

The First Lasing of SACLA

XFEL/SPring-8 → SACLA (SPring-8 Angstrom Compact free electron LAser)

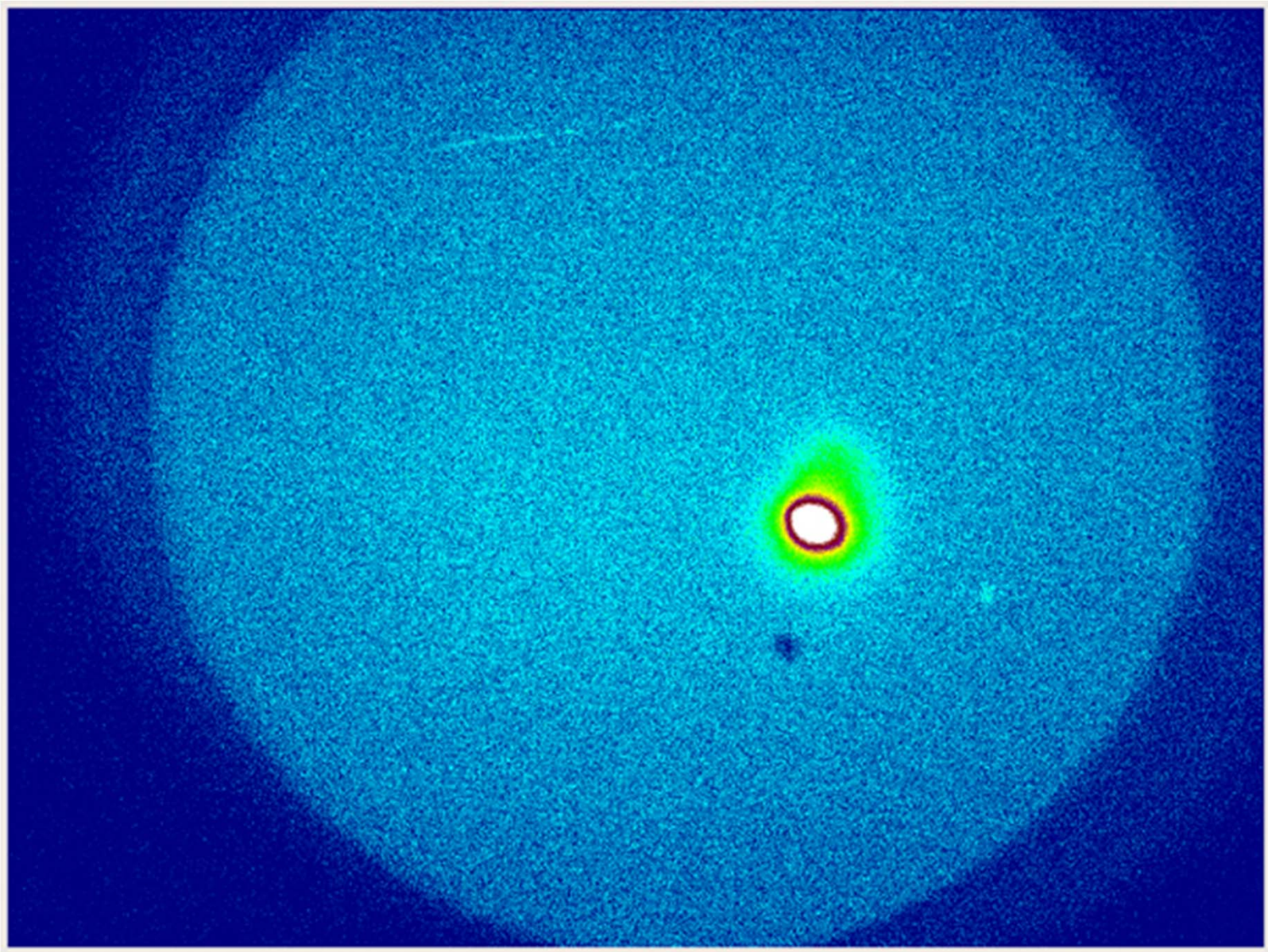
Reported by

Tsumoru Shintake for SACLA team

RIKEN/SPring-8

On June 7, the first SASE lasing at 1.2 Angstrom was observed at SACLA.

In March 2012, the facility will be opened to public users from around the world.



First laser spot observed on YAG-screen, 110 m downstream from the undulator on June 7.

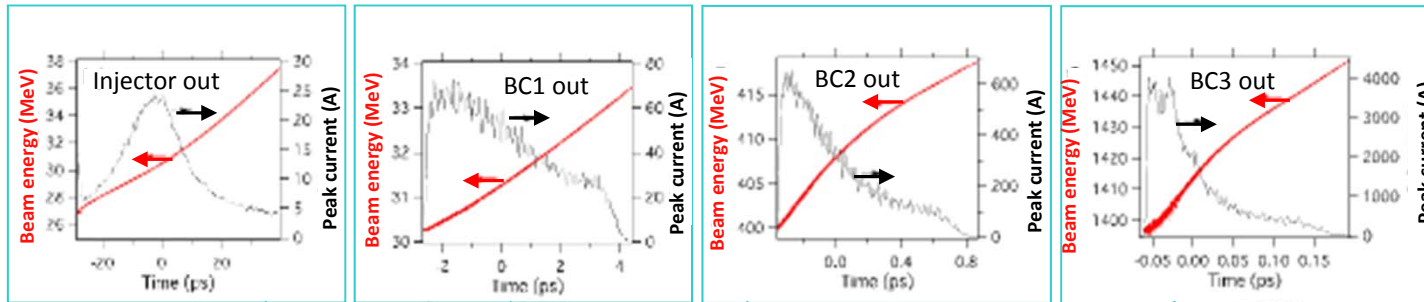




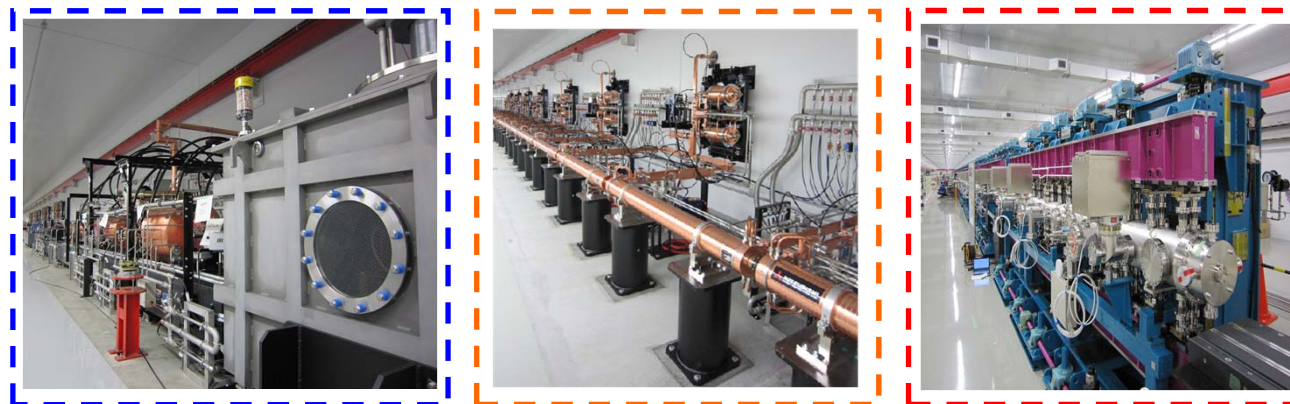
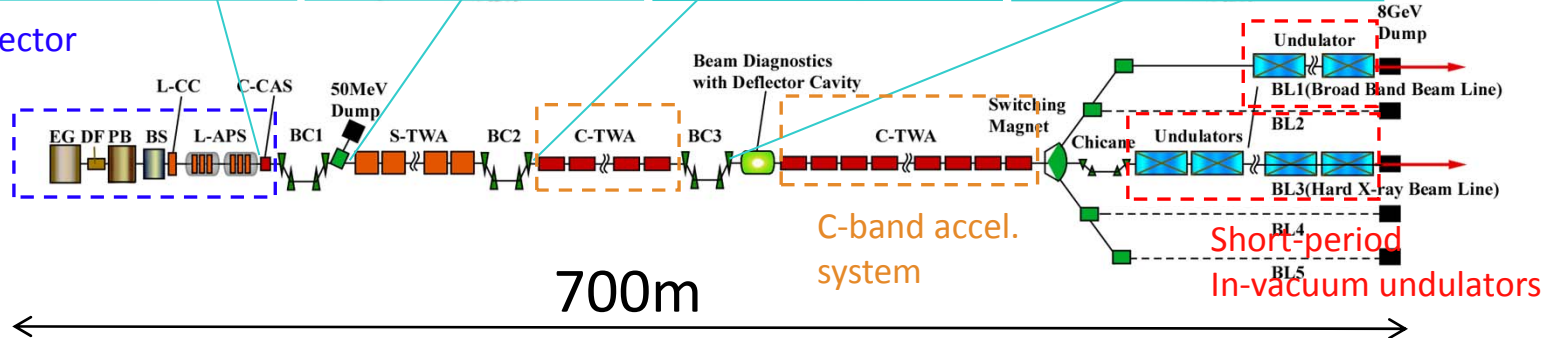
SPring-8 1997~
3rd Generation SR Light Source

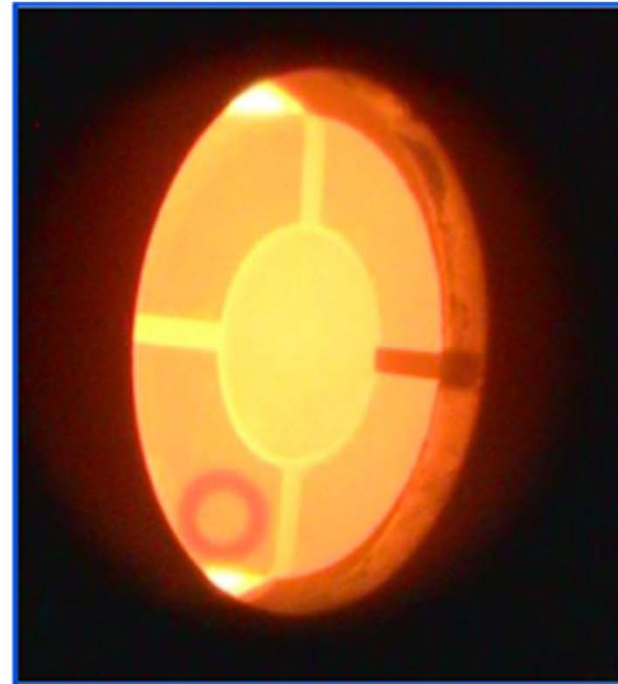
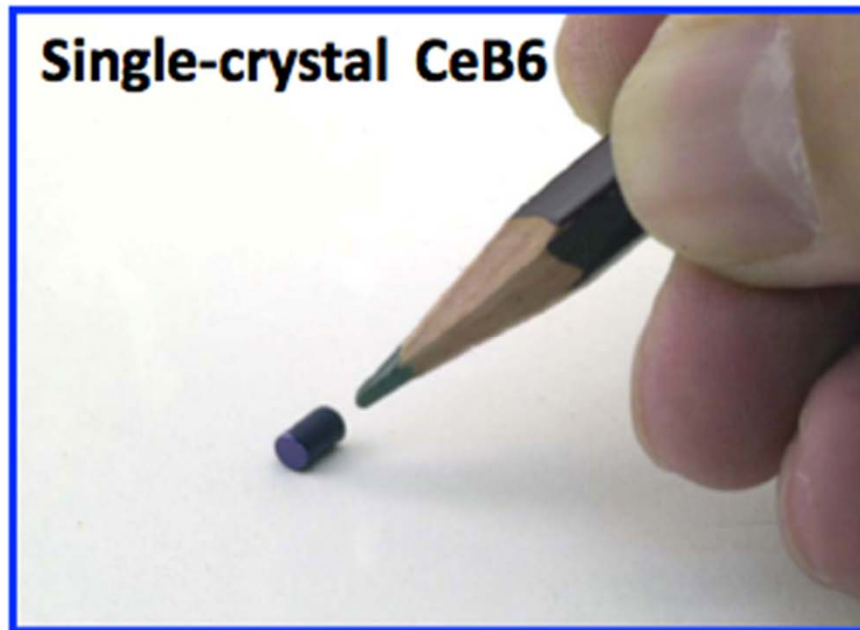
SACLA 2011~
X-ray Free Electron Laser

SACLA System



Low emittance injector
with CeB6 E-gun



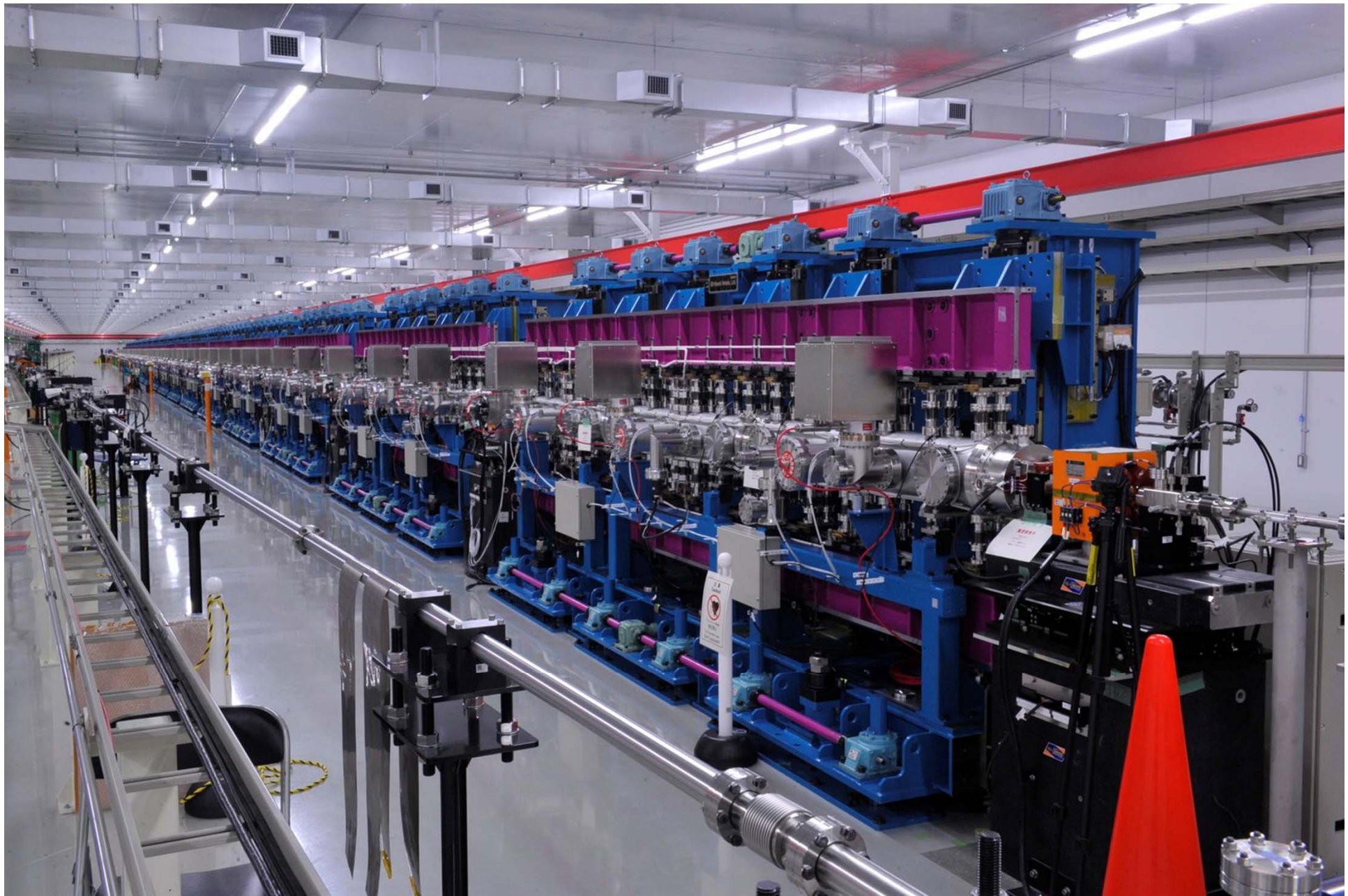


3 mm diameter CeB6 cathode, emits 1 A DC beam (long pulse) in 500 kV gun.



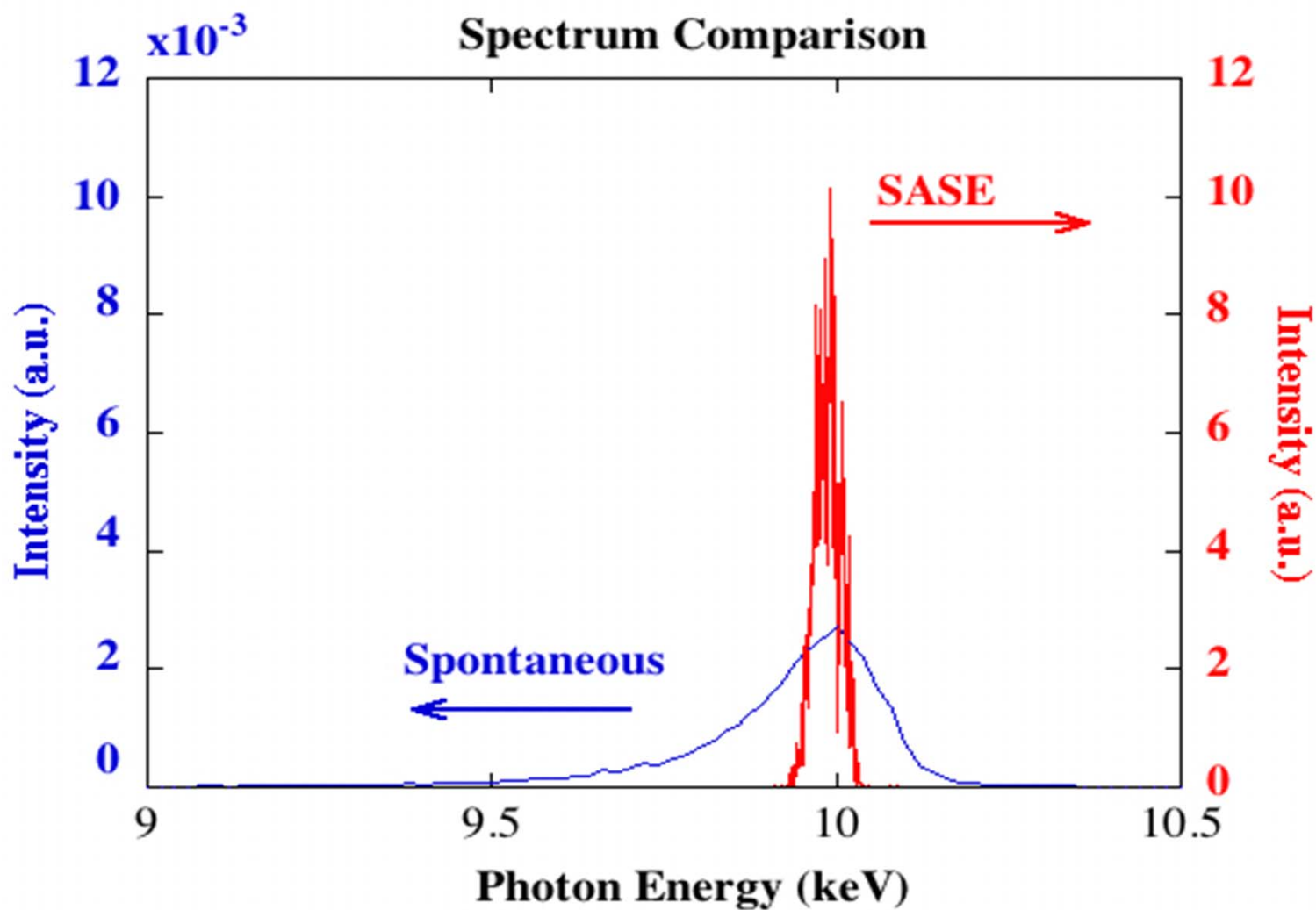
400m, 8 GeV Accelerator with C-band running at 35 MV/m



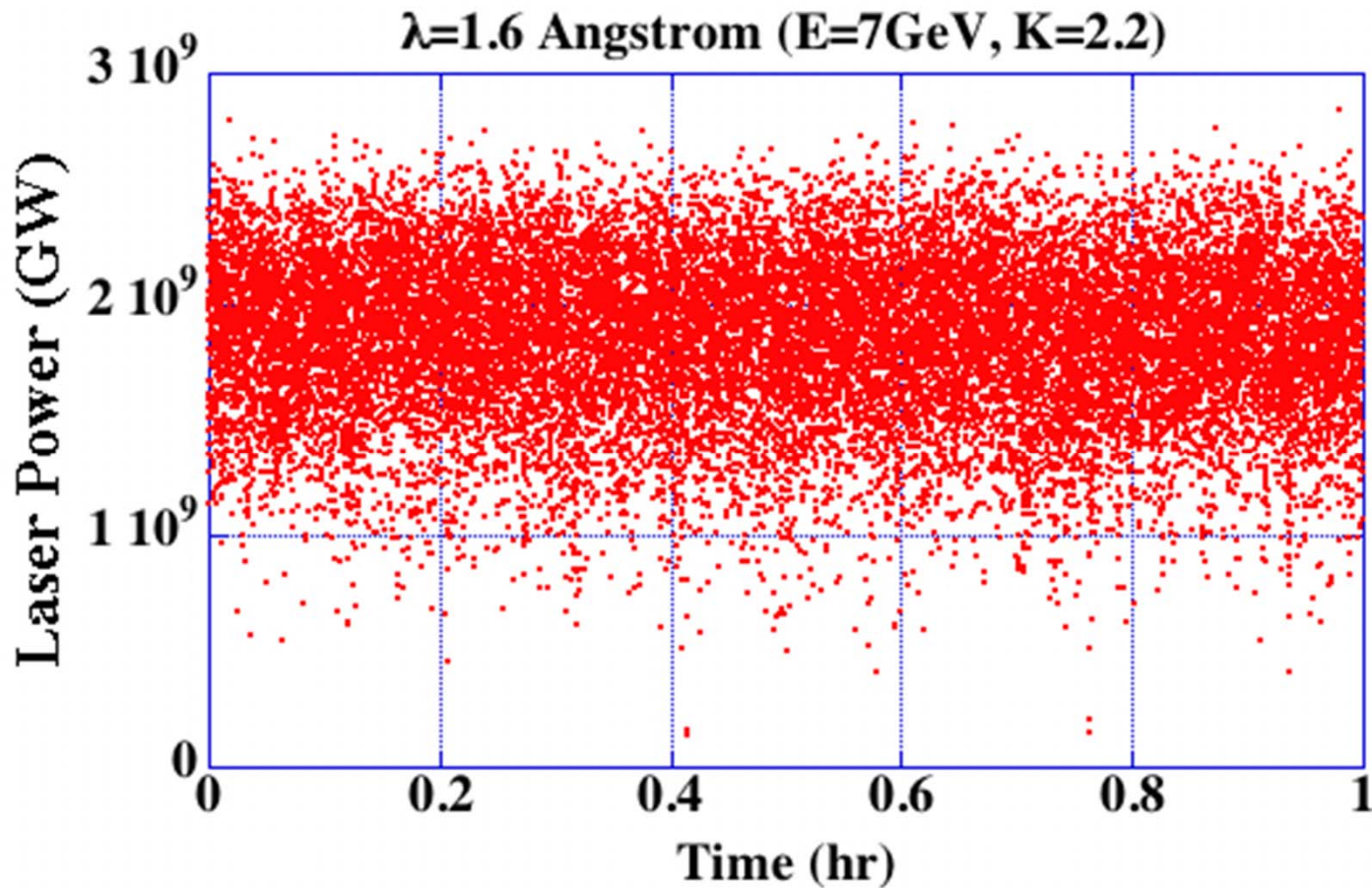


In Vacuum undulator, 5 m x 19 unit

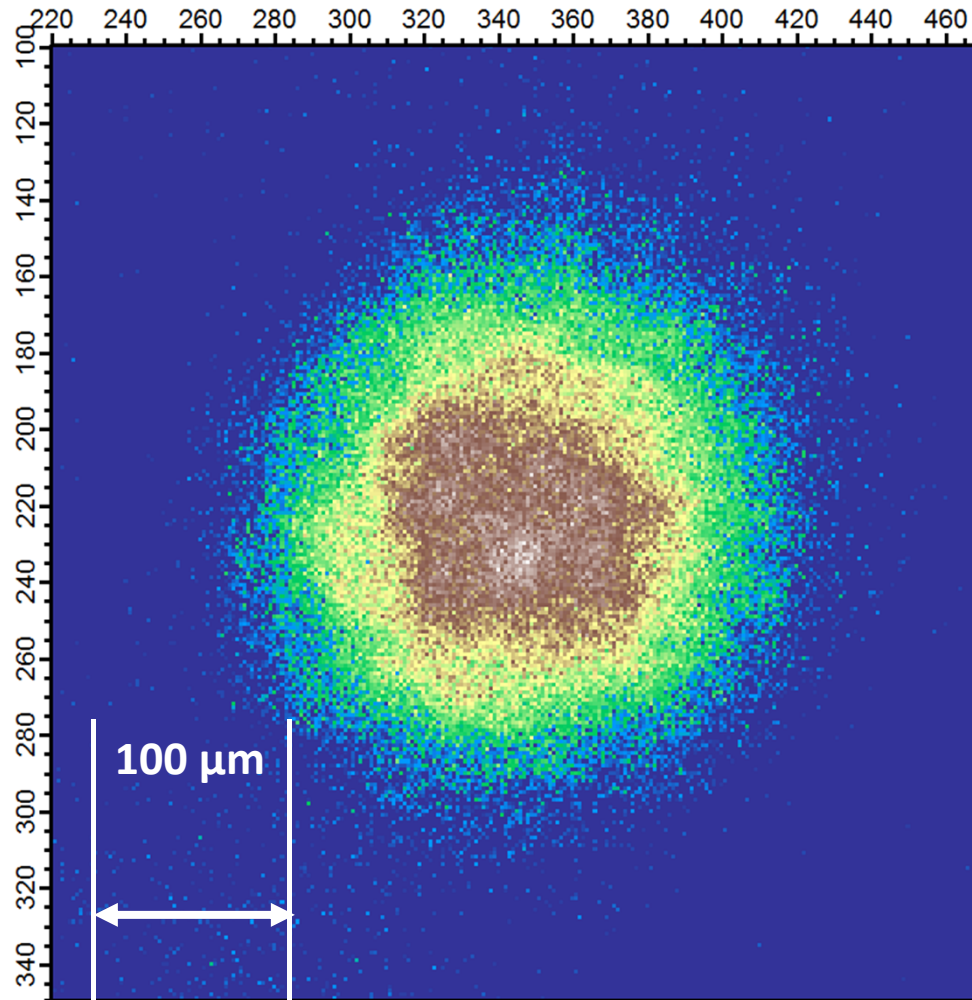
Laser Spectrum (K=1.8)



X-ray laser intensity trend.



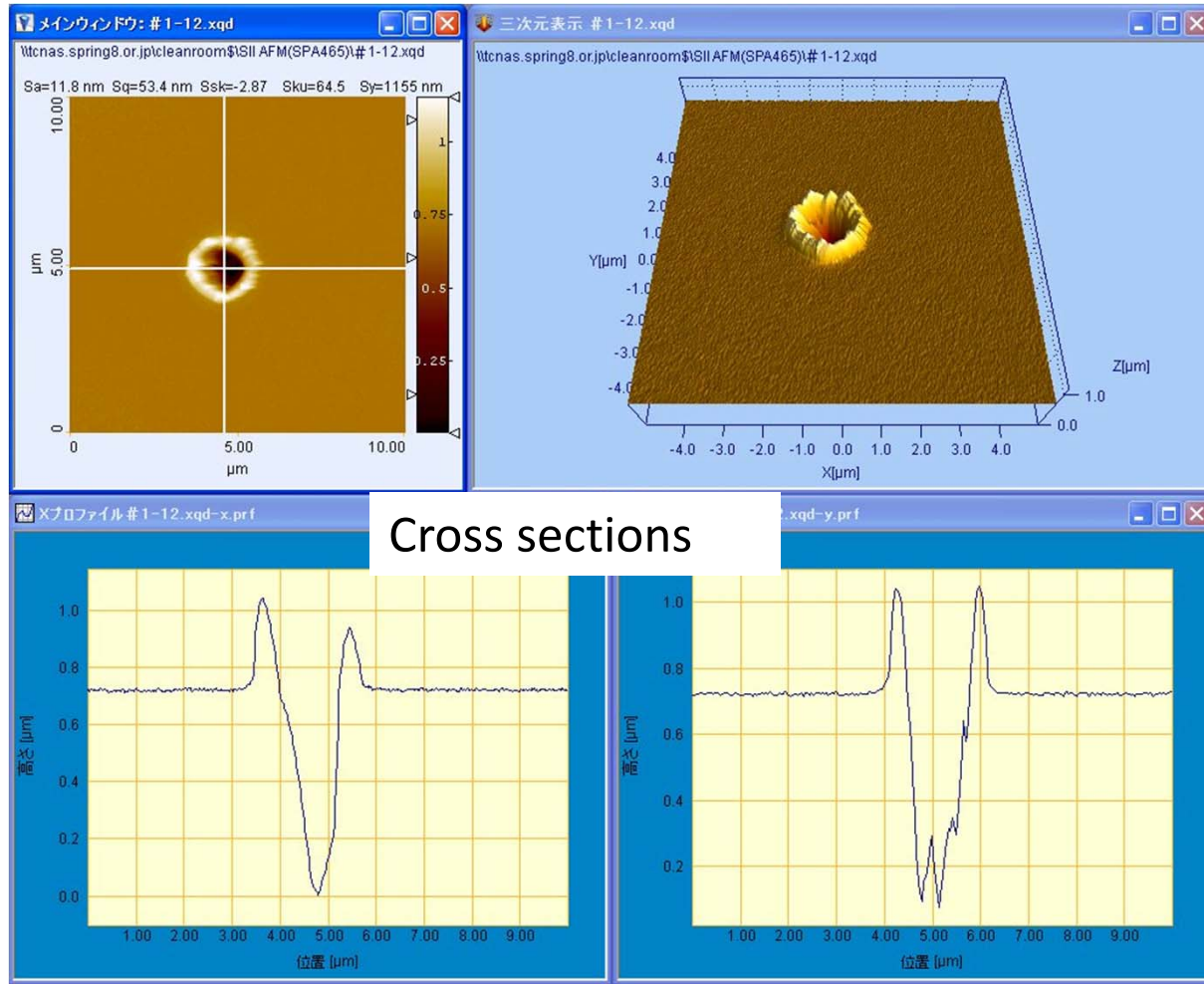
Spatial Profile



Photon energy: 10 keV
110 m from exit of ID18

X-ray Laser Beam Focus

Focused down to $1.1\ \mu\text{m} \times 0.9\ \mu\text{m}$ (FWHM)



**Ablation pattern
by focused XFEL on
gold-deposited film**

Collaboration with Osaka
Univ. (Prof. Yamauchi) and
Univ. Tokyo (Prof. Mimura)
(MEXT「X線自由電子レーザー
利用推進研究課題」/ RIKEN
「SACLA利用装置提案課題」)

Achieved Results

- Laser power amplification at wavelengths from 1.6 to 0.8 Angstroms
- Maximum laser power ~ 4 GW
- Intensity fluctuation ~ 18 %
- Laser being reproducible
 - w/o beam FB keeping the peak current
 - at $\sim 25\%$ of peak intensity