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Time-resolved ARPES at the Advanced Laser Light Source (ALLS) user facility –new insights into the ultrafast quench of superconductivity in Bi-based cuprates

Wednesday 29 May 2024 11:30 (30 minutes)

Time- and angle-resolved photoemission spectroscopy (TR-ARPES) is a powerful technique for exploring intrinsic and light-induced electrodynamics in quantum materials [1]. In this talk, I will present the novel TR-ARPES endstation and the Advanced Laser Light Source (ALLS) user facility. I will show how, by combining sample voltage bias and a hemispherical electron analyzer with next generation deflector technology, we are able to probe a large fraction of the momentum space of quantum materials even with low photon energy ultraviolet light (6 eV).

This technical capability allowed us to investigate electron dynamics driven by mid-infrared light in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+x}$ (Bi2212), the prototypical high-temperature cuprate superconductor, far beyond the near-nodal region previously explored [2,3]. I will present preliminary results on the momentum dependence of the light-induced melting of the long-range coherent of the macroscopic superconducting condensate. This study demonstrates the state-of-the-art capabilities of the TR-ARPES endstation at ALLS and provides new insights into the transient evolution of electron interactions in cuprates.

[1] Boschini, Zonno, Damascelli arXiv:2309.03935 (to appear in Reviews of Modern Physics)

[2] Smallwood et al., Science 336, 1137-1139 (2012)

[3] Boschini et al., Nature Materials 17, 416-420 (2018)

Keyword-1

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Keyword-2

cuprates

Keyword-3

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