Progress and future perspective of SACLA

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SACLA (SPring-8 Angstrom Compact free-electron LAser) started its operation in 2011 as the second XFEL facility after LCLS [1]. The SACLA facility covers a wide spectral range from soft x-ray to hard x-ray and provides a unique light source, such as a two-color XFEL, to user experiments. The undulator hall of SACLA can accommodate up to five undulator beamlines and three of them, BL1$\sim$3, have been installed so far. BL1 is a soft x-ray FEL beamline from 20 to 150 eV driven by a dedicated 800 MeV linac, which is the former SCSS accelerator [2]. BL2 and BL3 are XFEL beamlines ranging from 4 to 15 keV. These three beamlines are operated in parallel to meet the increasing demands for XFEL user experiments [3].

The electron beam energy of the SACLA main linac is changed between 6 and 8 GeV according to the XFEL photon energy. The typical laser pulse output is 500$\sim$700 uJ at 10 keV with a pulse duration of sub 10 fs (FWHM). Since SACLA employs variable gap in-vacuum undulators with 18 mm period, simultaneous lasing at two different wavelengths is possible with an adjustable temporal separation of 0$\sim$200 fs [4]. This two-color XFEL operation offers an ideal light source for x-ray pump x-ray probe experiments.

In the parallel operation, a kicker magnet switches the two XFEL beamlines from pulse to pulse to share the 60 Hz electron beam of the SACLA main linac. In addition to undulator K-values, the beam energies and lengths of the electron bunches are independently adjusted for each beamline to ensure wide spectral tunability and obtain optimum laser performance [5].

In future, SACLA is planned to be used as a low-emittance injector of the upgraded SPring-8. The beam injection test will start in September 2018 using the present SPring-8. For the topping-up operation, one electron bunch is sent to the SPring-8 storage ring every few seconds upon request, while keeping the XFEL operation.

In this talk, current status and future perspective of SACLA will be presented.

References

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