Preface

The Synchrotron Radiation Laboratory (SRL) of the Institute for Solid State Physics (ISSP) advances novel materials research by developing soft X-ray spectroscopic techniques using the high-brilliance synchrotron radiation source and soft X-ray lasers at three locations in Harima, Sendai, and Kashiwa.

In the Harima office, the world's highest performance fast polarization-switching soft X-ray undulator beamline was used for the joint-research use until August 3, 2022, and then transferred to RIKEN, where R&D of a soft X-ray spectroscopic imaging station has started in collaboration with RIKEN SPring-8 from the end of 2022. At the X-ray free electron laser facility, SACLA, nonlinear soft X-ray spectroscopy was developed, exploring its science and technology as a new spectroscopy method.

To advance measurement techniques in the soft X-ray region, the Sendai Office opened next to the new 3GeV X-ray source facility “NanoTerasu” which is under construction on Tohoku University's Aobayama new campus in November 2022. The ambient-pressure photoelectron spectroscopy station, high-resolution soft X-ray emission spectroscopy station, and the three-dimensional nanoESCA station were relocated from SPring-8 to the NanoTerasu. We will continue to strive for higher performance than our prior targets, including high pressure (up to 100 mbar), high spatial resolution (up to 70 nm), and high energy resolution ($E/\Delta E \approx 10{,}000$), and planning to begin operations in April 2024.

In addition to the cutting-edge activities using synchrotron radiation and SACLA, the SRL has promoted the scientific use of laser-based high-harmonic generation in the vacuum ultraviolet and soft X-ray regions at the E-building of the Kashiwa campus, in collaboration with Kobayashi and Itatani laboratories at the LASOR laser group. Since 2015, the SRL has operated a joint research program using the high-resolution laser spin- and angle-resolved photoelectron spectroscopy (SARPES) system, which is designed to provide high-energy (1.7 meV) and -angular resolutions with high-efficiency spin detectors for various types of solids, such as spin-orbit coupled materials and ferromagnetic materials. We also developed a two-dimensional angle- and time-resolved photoemission spectrometer and made it available for joint-research use since 2022.

Our goal is to provide users with a platform that uses both synchrotron radiation and high-harmonic laser generation through strong collaboration with other LASOR group members.

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