

A ToF-PAX-RIXS Endstation for Combined ARPES and RIXS Studies at the P04 Beamline

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We report a new ToF-PAX-RIXS endstation at P04 beamline at PETRA III, Hamburg, a development of a promising novel approach to RIXS. It is based on a ToF photoemission microscope (momentum and real space imaging), allowing ARPES and RIXS studies carried out back-to-back. While RIXS is a powerful method for studying low-energy quasiparticle excitations like phonons or magnons, ARPES remains the method of choice for electron band structure investigations. Together they will help characterizing electron-phonon and electron-magnon interactions in strongly correlated material phases (Mott insulators, CDW, high-Tc superconductors).

While conventional RIXS spectrometers rely on large optical grating spectrometers, the PAX (photoelectron spectrometry for analysis of X-rays) method is based on scattered X-ray light spectrum converted into a photoelectron spectrum and can be done in a compact photoemission electron microscope. Moreover, ToF-PEEM setup offers simultaneous multichannel detection in a range of scattering angles and loss energies. In turn, acquired data is more complicated and presents essentially a convolution of two spectra: the sample's inelastic X-ray response and the photoemission spectrum of the converter foil. Reliable high-resolution deconvolution of this data is a critical step of the experiment.

As a benchmark, an undoped CaCuO_2 cuprate film was investigated. Existing RIXS studies have shown distinguishable phonon and magnon resonance peaks at Cu L3 edge in this system. Au, Ag and Pt converter foils have been tested for their performance, all showing promising PAX spectra, and our preliminary data evaluation managed to bring out major RIXS features.

Type of presence

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