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Precision microwave spectroscopy of the heavy fermion superconductor $CeCoIn_5$ reveals nodal quasiparticle dynamics COLIN TRUNCIK, WENDELL HUTTEMA, PATRICK TURNER, Simon Fraser University, SIBEL OZCAN, University of Cambridge, NATALIE MURPHY, PAUL CARRIERE, ERIC THEWALT, KEVIN MORSE, Simon Fraser University, JOHN SARRAO, Los Alamos National Laboratory, DAVID BROUN, Simon Fraser University — $CeCoIn_5$ is a heavy fermion superconductor with strong similarities to the high-T_c cuprates, including quasi-two-dimensionality, proximity to antiferromagnetism, and probable d-wave pairing arising from a non-Fermi-liquid normal state. Each system therefore forms an important testing ground for ideas relevant to the other system. Experiments that allow detailed comparisons of electronic properties are of particular interest. Here we use low temperature microwave spectroscopy to carry out a high-resolution study of the charge dynamics of the $CeCoIn_5$ superconducting state. The similarities to cuprates, in particular to ultra-clean $YBa_2Cu_3O_y$, are striking: the frequency and temperature dependence of the quasiparticle conductivity are instantly recognizable, a consequence of rapid suppression of quasiparticle scattering below T_c; and penetration depth data, when properly treated, reveal a clean, linear temperature dependence of the quasiparticle contribution to superfluid density. The measurements also expose key differences, including prominent multiband effects and a temperature-dependent mass renormalization.

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