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Quasiparticle Interference and Strong Electron-Mode Coupling in the Quasi-One-Dimensional Bands of Sr_2RuO_4 ZHENYU WANG, MELINDA RAK, PETER ABBAMONTE, EDUARDO FRADKIN, VIDYA MADHAVAN, University of Illinois Urbana-Champaign, DANIEL WALKUP, Boston College, PHILIP DERRY, Oxford University, YOSHITERU MAENO, Kyoto University — Sr_2RuO_4 has attracted a great deal of interest as a spin-triplet superconductor with an order parameter that may potentially break time reversal invariance and host half-quantized vortices with Majorana zero modes. While the actual nature of the superconducting state is still a matter of controversy, it has long been believed that it condenses from a metallic state that is well described by a conventional Fermi liquid. In this talk we use a combination of Fourier transform scanning tunneling spectroscopy (FT-STS) and momentum resolved electron energy loss spectroscopy (M-EELS) to probe interaction effects in the normal state of Sr_2RuO_4. Our high-resolution FT-STS data show signatures of the β-band with a distinctly quasi-1D character. The band dispersion reveals surprisingly strong interaction effects that renormalize the Fermi velocity, suggesting the normal state is a 'correlated metal' where correlations are strengthened by the quasi 1D nature of the bands. In addition, kinks at energies of approximately 10meV, 38meV and 70meV are observed. By comparison with M-EELS data we show that the two higher energy features arise from coupling with collective modes. This work opens up a unique approach to reveal the superconducting order parameter in this compound.

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