Research capabilities and ongoing research of the electron structure at NSRC SOLARIS

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The supervisors of two ARPES beamlines at SOLARIS synchrotron in Poland [1] responsible for their maintenance, commissioning, development, and cooperation with scientists will present the research possibilities of the PHELIX and URANOS beamlines. Those two beamlines are complementary tools to expose the fundamental parameters of electrons: energy, momentum, and spin.

The first beamline, URANOS, operates at 8-170 eV of the energy range, while the second, PHELIX, delivers the light of the energy ranging from 50 to 1500 eV. The spin detector setup at PHELIX already exists, while URANOS will soon be equipped with 3D VLEED spin filters and, additionally, with a 6-axis manipulator operating at extremely low temperatures. Both beamlines provide the possibility of automatic measurements of the multidimensional dispersion relation E(k) with high energy and angular resolution, spectrally pure monochromatic photon beam with a wide range of energy and any polarization, and offer extensive possibilities of in situ sample preparation.

The scope of the research offer includes the study of electronic properties of novel materials for spintronics using synchrotron light, surface states of chiral, layered, topological, magnetic, and quantum well systems, the band structures that could demonstrate the existence of (Kramers-)Weyl, Majorana or Dirac fermions and others, which are responsible for the unusual transport and optical properties.

During the presentation, the technical possibilities (present and future) of both beamlines, including available research methods and instruments for the preparation and investigation of samples will be presented: sample holders, detection methods, measurement temperatures, manipulators possibilities, thin films deposition, gas dosing, etc.

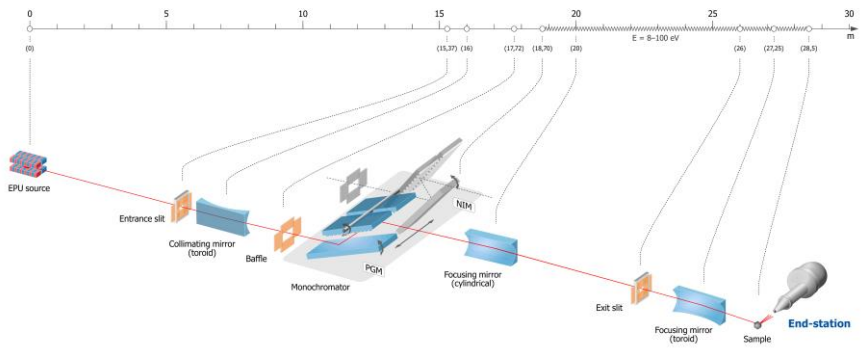

Fig. 1. The layout of the URANOS beamline, which is built (from the right) of the Apple II quasiperiodic undulator, a system of mirrors transferring the photon beam, two monochromators (with a plane and normal geometry), precise exit slits, and an end station with a hemispherical DA30L detector.

[1] J. Szlachetko et al., The European Physical Journal Plus 138, 10 (2023).