

SACLA

I. Introduction

SACLA is the world's second X-ray free electron laser (XFEL), following the Linac Coherent Light Source (LCLS) in the US. Currently, these are the only two XFELs in operation. SACLA delivers the shortest wavelength XFEL. SACLA achieved its first lasing on June 7, 2011, within three months of electron beam commissioning, and launched user operations from 2012A. The user selection system for SACLA is based on that used by SPring-8. SACLA has an independent proposal review committee, the SACLA Proposal Review Committee (SACLA PRC), which reviews all received proposals.

II. Machine Operation & Beamlines

Our third year of operations proceeded without any significant issues. Operation statistics are summarized in Table 4. The ratio of downtime to user time was kept below 6.6%, a reasonably low rate for linac-based light sources.

Table 4. Operation statistics for FY2014

	Time (h)
Total operation time	6258
User time	3600
Facility tuning time	382
Study time	2276
Downtime	237 (6.6% of user time)

In 2014, two beamlines, BL3 for XFEL and BL1 for broadband spontaneous light, were open for users, while all experiments were conducted with BL3. As the newest beamline, construction of BL2 was completed during the summer shutdown, and first laser amplification was achieved on October 21.

III. User Program and Statistics

SACLA calls for public use proposals twice per year. Proposals fall into two categories: General Proposals for general research with no specific research theme, while Priority Strategy Proposals are on strategic themes that are designated by the national policy. Currently there are two strategic themes: Hierarchical Structure Dynamics of Biomolecules and Pico/Femto Second Dynamic Imaging. Table 5 shows the research themes for each group are as follows:

Table 5. Research themes for each group

1. Hierarchical Structure Dynamics of Biomolecules	1-1 Structural Analysis of Drug-targeted Membrane Protein Nanocrystals
	1-2 Imaging of Whole Cell and Its Components in the Living State
	1-3 Single Molecule Structural Analysis of Supramolecular Complex
	1-4 Dynamics Research Combining Single Molecule X-ray Diffraction Experiments and Supercomputer Analysis
	1-5 Dynamic Structural Analysis Using Pump-Probe Techniques
2. Pico/Femto Second Dynamic Imaging	2-1 Gas-Phase/Liquid-Phase/Solid-Phase Reaction Dynamics
	2-2 Ultrafast Interface Reaction Processes
	2-3 Charge Generation/Charge Transfer Dynamics
	2-4 Ultrafast Processes under Extreme Conditions
	2-5 Dynamic X-ray Spectroscopy

Table 6, Figs. 6 and 7 provide statistics on proposals, users, and beamtime. Among the proposals carried out, the number of general proposals were 13, 8, 9, 11, 8, and 12 during 2012A, 2012B, 2013A, 2013B, 2014A, and 2014B, respectively.

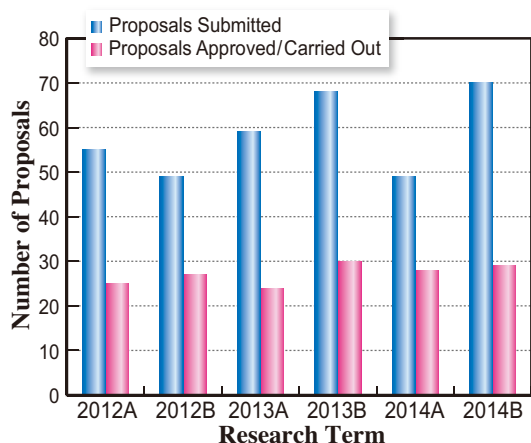


Fig. 6.

Table 6. Number of proposals submitted, proposals approved/carried out, cumulative users and beamtime available by research term

Half-year Research Term	Proposals Submitted	Proposals Approved/Carried Out	Cumulative Users	Beamtime Carried Out (Shifts)
2012A	55	25	297	126
2012B	49	27	461	154
2013A	59	24	268	117
2013B	68	30	410	139
2014A	49	28	400	147
2014B	70	29	430	140

One shift = 12 hours at SACLA beamlines

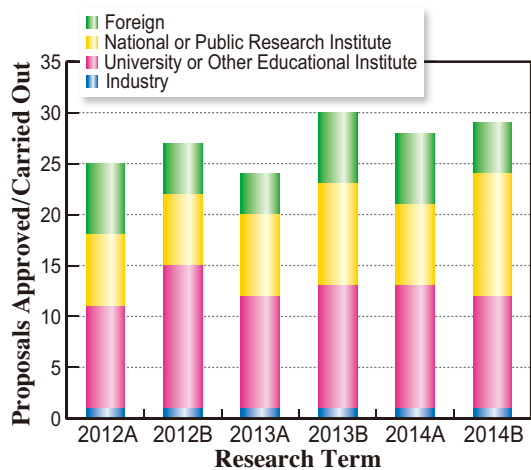


Fig. 7.

IV. Research Outcome

In 2014, 16 papers were published as user scientific activities at SACLA, while 4 papers were reported from the SACLA facility. They include 10 reports appeared in Nature-related journals and Physical Review Letters.

