1. Accelerator

In FY2019, the system integration of the two accelerators, SPring-8 and SACLA, has continued toward the realization of the SPring-8-II upgrade. The first step is to achieve the SACLA injection, which will enable beam injections from the time-shared SACLA linac to the current ring for SPring-8 user operations. A beam test for the SACLA injection during regular user operations was scheduled for February 2020. Prior to the test, all the necessary systems, including the radiation safety interlock, were modified. The beam test was conducted as planned, but unfortunately had to be suspended due to electron gun cathode trouble. Although a stable operation without serious trouble was achieved, the test period was only 24 hours, which was too short. The next test, which must occur over a longer time period of two weeks or more, is scheduled for the beginning of FY2020 to confirm stable and reliable user operations with the SACLA injection.

One of the most critical issues to realize a practical SACLA injection is to constantly provide high-performance XFELs, which meet the user requirements that vary by the experiment and by the timeshared multi-beamline operations. During such operations, it is impossible to stop the linac operation for tuning the components in the tunnel and undulator hall, or to conduct destructive beam measurements. To establish a highly efficient beam tuning procedure that does not seriously disturb operations conducted in parallel, we investigated updates to the parameter optimization programs and the linac hardware systems, including magnet power supplies, beam monitors, and beam collimators.

Another important issue for accelerator system integration is to provide NewSUBARU with an injection beam of 1 GeV. This will enable the shutdown of the dedicated injector complex, 1-GeV linac, 8-GeV booster synchrotron, and ancillary facilities. To complete the new compact C-band linear acceleration system by the end of 2020, which will serve as a prototype of the 3-GeV SX (Soft X-ray) SR source in the Aobayama campus of Tohoku University, high power RF equipment such as a klystron, modulator, and PFN charger was installed in the NewSUBARU Klystron Gallery building.

In parallel to the above activities, several developments and modifications were implemented to improve the current and future ring performance. An advanced correction scheme on the ID lookup table using an adaptive feedforward concept was developed to suppress the orbit variations caused by independent tuning of ID23 and ID25. The final beam test showed a sufficient performance to keep the variations less than several microns in rms. A safe and reliable beam abort scheme for a high-density electron beam with a small emittance, which is critical for a next generation SR source, was also investigated, and the design of the beam abort scheme was completed.

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