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The SXP instrument at the European XFEL, a novel tool to investigate quantum materials

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Quantum materials nowadays hold the key to develop new technologies that satisfy the increasing societal demands in terms of communication and data handling while being sustainable and ecofriendly. The technological development relies on the ultimate understanding of the materials properties as well as on the definition of new pathways to control their properties. Femtosecond time-resolved photoelectron spectroscopy (TR-XPES) with laser sources has proven to be a powerful tool to the understanding and coherent control of quantum materials. However, the accessible photon energies, limited to around 100eV, prevent the full exploitation of this technique. Experiments at higher photon energies with femtosecond time resolution are only possible at MHz free electron lasers due to space charge effects. In this contribution, we present the SXP instrument at the European XFEL conceived as an open port with various interaction points, one of which hosting a TR-XPES setup with a momentum microscope. The photon energy range available at the SASE3 undulator, 0.25keV to 3keV, and the variable polarization will allow the simultaneous characterization of the electronic, magnetic and structural properties of quantum materials. A wide range of laser wavelengths, from the XUV to the THz region, will be available to study dynamics and quantum control.

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