LAM Measurements for User Experiments at FLASH and EuXFEL

Report on Latest Investigations and Advancements

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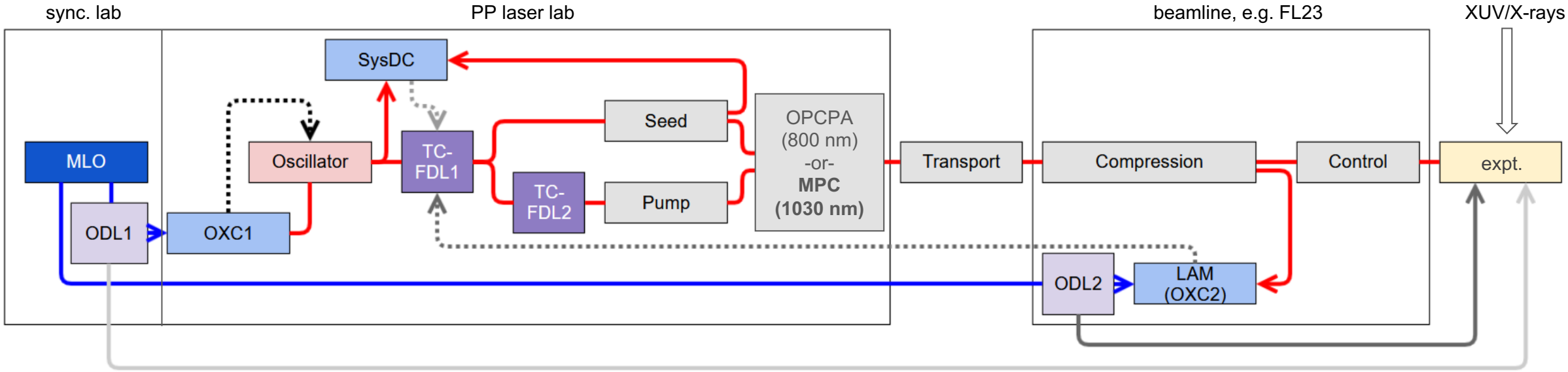
Darmstadt, 5 July 2024

HELMHOLTZ

DESY.

Laser Pulse Arrival Time Monitor: Integration into Facility

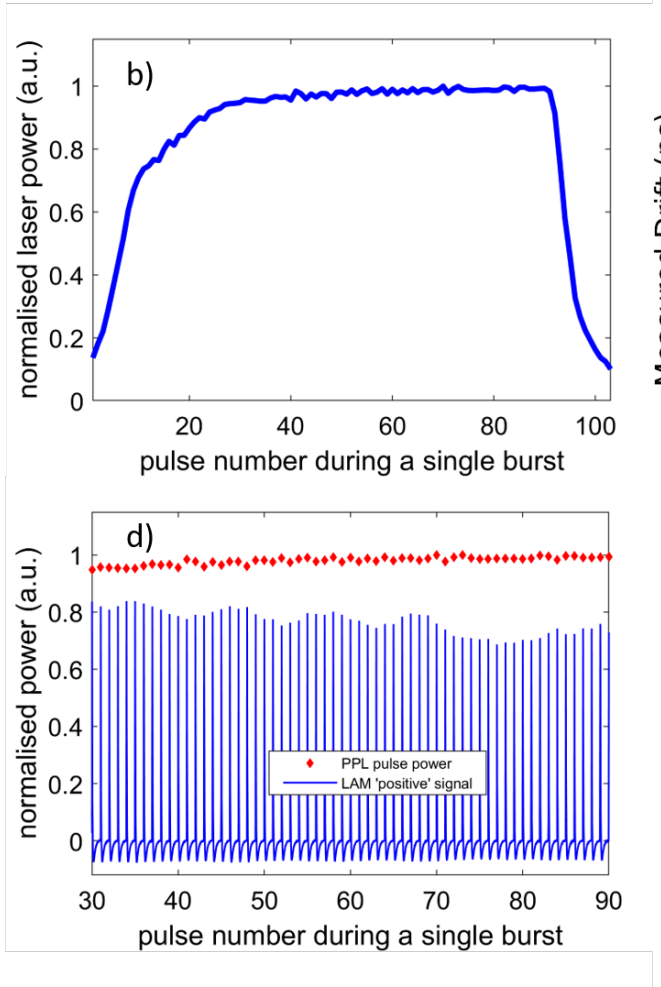
Improvement of Laser Pulse Arrival Time Jitter and Drift at Experiment

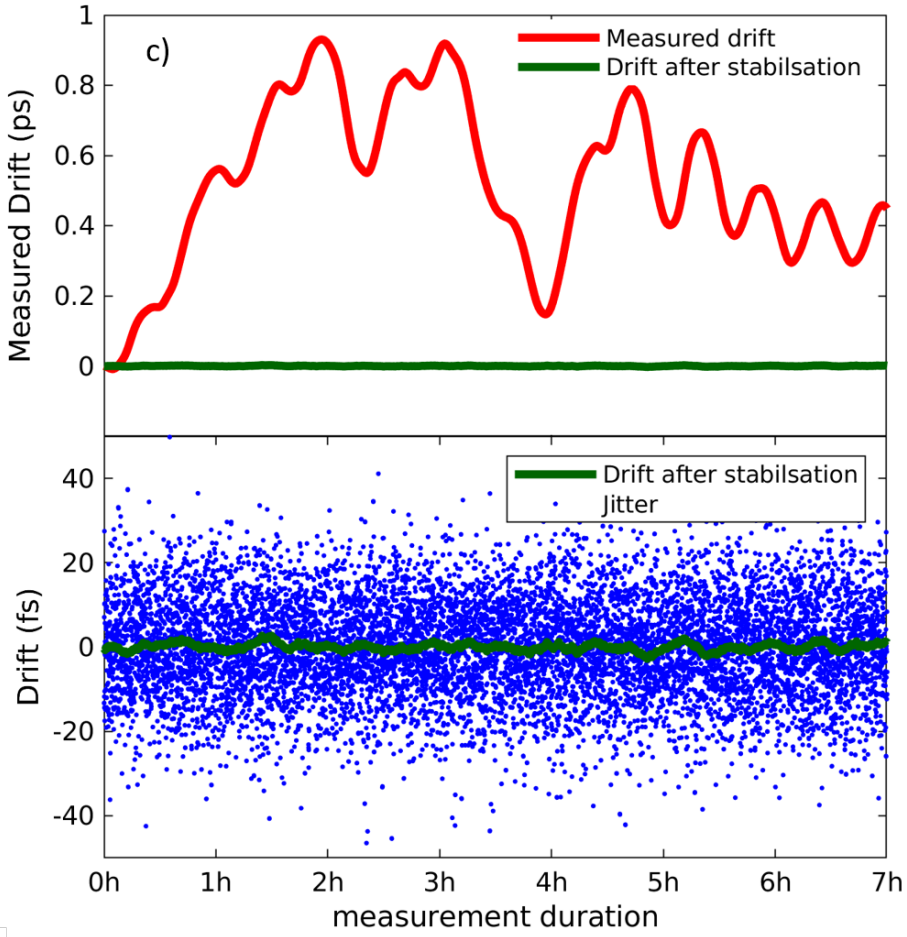


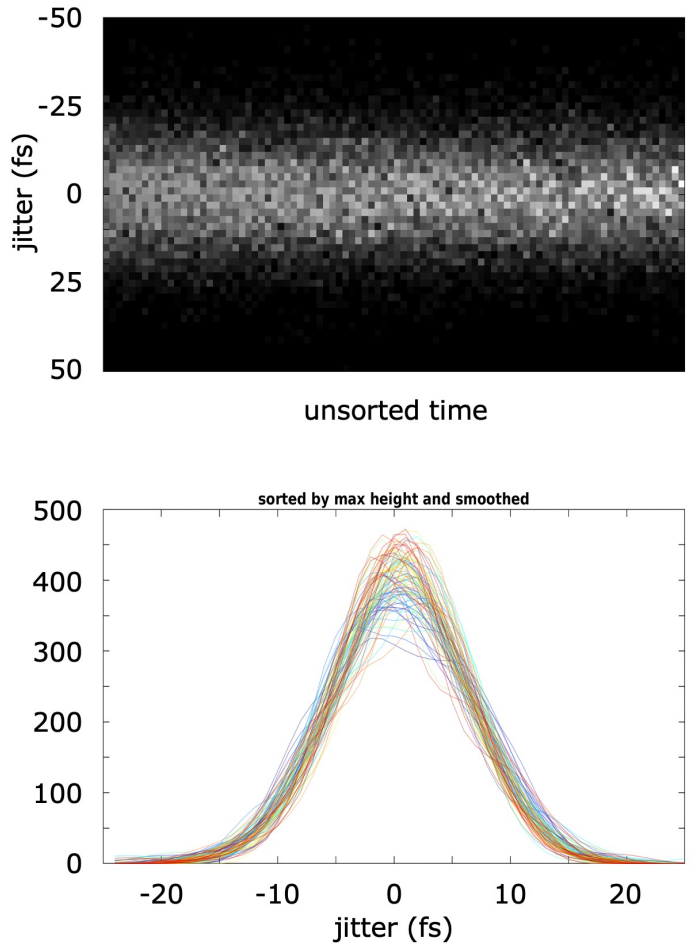
- based on common, fibre-based optical reference (MLO)
- implementation in stages
  - **single-pulse measurements** (up to 4.5 MHz at EuXFEL, **100 kHz** and 1 MHz **at FLASH**)
  - **feedback to compensate drifts (up to 10 Hz rate)**
  - fast feedbacks over the burst or for high duty cycle operation (with additional LLL between distributed MTCA systems)

Drift and Jitter Measurements: MPC-based Laser Delivery

FLASH Beamline FL23: Picosecond Arrival Time Drift Compensation with Sub-30 fs rms Jitter

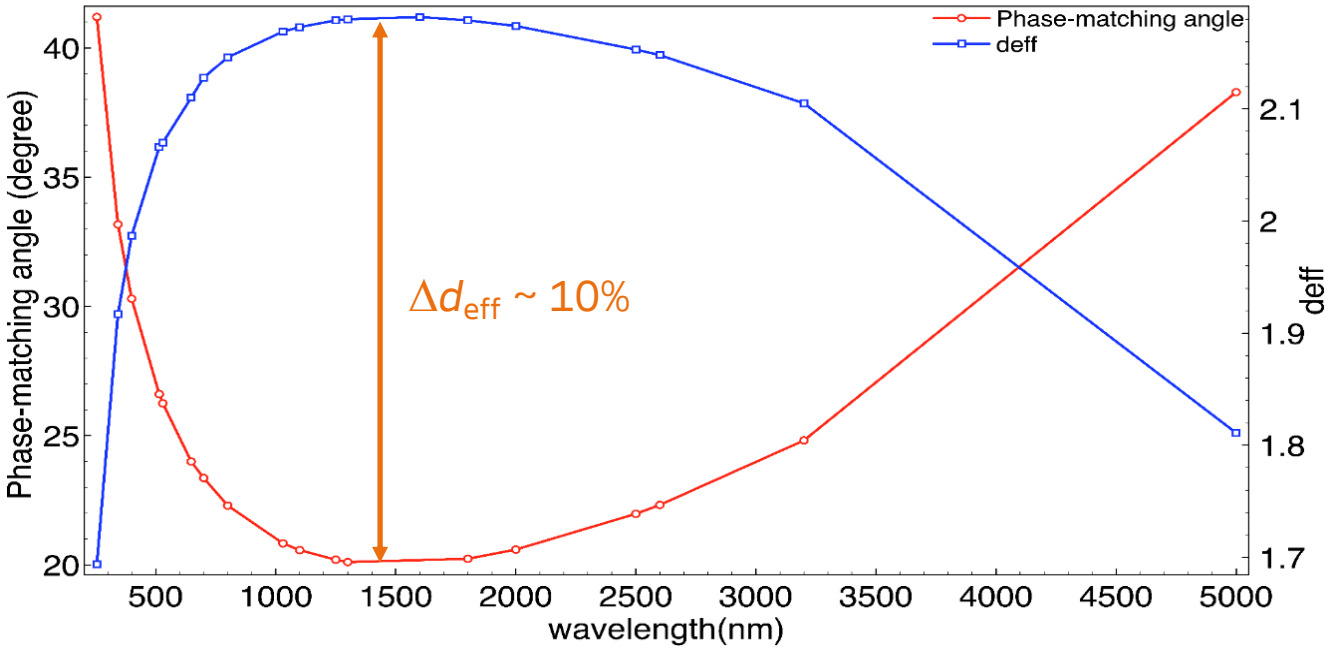


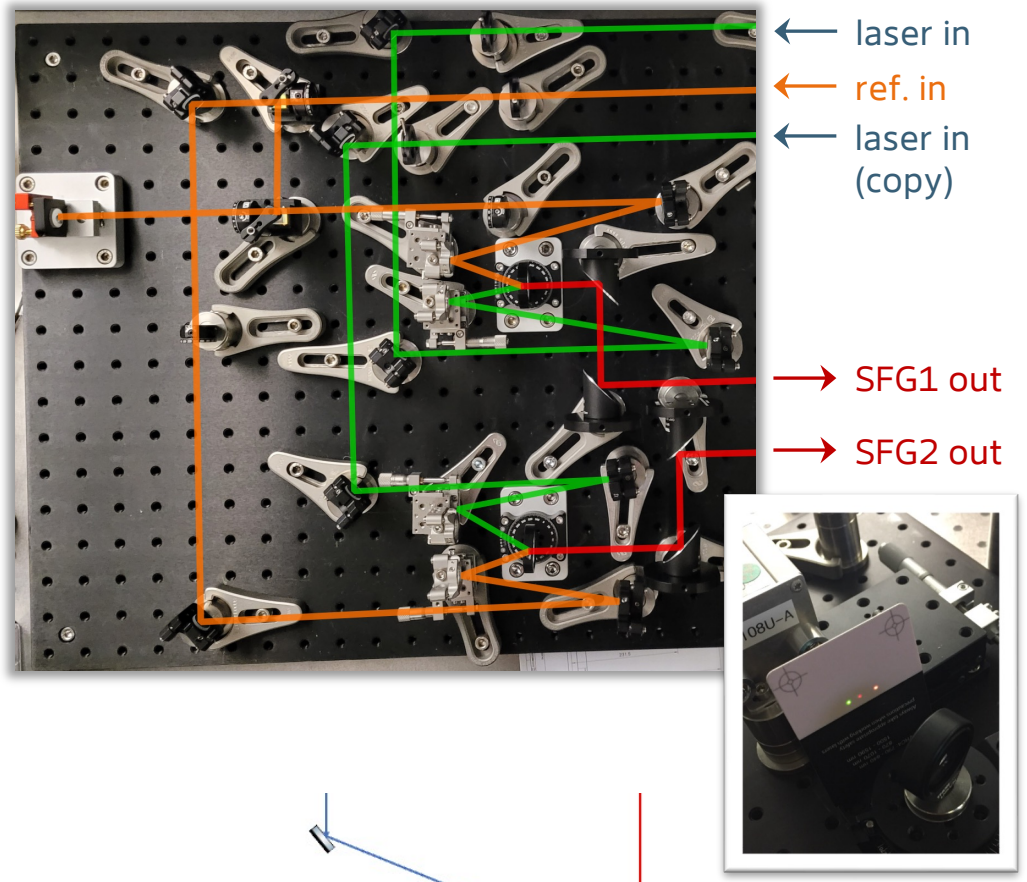




Towards Wavelength-tuneable Balanced Cross-Correlators

UV-VIS, VIS-NIR, potentially MIR





- large phase-matching possible by tilting the crystal
- investigations on-going
  - 1030 nm, 515 nm and 343 nm
  - one vs. **two-crystal implementation**
  - **more robust setup and automation**