

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 second year of operations proceeded without any significant issues. Operation statistics are summarized in Table VI. The ratio of downtime to user time was kept below 7.3%, a reasonably low rate for linac-based light sources.

Table VI. Operation statistics for FY2013

	Time (h)
Total operation time	7017
User time	3459
Facility tuning time	860
Study time	2698
Downtime	252 (7.3% of user time)

In 2013, two beamlines, BL3 for XFEL and BL1 for broadband spontaneous light, were open for users, while all experiments were conducted with BL3. The key components, the 1- μ m focusing system and the synchronized optical laser system, were utilized for many experiments.

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 the Priority Strategy Proposals for strategic themes identified based on national policy. Currently there are two strategic themes: Hierarchical Structure Dynamics of Biomolecules and Pico/Femto Second Dynamic Imaging. Table VII shows the research themes for each group are as follows:

Table VII. 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 VIII, Figs. 18 and 19 provide statistics on proposals, users, and beamtime. Among the proposals carried out, the number of general proposals were 13, 8, 9, and 11 during 2012A, 2012B, 2013A, and 2013B, respectively.

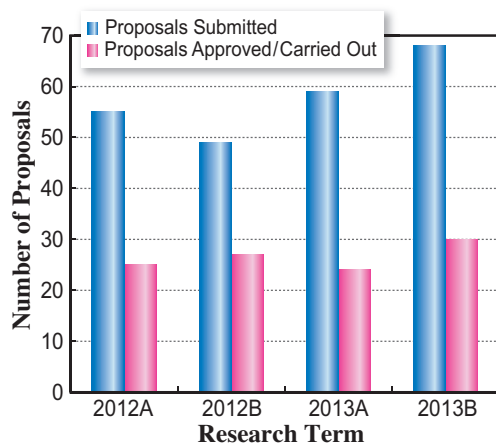


Fig. 18.

Table VIII. 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

One shift = 12 hours at SACLA beamlines

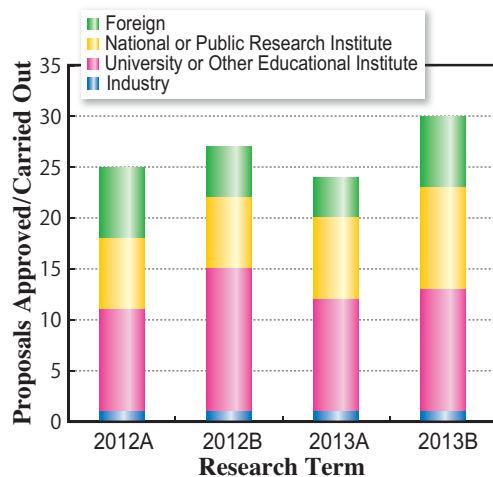


Fig. 19.

IV. Research Outcome

Fifteen original papers were published and registered in the SACLA information database. These include two papers in Physical Review Letters (see Chemical Science in this volume, pages 78 and 80), one in Nano Letters, and one in Nature Photonics.

