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Nodal quasiparticle dynamics in the heavy fermionsuperconductor $CeCoIn_5$revealed by precision-microwave spectroscopy

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$CeCoIn_5$ 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. Experiments allowing detailed comparisons of the electronic properties of these two types of superconductor are of particular interest, but in most cases are difficult to realize, due to their very different transition temperatures. Here we use low-temperature microwave spectroscopy to study 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 renormalization of the quasiparticle mass. C.J.S. Truncik et al., Nat. Comm. 4, 2477 (2013).