SACLA

We are pleased to inform you of the dedication of the XFEL facility in March 2011. It was almost on time and within budget, which is exceptional for a project of this scale, although the delivery of a small portion of the hardware was delayed because of the big earthquake and tsunami on 11th March. The facility was named SACLA, after 'SPring-8 Angstrom Compact free electron LAser'. We decided to start the user operation of SACLA from March 2012. Preparation toward user operation started accordingly. The RIKEN-JASRI joint project team for XFEL construction dissolved when the construction was completed. The management and commissioning tasks were decided to be taken by a new XFEL division set up in the RIKEN SPring-8 Center. Since the technical phase of the facility was not very much matured and needed much R&D works for several years in contrast to SPring-8, RIKEN decided to operate the facility by itself in order to find out possible improvement effectively.

Electron beam commissioning went smoothly. By the end of March 2011, we reached the design operation energy 8 GeV, and recorded the spontaneous radiation from undulators with the 8 GeV electron beam. With the help of the X-ray image detectors and double-crystal monochromator already installed in the photon beamline and waiting for the beams, we were able to measure the undulator spectrum and observe the circular off-resonance monochromatic radiation patterns from each undulator module to determine precisely the magnetic field parameter. We have developed a new method of beam-based alignment toward the SASE lasing using the monochromatic undulator radiation pattern to adjust the magnetic field of each of the 18 undulator modules independently. We observed the first SASE laser amplification at 0.12 nm on 7th June 2011, which was the world equal record of the shortest laser wavelength at that time attained at LCLS. The following tuning process of the accelerator and undulator made it possible to observe the lasing at 0.063 nm at the end of October 2011.

In addition to the development of the SASE FEL light source, photon beamlines and end-station equipment were developed to meet various users' needs from different application fields. Ultrafast optical lasers were prepared in the experimental hall for pump-probe measurements. Octal-module X-ray CCD detectors with 60 Hz read-out capability were equipped to make coherent X-ray diffraction imaging and other imaging experiments. A Kirkpatrick-Baez X-ray focusing mirror was installed and produced the focused beam with a focal size of 1 μm $\times$ 1 μm. A number of end-station instruments have been developed in collaboration with outside researchers all over Japan. These include AMO, Pump-Probe, and Imaging instruments. Commissioning of these end-station instruments has been carried out after September 2011 by teams sometimes including foreign collaborators. One example is the Tohoku-Kyoto-MPI collaboration team for AMO instruments. Another example is the AIST-DESY-PTB-RIKEN collaboration team for pulse energy measurement, producing three types of inter-calibrated detectors using an AIST calorimeter as a standard.

The prototype EUV-FEL has been used by many users. It should be noted that this facility recorded the world's first seeded operation of SASE EUV-FEL by using HHG. We are planning to deliver seeded SASE-FEL to general users in the near future.

Last but not least, our accelerator designer, Dr. Tsumoru Shintake, moved to Okinawa Institute for Science and Technology (OIST) in September 2011. We miss him a lot and wish him to open another new world.

Tetsuya Ishikawa