Synchronized Optical Laser System at SACLA

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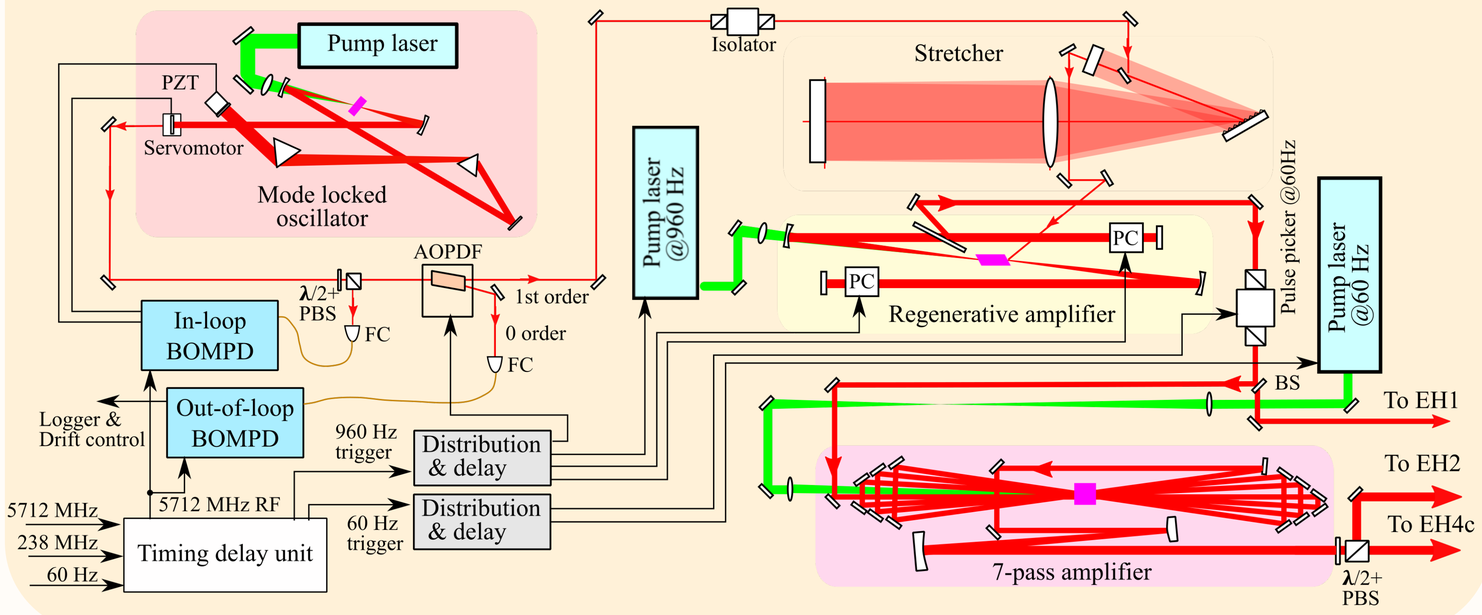
(on behalf of SACLA)

Femtosecond synchronized optical laser system

T. Tadashi et al. Appl. Sci. 10, 7934 (2020);
doi:10.3390/app10217934

Outline at LH1 (BL3)
Chirped pulse amp. based on Ti:sapphire laser



Specifications (BL1, BL3)

Rep. rate: 60 Hz

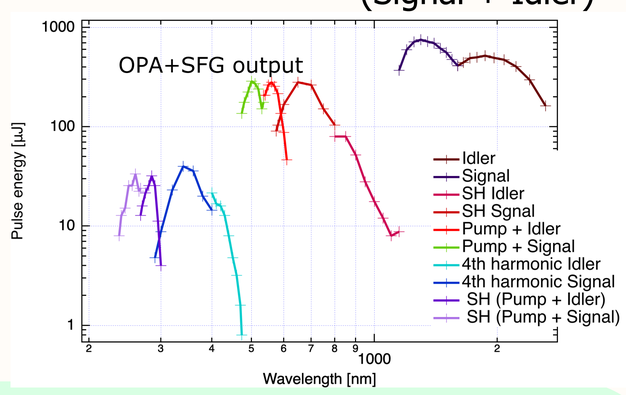
Fundamental (800 nm)
Pulse energy: ~12 mJ
Pulse width: ~40 fs

2nd harmonics (400 nm)
Pulse energy: ~0.5 mJ
Pulse width: ~30 fs

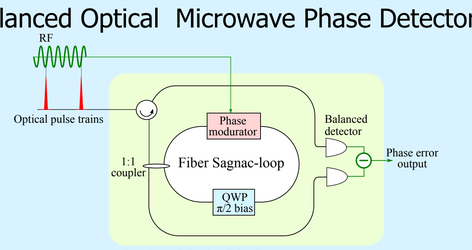
3rd harmonics (267 nm)
Pulse energy: ~0.2 mJ
Pulse width: ~50 fs

(Option)
4th harmonics (200 nm)
Pulse energy: ~5 μJ

Optical parametric amp. (OPA)
+ Sum frequency mixing (SFG)
Wavelength: 0.25 - 2.6 μm
Output: Max. 1.7 mJ
(Signal + Idler)

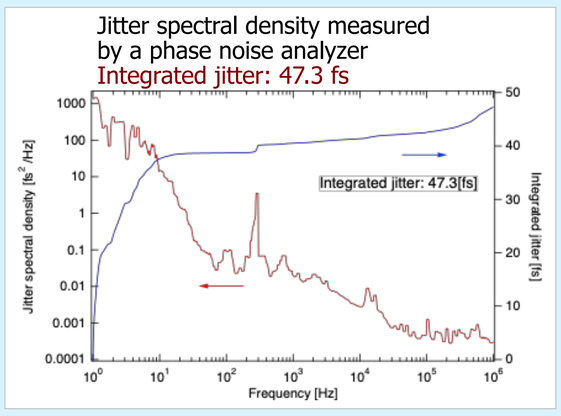


BOMPD
(Balanced Optical Microwave Phase Detector)

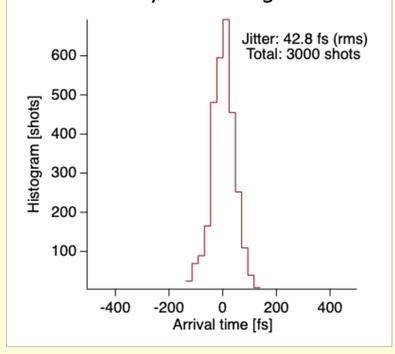


K. Jung et al. OL 37, 2958 (2012)

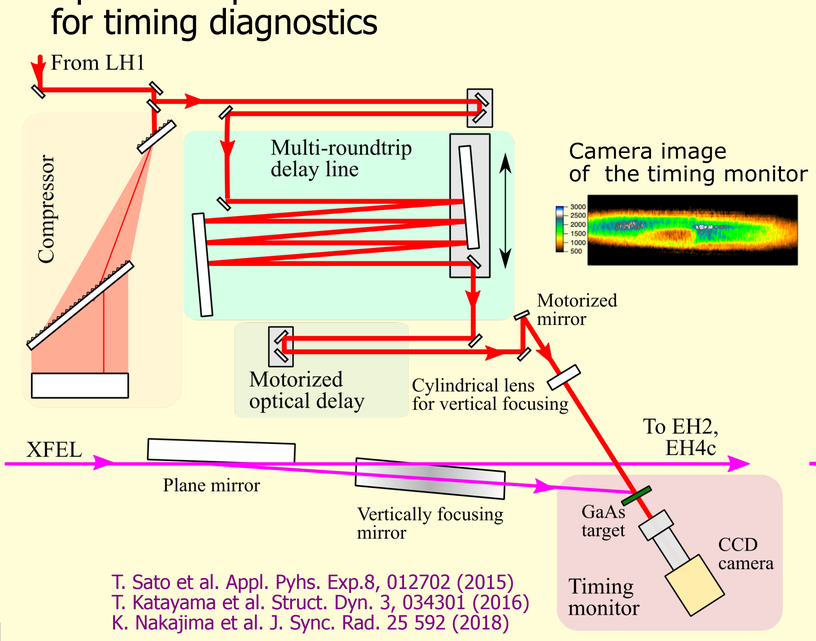
Jitter spectral density measured by a phase noise analyzer
Integrated jitter: 47.3 fs



Timing jitter: 42.8 fs
measured by the timing monitor

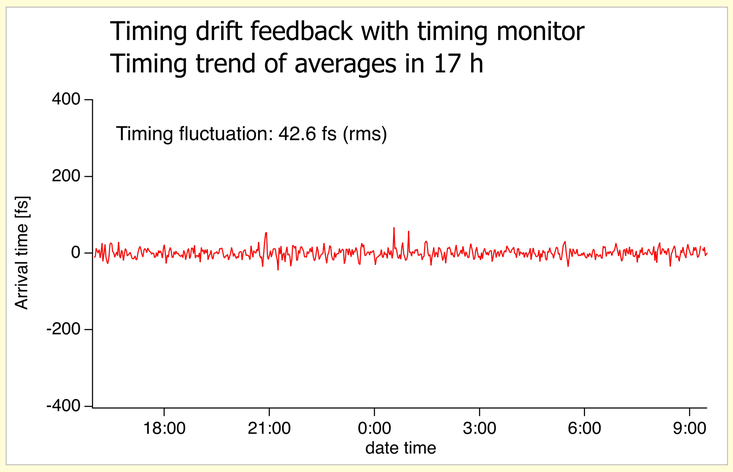


Optical setup at EH1
for timing diagnostics

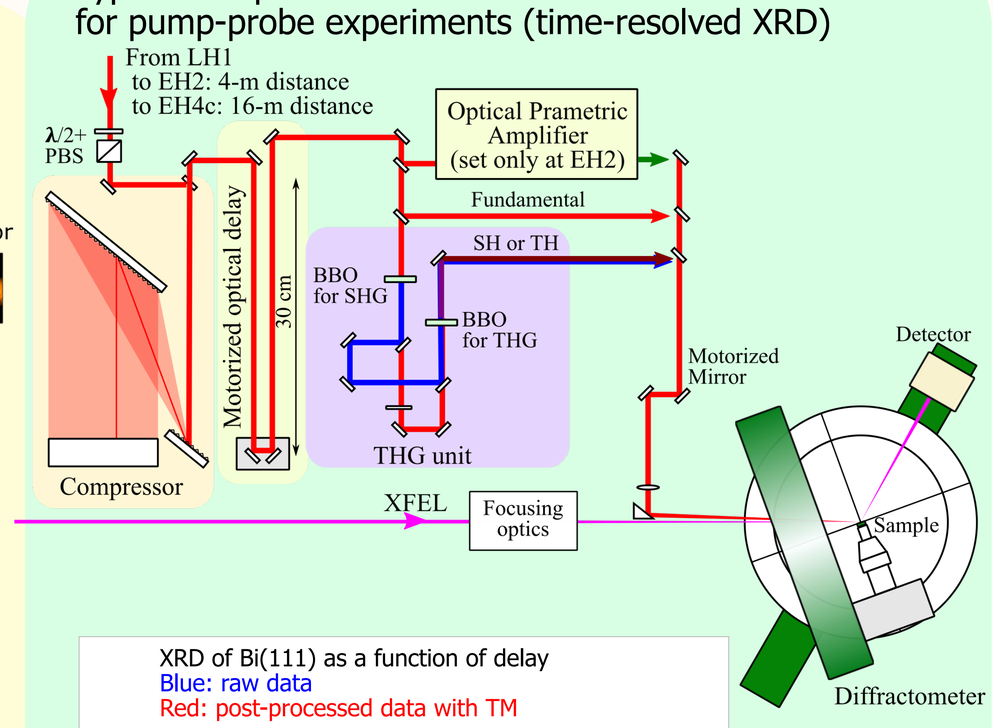


T. Sato et al. Appl. Pyhs. Exp.8, 012702 (2015)
T. Katayama et al. Struct. Dyn. 3, 034301 (2016)
K. Nakajima et al. J. Sync. Rad. 25 592 (2018)

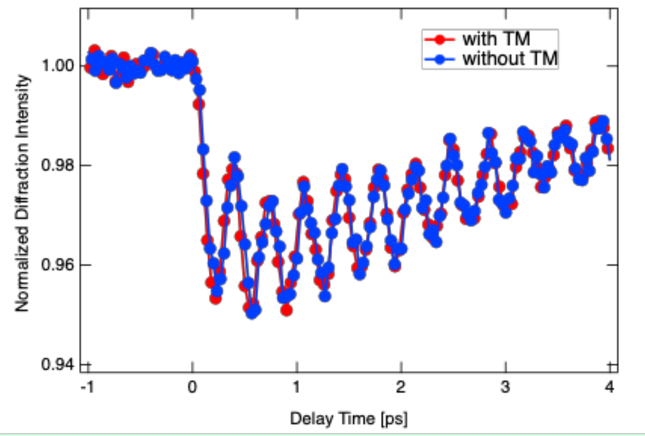
Timing drift feedback with timing monitor
Timing trend of averages in 17 h



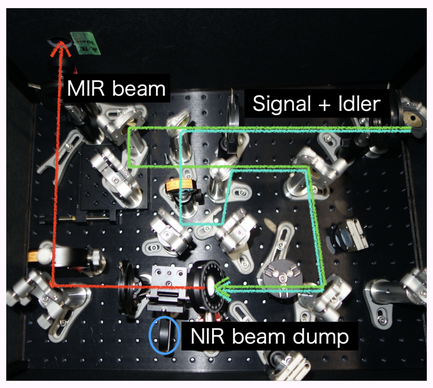
Typical setup at EH2
for pump-probe experiments (time-resolved XRD)



XRD of Bi(111) as a function of delay
Blue: raw data
Red: post-processed data with TM

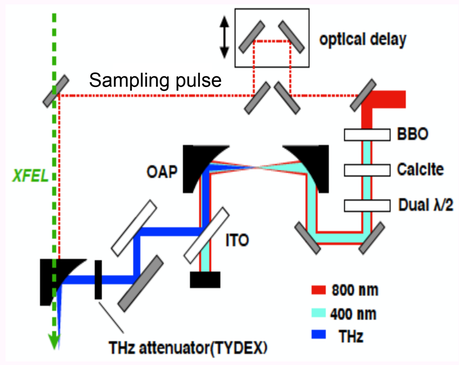


Mid-IR & THz generation (BL1, BL3)

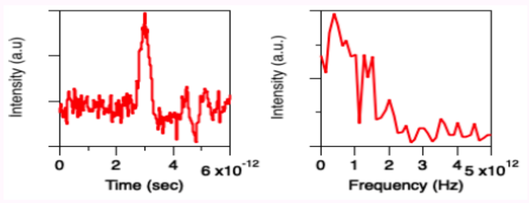


MIR generation unit

Mid-IR
Wavelength:
2 ~ 11 μm ($AgGaS_2$, Eksma)
3 ~ 18 μm (GaSe, Eksma)
Pulse energy:
< 20 μJ @15 μm
Focus size:
~400 μm (FWHM)



THz generation unit



THz
Method:
Air plasma indused by two-color pulses
Spot size: ~ ϕ1 mm
Field intensity: ~ 1 MV/cm (preliminary)

Nanosecond lasers (BL2)

Minilite (Amplitude)
Wavelength:
532 nm
Pulse energy:
< 10 mJ
Rep. rate:
< 15 Hz

NT232 (OPO, EKSPLA)
Wavelength:
210 - 2600 nm
Rep. rate:
< 30 Hz

Typical pulse energy of NT232