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**Anomalous quasiparticle transport in the superconducting state of $CeCoIn_5$** YUICHI KASAHARA, Department of Physics, Kyoto Univ., YASUYUKI NAKAJIMA, ISSP Univ. of Tokyo, KOICHI IZAWA, CEA-Grenoble, ISSP Univ. of Tokyo, KAMRAN BEHNIA, Laboratoire de Physique Quantique (CNRS) ESPCI, ISSP Univ. of Tokyo, YUJI MATSUDA, Kyoto Univ., ISSP Univ. of Tokyo, HIROAKI SHISHIDO, RIKIO SETTAI, YOSHICHIKA ONUKI, Osaka Univ. — To investigate the quasiparticle dynamics in the superconducting state of quasi-two dimensional heavy fermion superconductor $CeCoIn_5$, the thermal Hall conductivity $\kappa_{xy}$ is measured. In zero magnetic field, thermal Hall angle shows up a steep increase below $T_c$, indicating that the quasiparticle mean free path is strongly enhanced. In spite of the presence of a periodic vortex lattice, this enhancement is easily suppressed by a very weak magnetic field. We found that the density states of the delocalized quasiparticles $N_{\rm del}$, which is obtained from $\kappa_{xx}$ and $\kappa_{xy}$, exhibits a $\sqrt{H}$- dependence, indicating a Volovik effect. Moreover, $\kappa_{xy}$ reveals the scaling relation with respect to $T/\sqrt{H}$, which is expected for $d$-wave symmetry. These results provide a further support for $d$-wave superconducting symmetry in $CeCoIn_5$. We also argue that a small Fermi energy, a short coherence length, and a long quasiparticle mean free path all indicate $CeCoIn_5$ is in the superclean regime. These results highlight that $CeCoIn_5$ is unique among superconductors.

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