Electronic signatures of the quasiparticles in the iron-chalcogenide superconductors

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Iron-chalcogenide superconductors of the FeSe family provide an exciting platform to investigate the high-temperature superconductivity that often emerges from intertwined electronic nematic and spin-density wave orders. Tuning parameters, such as applied pressure and chemical pressure [1,2], can be used to explore the phase diagram and establish the characteristics of the normal state quasiparticles. In this talk, I will present quantum oscillations studies under high applied hydrostatic pressure in $FeSe_{1-x}S_x$ using magnetotransport and tunnel diode oscillator experiments up to 45T [3,4,5]. I will discuss the evolution of the Fermi surface and the quasiparticle effective masses in the vicinity of the nematic end point as well as inside the high-pressure phase where superconductivity is enhanced. I will compare phase diagram of different systems and discuss the role of Cu impurity scattering [6,7]. These studies emphasize the robustness of the high-temperature superconducting phase, the role of the electronic correlations as well as the characteristics of the anomalous normal electronic phases.

References

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