UARPES -Angle Resolved Photoelectron Spectroscopy Beamline at the Polish Synchrotron Radiation Facility SOLARIS

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The Angle Resolved Photoelectron Spectroscopy (ARPES) allows for measurements of the energy and the momentum describing the photoelectron over surface. Within a so called sudden approximation these quantities are simply related, to binding energy and quasi momentum of the quantum state occupied by the electron before the photoelectric transition took place. Along these lines electronic band structure of the solid is obtained experimentally. Beside the single electron picture ARPES gives also very detailed insights into complex *electron–electron* and *electron-lattice* interactions in the solid.

Many recent celebrated developments concerning complex or exotic electronic systems, for example: topological matter, graphene, high temperature superconductors, colossal magnetoresistance materials, have been enabled by ARPES studies.

The importance of ARPES technique for contemporary science and technology is widely recognized. Dedicated ARPES beamlines exist at almost all synchrotron radiation centers worldwide. Typically, for these beamlines, the demanded beamtime surpasses the offered one many times. To meet such expected demands a beamline dedicated for Angle Resolved Photoelectron Spectroscopy has been constructed as one of the first at the SOLARIS synchrotron facility. The acronym UARPES (after Ultra-ARPES) is proposed as the name for this research installation. The UARPES beamline is designed to have the following parameters: *energy range of 8-100 eV; resolving power ≥ 20 000 over the full energy range; photon flux on the sample ≥ 5×10^{11} photons/s@20000 RP; available polarizations: linear of any orientation, circular, elliptical; harmonics contamination: < 1%; spot size on the sample: 50 × 200 μm^2*.

Elliptically polarizing, APPLE-II type undulator is implemented as a light source. The undulator has a quasi-periodic geometry for suppression of the harmonics spectral contamination. The monochromator used is combining normal (NIM) and grazing incidence (PGM) optics. The NIM is used in the energy range 8 – 30 eV while the PGM is used in the energy range 25 – 100 eV. The advantages of having the NIM option are: better conservation of the undulator beam polarization, and further reduction of the harmonics spectral contamination at the lowest photon energies .

The beamline endstation is composed of several ultrahigh vacuum chambers designed for sample processing and analysis, as well as for storage and transfer. Cryogenic, 5-axes manipulator is capable of stabilizing the sample temperature in the range 10 – 500 K, as well as of precise positioning of the sample for experiments. State-of-the-art electron energy spectrometer, having the energy resolution up to 1 meV and the angular resolution up to 0.1° is capable of massively parallell recording of angle-resolved data. Low energy electron diffractometer (LEED), with MCP image amplifier, is available for surface structure studies. Sample processing devices allow for typical *in situ* preparation techniques such as sputter cleaning, thermal annealing, thin film growth, sample cleaving, surface reactions in the gas phase.