

## Preface



This Activity Report covers scientific and technological activities carried out using the UVSOR-III Synchrotron in FY2023 (April 2023 - March 2024). We present scientific examples of how the users study at the UVSOR Synchrotron Facility.

The present UVSOR-III Synchrotron is one of the most advanced low-energy SR facilities of the 3<sup>rd</sup> generation SR in the world and is now one of the critical resources to accelerate the investigation of molecular science. The UVSOR-III Synchrotron has a small electron storage ring but has powerful 6-undulator beamlines (3 VUV and 3 in-vacuum soft X-ray undulators) with 7-dipole beamlines. The BL2B of ARPES beamline has been closed for user operation, the function for the ARPES for organic materials has been moved to BL4B. We continue improving and upgrading our micro- and nano-scale photoabsorption and photoemission approaches and in situ/operando measurements in the IR, VUV, and soft X-ray regions, based on our strategic international collaboration program in molecular

science. We will also carry out a feasibility study to develop the instrumentation to be adopted for a complicated and inhomogeneous sample system. Since winter 2023, the beam current cannot cover the 300-mA operation due to lower efficiency of the electron beam injection. We are struggling to solve this problem, but it remains to be unsolved at the moment, and to the operation below 200 mA will have to be maintained till the end of FY2024. We are grateful to all the people who use our facility and support our efforts.

UVSOR operates for 40 weeks/year (ca. 2,200 h user time for 36 weeks), accepts ~230 proposals, about ~500 individual researchers counting total ~5,000 people\*day/year. Most users stay for one or two weeks for experimenting. To continue high-level achievements in science and technology at the UVSOR-III Synchrotron, our in-house staff is constantly committed to maintaining and improving high-performance accelerators and beamlines.

On the experimental side, technological development never stops, hence we will make a progress on the operando and/or imaging-related techniques to inspire advanced molecular science. We have started to construct the new end-station at the undulator-based soft X-ray beamline BL6U since 2020. The cutting-edge instrumentation of the photoelectron momentum microscope (PMM) with a double-hemispherical analyzer with 2D spin detector. The present status of the instrumental development is summarized in this article. In the beamline BL1U, we have conducted in developing the novel light sources, including novel experiments using twin-Undulator configuration to demonstrate atto-second interference experiments. The advanced SR-related instrument will offer opportunities in characterizing the electronic structure of surface atomic sites, thin films, molecular adsorbates, bulk crystals, and so on.

We have discussed to construct the post-UVSOR-III as a long-term plan for sustainable development since 2019 (find the special website\*). In FY2023, we hold several workshops for discussing the perspectives, including UVSOR's 40th anniversary commemorative event\*\* and the annual UVSOR users' meeting with the 6th Next-Facility-Construction Review Meeting entitled "Development of Photoscience in Biosystems" to achieve our goal of merging different fields of life science and photoscience. We look forward to receiving your feedback and suggestions on the continuing evolution of the UVSOR Synchrotron Facility. We hope many users will perform excellent work by fully utilizing the UVSOR-III Synchrotron as a unique international hub for the SR research in advanced molecular science.

\*\*"Next-Generation Facility Home Page"



\*\*\*"Meeting Report: UVSOR Synchrotron Facility 40th Anniversary"



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