SACLA Users' meeting 2024

Technical update in the synchronized optical laser systems

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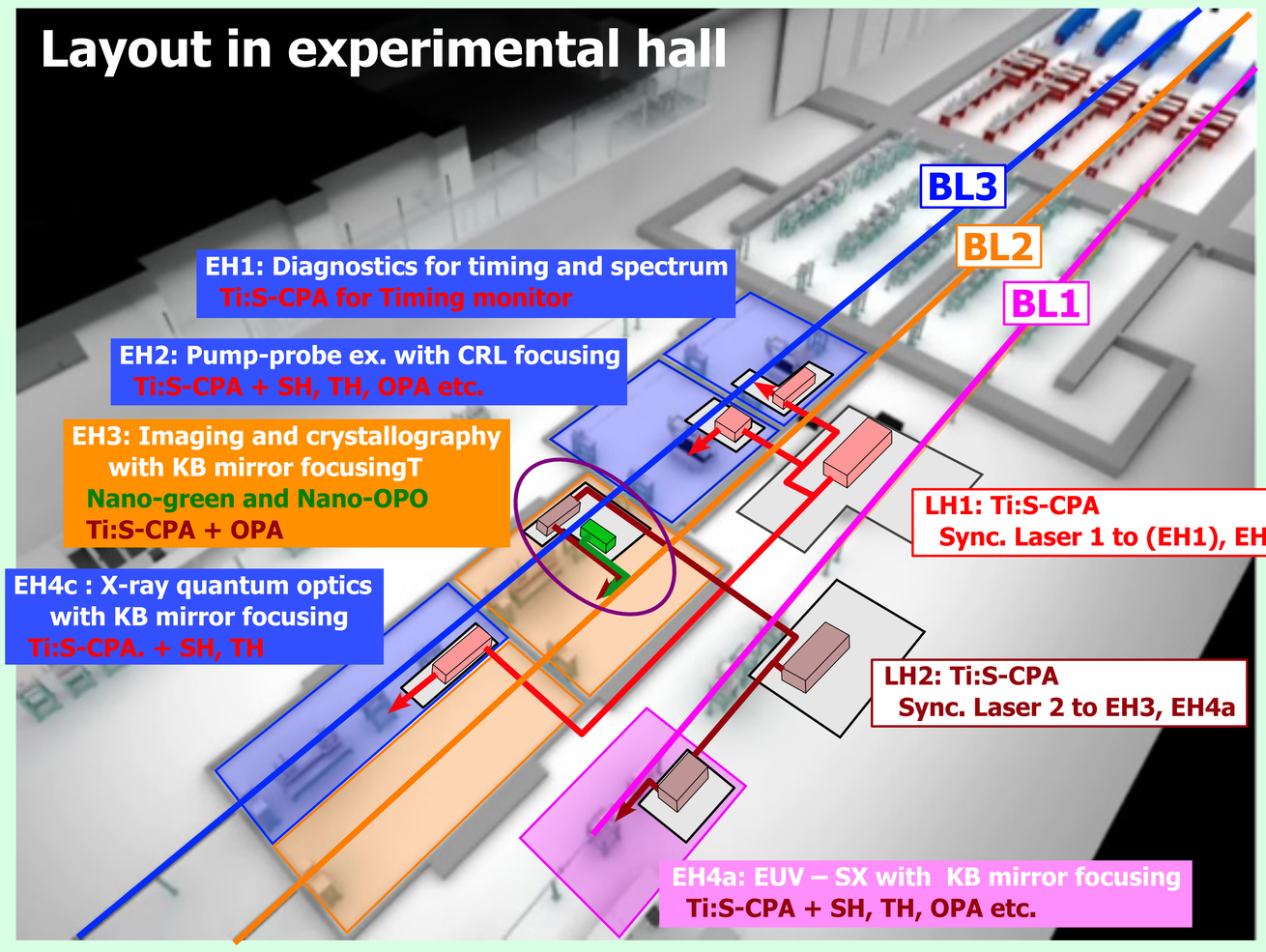
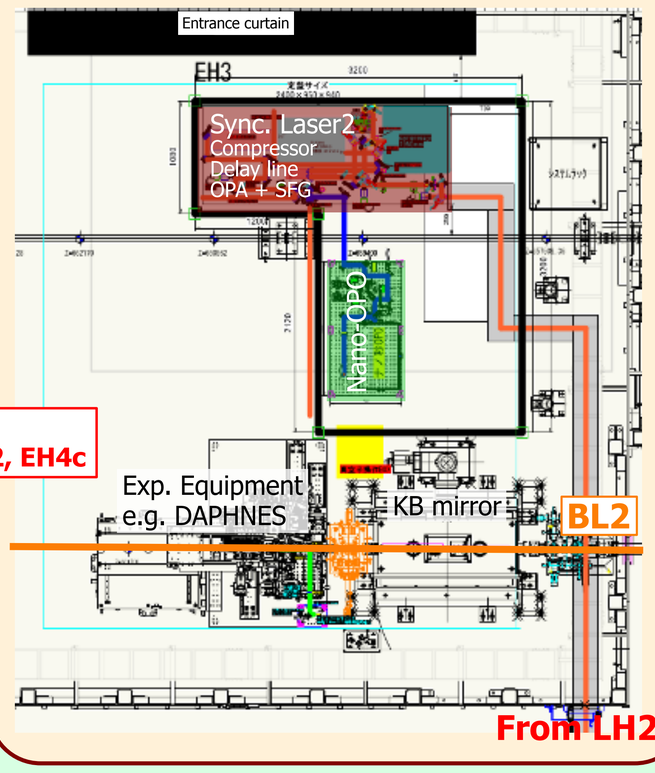
(on behalf of SACLA)

Layout in experimental hall



Layout in EH3 (under construction), available in 2024A



Sync. Laser 2 has been operated in the new laser hatch, **LH2** since the summer of 2023.

The timing Monitor for BL2 is not available now.
It will be constructed in FY2025.

Permanent laser parameters

Femto at EH2, BL3
Sync. Laser 1
Rep. rate: <60 Hz
Jitter: ~50 fs
Timing Monitor: Available
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
OPA + SFG
Wavelength: 0.25 - 2.6 μm
Output: Max. ~1.7 mJ
(Signal + Idler)

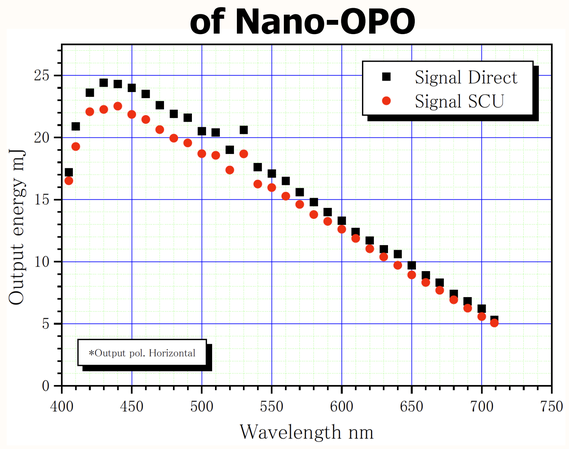
Femto at EH4c, BL3
Sync. Laser 1
Rep. rate: <60 Hz
Jitter: ~50 fs
Timing Monitor: Available
Fundamental (800 nm)
Pulse energy: ~12 mJ
Pulse width: ~40 fs
2nd harmonics (400 nm)
Pulse energy: ~0.5 mJ
Pulse width: ~30 fs
3rd harmonics (267 nm)
Pulse energy: ~0.2 mJ
Pulse width: ~50 fs

Femto at EH4a, BL1
Sync. Laser 2
Rep. rate: <60 Hz
Jitter: ~300 fs
(improved up to ~50 fs)
Timing Monitor: Available
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
OPA + SFG
Wavelength: 0.25 - 2.6 μm
Output: Max. ~1.7 mJ
(Signal + Idler)

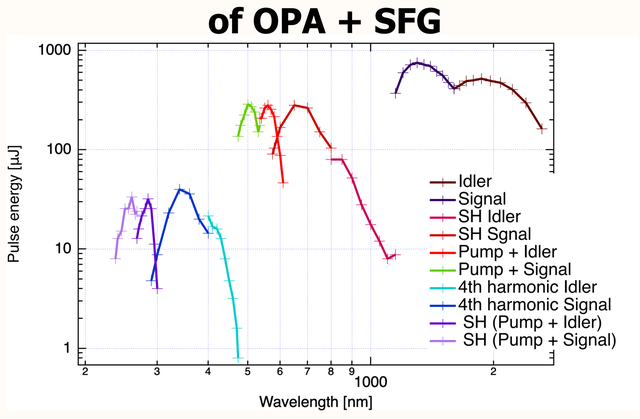
Femto at EH3, BL2
Sync. Laser 2
Rep. rate: <60 Hz
Jitter: ~300 fs
(improved up to ~50 fs)
Timing Monitor: Not available
Fundamental (800 nm)
Pulse energy: ~1 mJ
Pulse width: ~40 fs
OPA + SFG
Wavelength: 0.25 - 2.6 μm
Output: Max. ~1.7 mJ
(Signal + Idler)

Nano at EH3, BL2
Nano-OPO
(NT232, EKSPLA)
Rep. rate: <30 Hz
Wavelength: 210 - 2600 nm

Typical pulse energy of Nano-OPO



Typical pulse energy of OPA + SFG



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doi:10.3390/app10217934

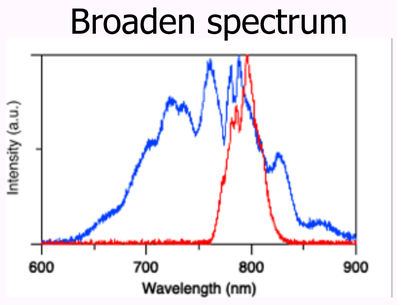
Mobile units

The mobile units, which can expand the pulse profile and the spectral region, are available on users' demand in the several hatches.

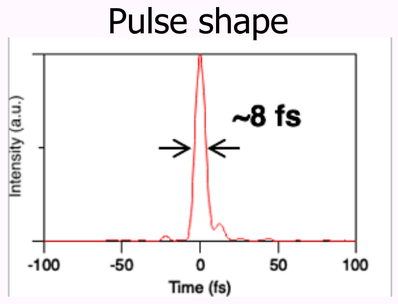
4th harmonics
ω + 3ω with BBO
Wavelength: 200 nm
Pulse energy: ~5 μJ
Hatch: **EH2**, **EH4c**, **EH4a**

Short pulse generation
Spectral broadening with Ar in Hollow fiber
Pulse width: ~8 fs
Hatch: **EH2**, **EH4a**

Broaden spectrum

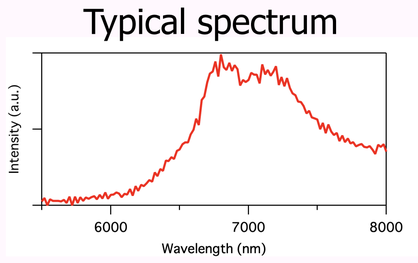


Pulse shape



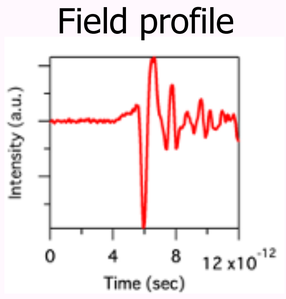
Mid-IR
DFG of Signal and Idler
Wavelength:
2 ~ 11 μm ($AgGaS_2$, Eksma)
3 ~ 18 μm (GaSe, Eksma)
Pulse energy: < 20 μJ @15 μm
Focus size: ~400 μm (FWHM)
Hatch: **EH2**, **EH4a**

Typical spectrum

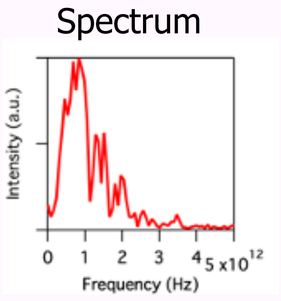


THz
Method: air plasma indused by two-color pulses
Spot size: ~ ϕ1 mm
Field intensity: ~ 1 MV/cm (preliminary)

Field profile



Spectrum



THz generation using organic crystal is under testing for improving efficiency and usability.