Abstract Submitted
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The magnitude of the magnetic exchange interaction in the heavy fermion antiferromagnet $CeRhIn_5$[1] P. DAS, Ames Laboratory, IA, USA; Los Alamos National Laboratory, NM, USA, S.-Z. LIN, N.J. GHIMIRE, F. RONNING, E.D. BAUER, J.D. THOMPSON, C.D. BATISTA, M. JANOSCHEK, Los Alamos National Laboratory, NM, USA, K. HUANG, University of California, San Diego, CA, USA, G. EHLERS, Oak Ridge National Laboratory, TN, USA — The family of heavy fermion compounds $CeTIn_5$ (T = Co, Rh, Ir) has been a fertile ground to explore and understand the interplay between magnetism, unconventional superconductivity and quantum criticality due to their tunability by pressure, substitution and magnetic field. $CeRhIn_5$ is a heavy fermion antiferromagent which can be tuned to quantum criticality under pressure. The strength of the magnetic exchange interaction, which is a key parameter to understand its complex properties, however remained unknown. We have used high-resolution neutron spectroscopy to determine the complete spin wave spectrum in $CeRhIn_5$. The spin wave dispersion can be quantitatively reproduced with a simple frustrated $J_1 - J_2$ model that also naturally explains the magnetic spin-spiral ground state of $CeRhIn_5$ and yields a dominant in-plane nearest-neighbor magnetic exchange constant $J_0 = 0.74(3)$ meV. Our results pave the way to a quantitative understanding of the rich low-temperature phase diagram of the prominent $CeTIn_5$ class of heavy fermion materials.

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