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The NFFA-SPRINT user facility for ultrafast photoelectron spectroscopy in the 17-31 eV photon energy range based on a coherent narrowband light source up to 200KHz repetition rate*

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Implementing all-resolved photoelectron spectroscopy (ARPES, SpinPES, SPARPES) with temporal resolutions, in pump-probe mode, requires dedicated facilities capable to deliver ultrashort photon pulses (~100 fs) in the Extreme Ultraviolet (EUV) region with an adjustable repetition rate up to the MHz range to provide the necessary statistics while maintaining the photoexcitation density safely in the perturbative linear regime. We have built the NFFA-SPRINT versatile UHV twin-beamline setup for advanced photoemission experiments based on table-top laser HHG source operating in the EUV range (17-31 eV) with repetition rate up to 200 kHz. Two end stations provide ARPES spectrometers, Vectorial Spin Polarimeters and surface science facilities, including UHV transfer from PLD/MBE growth systems. The operational set-up, opened to international users in 2019, has proven to deliver monochromatic EUV pulses shorter than 100 fs and with energy resolution of 18 meV in experiments on transition metals and topological insulators. Thanks to the high repetition rate, these features are fully exploitable for space-charge free PES/ARPES experiments i.e. with space-charge broadening effects reduced below the energy resolution of the measurements.

The high tunability multi-OPA configuration allows the realization of the first pump/probe experiments on various materials, from nanoparticle to thin films, from ferromagnetic structures to semiconductors.

*<https://www.trieste.nffa.eu/techniques/spectroscopy/time-resolved-pes-and-spin-polarization-sprint/>

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