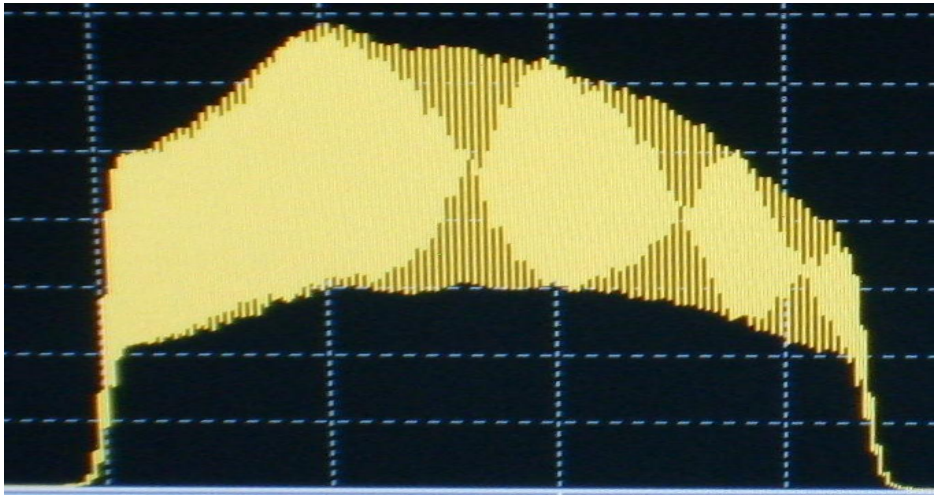


EO EXPERIMENTS

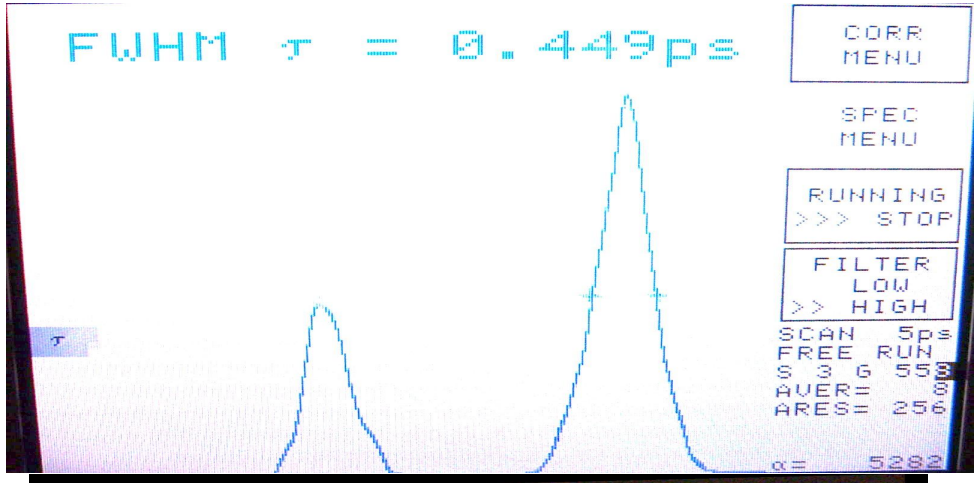
- Frequency time domain pairs

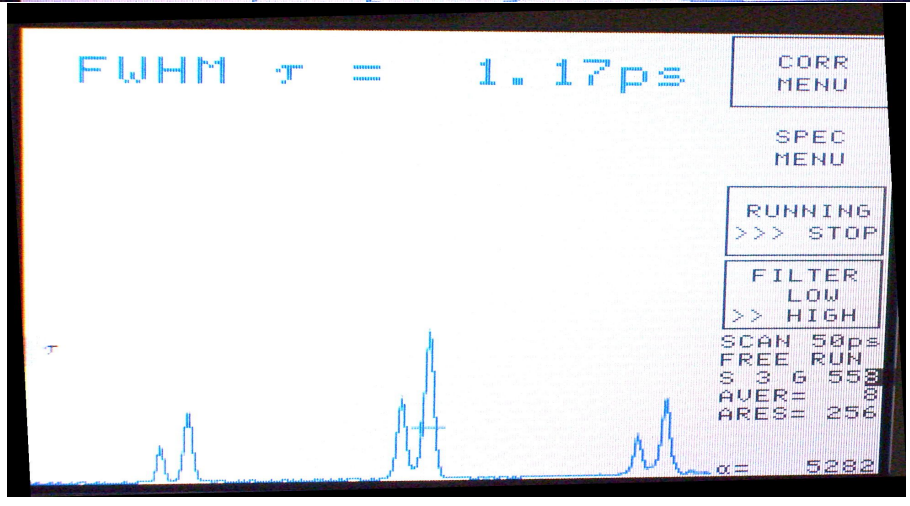
Spectrometer





Autocorrelator



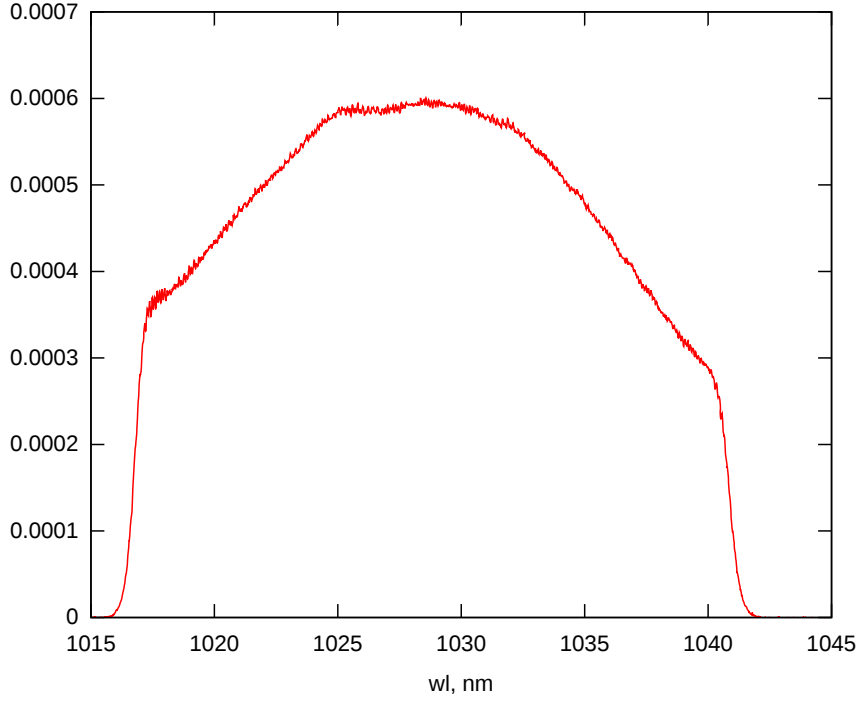


EO EXPERIMENTS

- EOM2 oscillator was not operating properly.
  It was replaced by an oscillator from EOM1.
  Correct mode-locking: mid of September.
  Still there ...

14.9.2013

9.11.2013



EO EXPERIMENTS

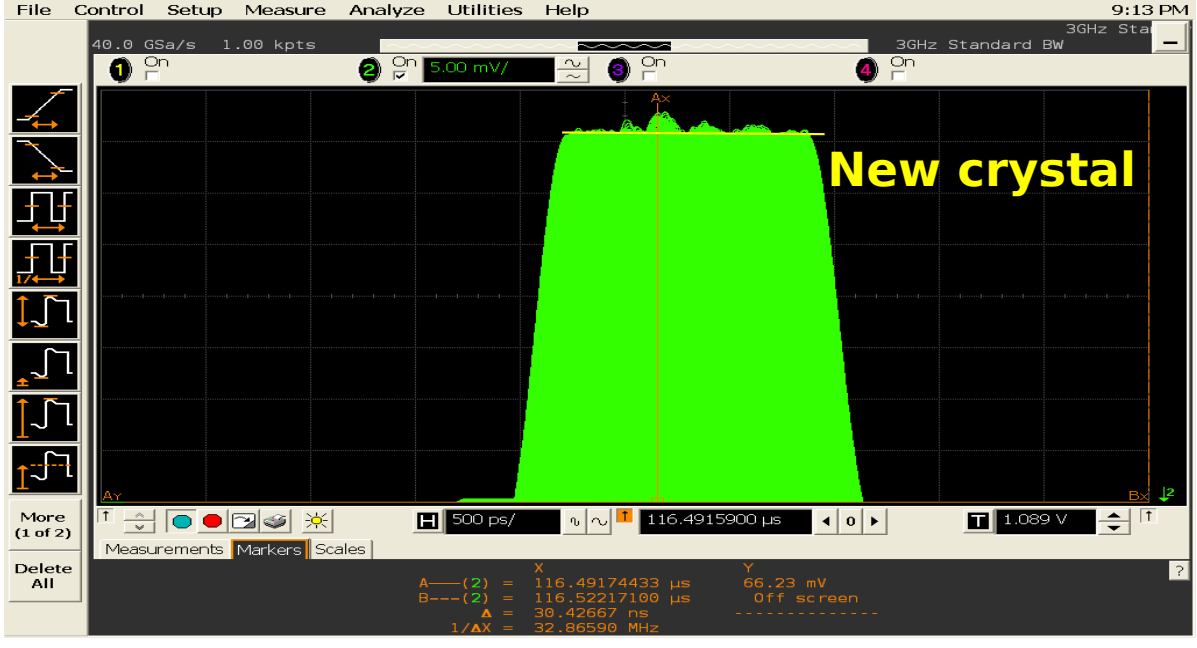
- Overlap signal

SO - Signal with shutter opened
SC - Signal with shutter closed

(SO-SC)/SC = 0.8/16.8

After crystal replacement

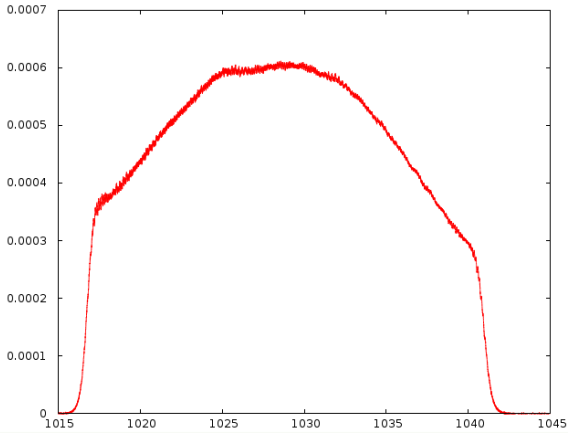
(SO-SC)/SC = 0.8/14.0



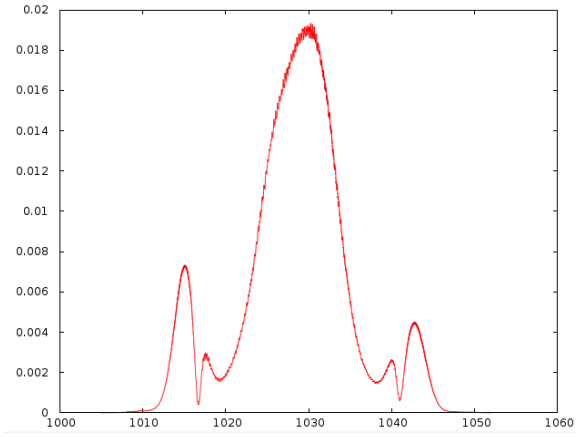
EO EXPERIMENTS

- Laser spectrum

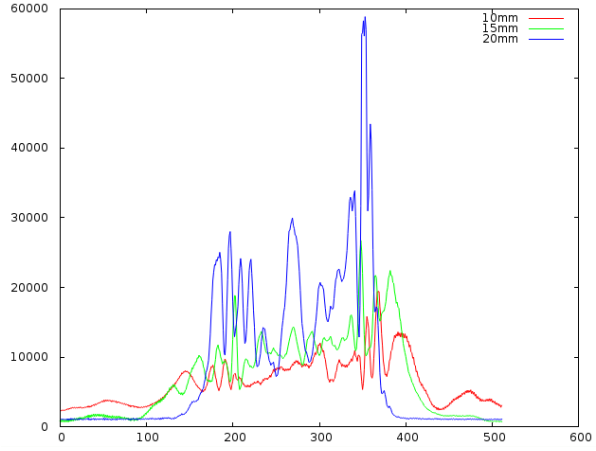
Oscillator intra-cavity



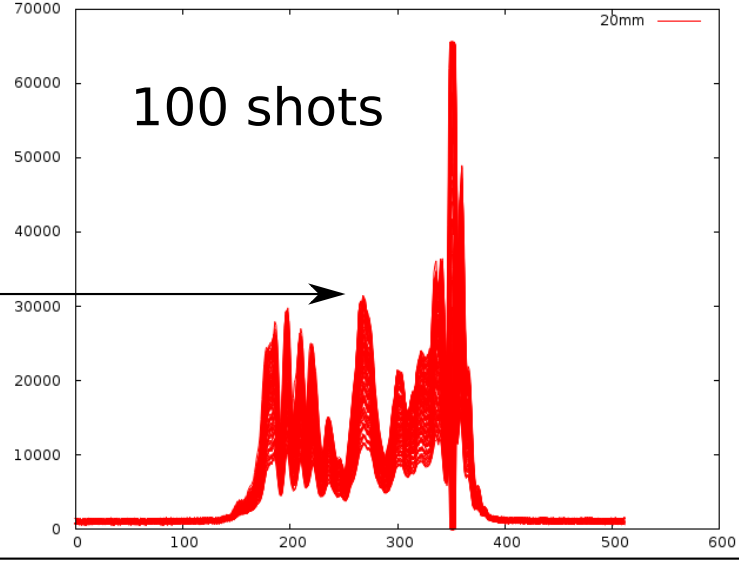
Oscillator output



Amplifier output



Central peak value varies from 10k to 30k



SUMMARY

- Two EO monitors are foreseen for SwissFEL Phase 2 (2016)
- Two complete systems were built at SITF. There is only one operational laser oscillator at PSI at the moment, a new one was recently assembled at DESY.
- EO system development is nearly finished, some additional electronics for full remote control.
- The laser stability is not sufficient for a reliable bunch longitudinal profile measurement, to be improved before the next run (early 2014).