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Colossal thermomagnetic response in chiral d-wave superconductor URu_2Si_2[1]

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The heavy-fermion compound URu_2Si_2 exhibits unconventional superconductivity at $T_c = 1.45$ K deep inside the so-called hidden order phase. An intriguing aspect is that this system has been suggested to be a candidate of a chiral d-wave superconductor [1], and possible Weyl-type topological superconducting states have been discussed recently. Here we report on the observation of a highly unusual Nernst signal due to the superconducting fluctuations above T_c. The Nernst coefficient is anomalously enhanced (by a factor of $\sim 10^6$) as compared with the theoretically expected value of the Gaussian fluctuations. This colossal Nernst effect intimately reflects the highly unusual superconducting state of URu_2Si_2. The results invoke possible chiral or Berry-phase fluctuations associated with the broken time-reversal symmetry of the superconducting order parameter [2]. [1]Y. Kasahara et al. Phys. Rev. Lett. 99, 116402 (2007). [2]T. Yamashita et al. Nature Phys. 11, 17 (2015).

[1]In collaboration with T. Yamashita, Y. Shimoyama, H. Sumiyoshi (Kyoto), S. Fujimoto (Osaka), T. Shibauchi (Tokyo), Y. Haga (JAEA), T. D. Matsuda (TMU) , Y. Onuki (Ryukyus), A. Levchenko (Wisconsin-Madison).