

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Vertical line nodes in the superconducting gap structure of Sr_2RuO_4 LOUIS TAILLEFER, PATRICK BOURGEOIS-HOPE, SAMUEL RENE DE COTRET, GAEL GRISSONNANCHE, NICOLAS DOIRON-LEYRAUD, University of Sherbrooke, Sherbrooke, Canada, ELENA HASSINGER, MPI, Dresden, Germany, HARUKA TANIGUCHI, MUHAMMAD ANWAR, YOSHITERU MAENO, Kyoto University, Kyoto, Japan — We report thermal conductivity measurements on single crystals of Sr_2RuO_4 down to 50 mK for currents parallel and perpendicular to the c axis. We observe substantial quasiparticle transport in the $T = 0$ limit for both current directions. A magnetic field H immediately excites quasiparticles with velocities both in the basal plane and in the c direction. Relative to the normal state, the thermal conductivity of the superconducting state is found to be virtually the same for the two current directions. These findings show that the gap structure of Sr_2RuO_4 consists of vertical line nodes. Our data down to $T_c/30$ and $H_{c2}/100$ show no evidence that the nodes would instead be deep minima. Given that the c -axis dispersion of the Fermi surface in Sr_2RuO_4 varies strongly from surface to surface, the small $a - c$ anisotropy suggests that the line nodes are present on all three sheets of the Fermi surface. If imposed by symmetry, vertical line nodes would be inconsistent with a p -wave order parameter, but they are consistent with a d -wave state. To reconcile the gap structure revealed by our data with a p -wave state, a mechanism must be found that produces accidental line nodes in Sr_2RuO_4 , present for any strength of impurity scattering.

Louis Taillefer
University of Sherbrooke

Date submitted: 11 Nov 2016

Electronic form version 1.4