First observation of the 61.5 nm seeded FEL at the SCSS test accelerator

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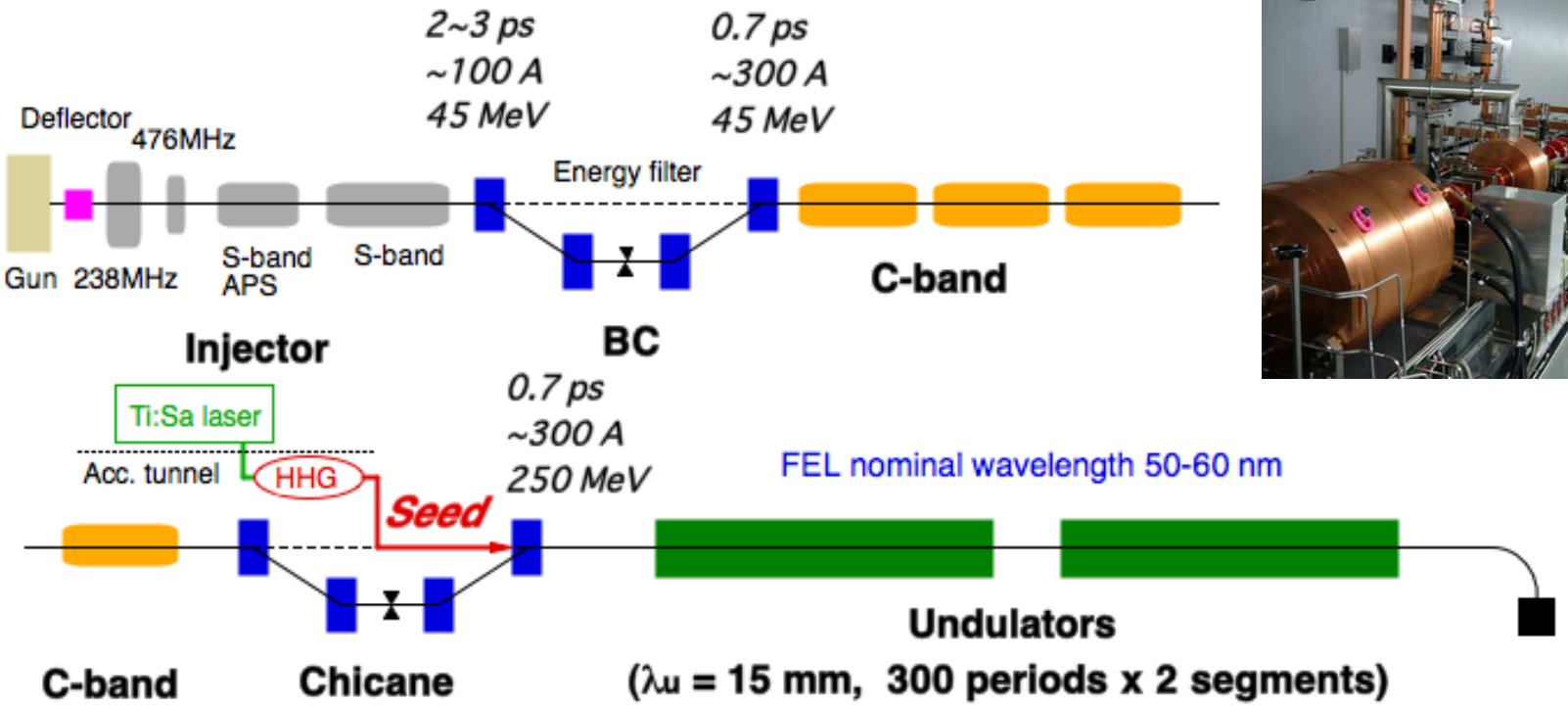
SCSS test accelerator

- **R&D facility for XFEL.**
- **User facility as a EUV light source.**

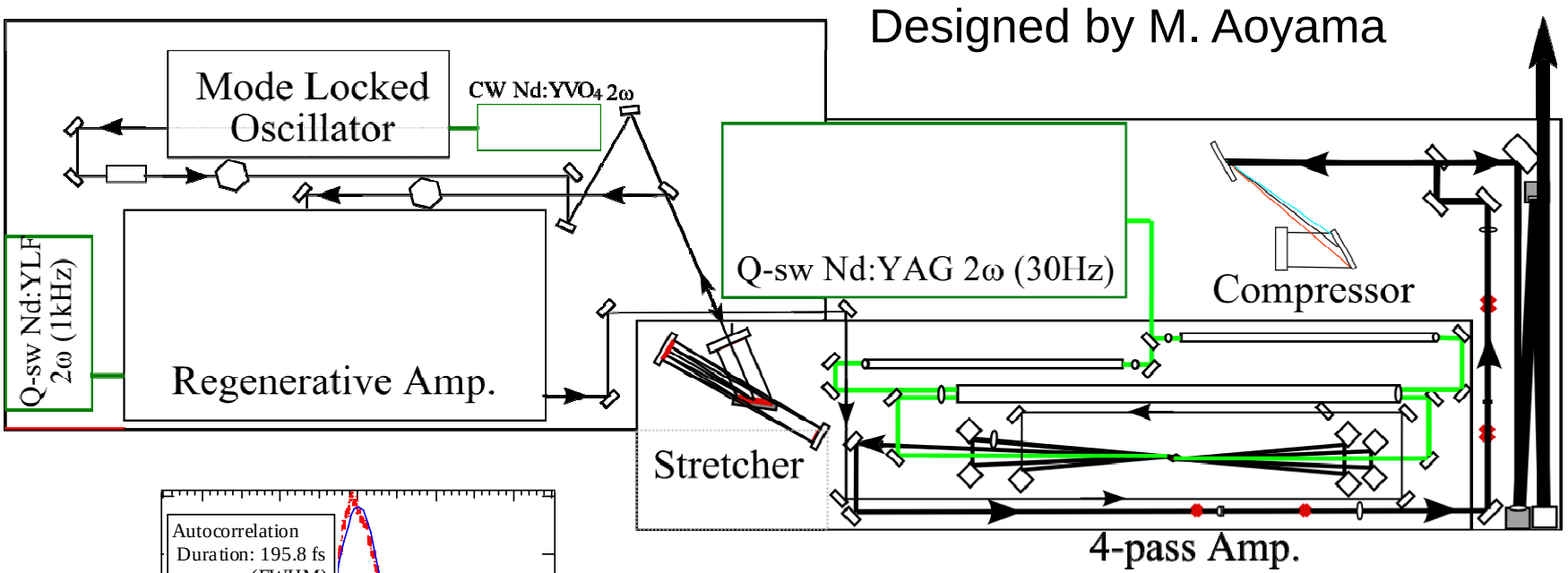


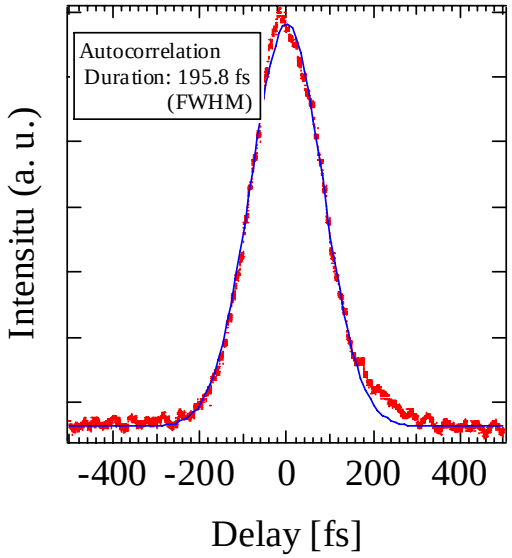
- Construction completed in August 2005.
- First FEL light in June 2006.
- SASE saturation in September 2007.
- Seeded FEL at 160 nm (160 MeV) in 2006-2007.

- Laser and HHG system upgrade in 2009

- First seeded FEL of HHG in plateau region at 61.5 nm in July 2010.

Development of Ti:sapphire laser system

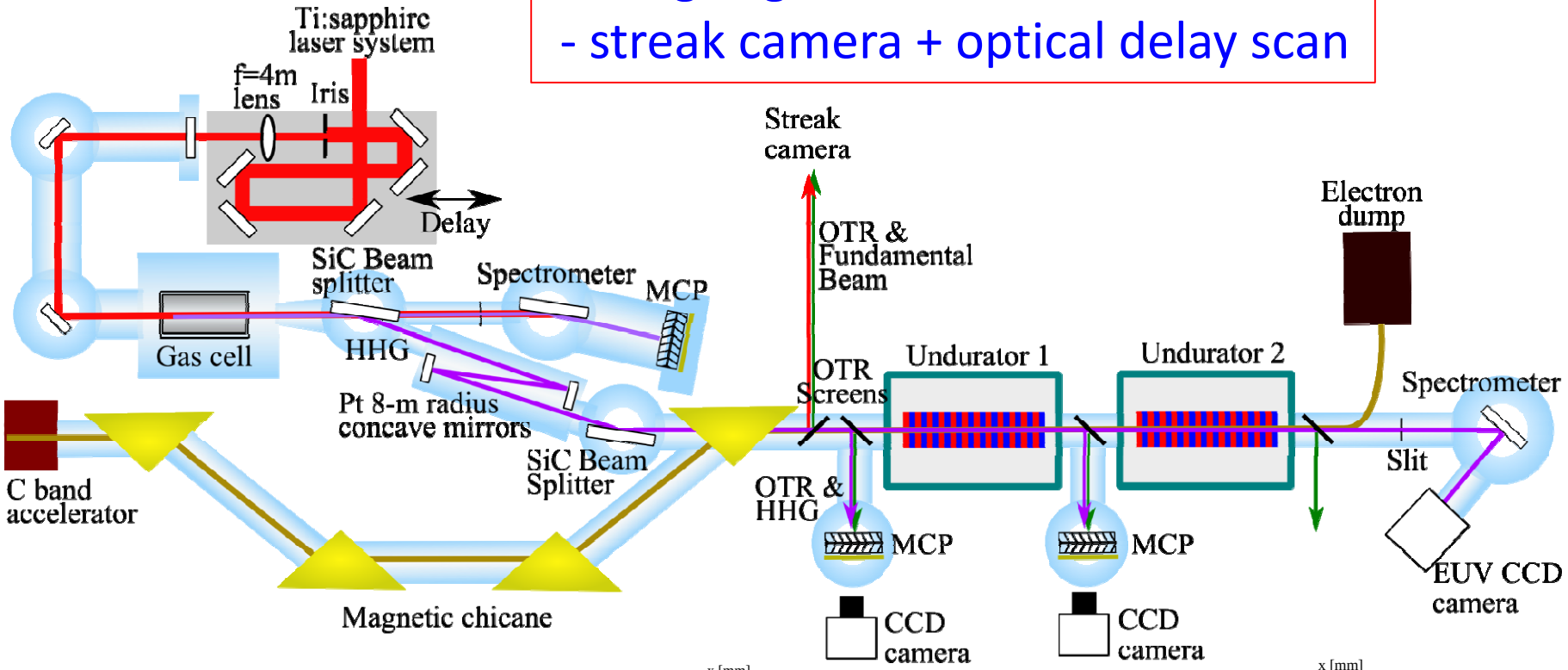




Output	100 mJ
Rep. rate	30 Hz
Pulse width	130 fs
Spot size	V: 9mm(FWHM) H: 6mm(FWHM)

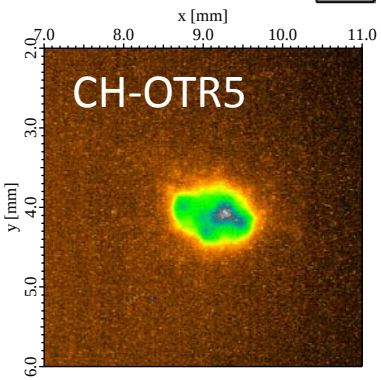
Alignment between HHG and electron beam

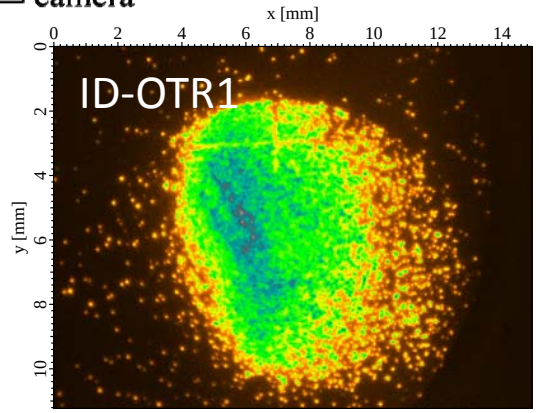
Timing alignment
- streak camera + optical delay scan



Spatial alignment
by MCP (OTR + HHG)

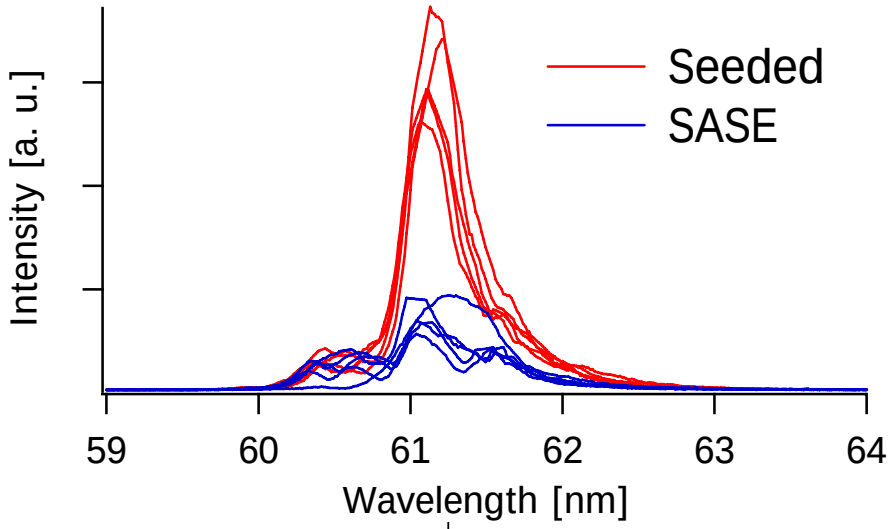
13th harmonic of Ti:Sa

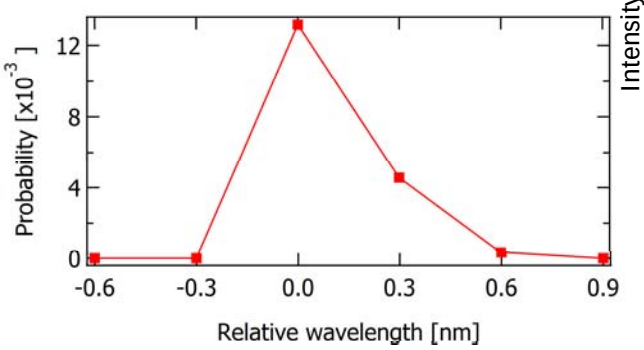


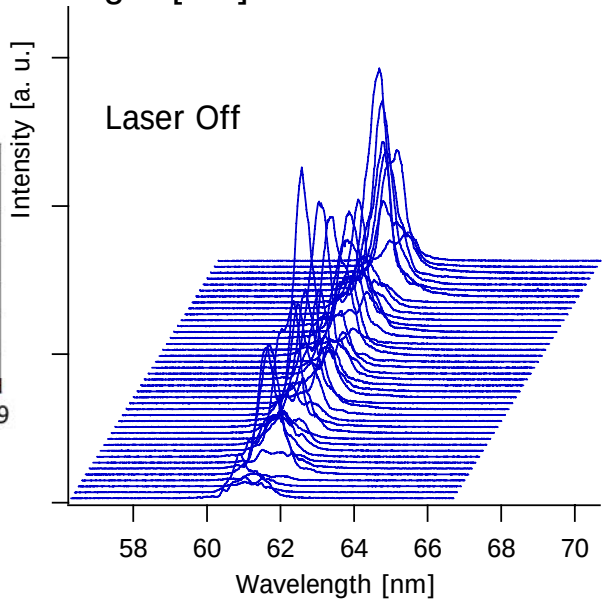


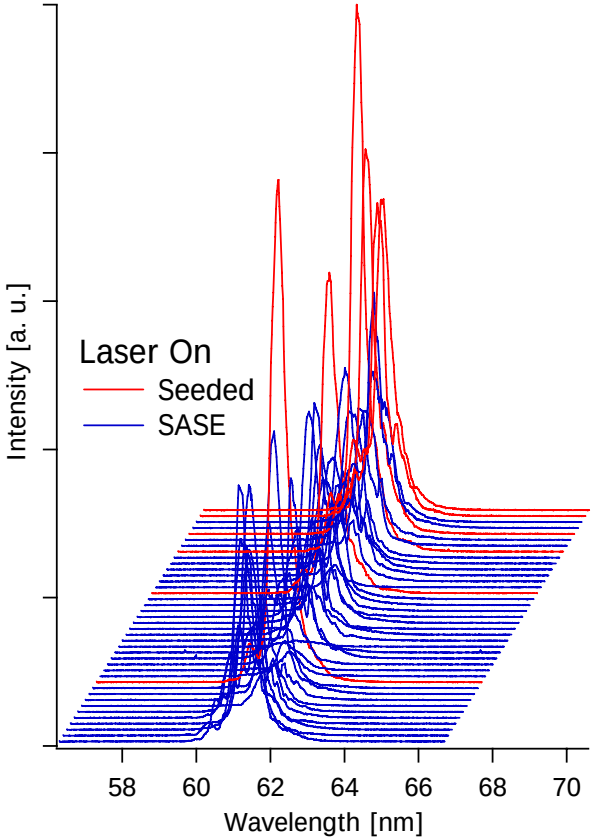
Preliminary results of 61.5 nm seeded FEL

SASE: 0.7 μJ
Seeded: 1.4 μJ
HHG seed: 2 nJ









Summary

- First success of observing the seeding effect at HHG plateau region (61.5 nm).
- Points to improve
  - Gun cathode was almost dying.
    Cathode has been changed.
  - Transverse matching (filling factor)

  ➡ Optimization and stabilization of HHG optics.

  - Synchronization of Ti:Sa laser to accelerator

  ➡ Improve jitter of Ti:Sa oscillator

HHG system optimized for 13th harmonic