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Observation of van Hove singularity and quasiparticle interference in KFe2As2 superconductors revealed by STM/STS measurements
HAI-HU WEN, DELONG FANG, ZENGYI DU, ZHENYU WANG, HUAN YANG, XIAXIN DING, Nanjing University — We have conducted STM/STS investigations on the KFe_2As_2 superconducting single crystals down to 0.45 K under magnetic field. Clear electronic standing waves have been observed allowing us to investigate the quasiparticle interference (QPI). Interestingly we observed a sharp peak of local density of states (LDOS) near the Fermi energy showing evidence of strongly enhanced DOS both below and above Tc. We demonstrate that this is induced by a van Hove singularity with the saddle point locating only 4 meV below the Fermi energy. Below Tc it is found that only 20% of the normal state DOS is gapped away by superconductivity, with the major part of DOS due to VHS ungapped. Combing with the ARPES data, we find that the VHS points locate on the (π,0) point, which gives strong constraint on the gap function and pairing mechanism. In the mixed state we clearly observed the mixture of vortices and the standing waves due to quasiparticle interference, giving support to above picture. In collaboration with X. Shi, P. Richard, T. Qian and H. Ding et al. in Institute of Physics, CAS.

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