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Entropy Accumulation near Itinerant Magnetic Quantum Critical Points JIANDA WU, Rice University, LIJUN ZHU, LANL, QIMIAO SI, Rice University, ANDREAS ROST, ANDY MACKENZIE, University of St. Andrews — Quantum critical point (QCP) occurs at a continuous phase transition at zero temperature. It follows from general hyperscaling argument that, near a QCP, the Grüneisen ratio (ratio of thermal expansion coefficient to specific heat) diverges and entropy accumulates [1]. The enhanced entropy has been observed near the field-induced metamagnetic QCP in Sr3Ru2O7[2]. Here we present a detailed theoretical study of entropy across itinerant-magnetic QCPs, with a focus on the ferromagnetic cases. We propose a regularization scheme for the effect of a dangerously irrelevant quartic coupling on the free energy [3], and calculate the entropy using this scheme. While the entropy accumulation near the QCP basically follows the hyperscaling arguments, the correction to scaling is sizeable especially for the two-dimensional case. We compare the theoretical results with the experimental data for Sr3Ru2O7 [2], providing an entropic characterization of the degree to which the metamagnetic QCP in this system is described by the itinerant-magnetic quantum criticality.

[1] L. Zhu et al, PRL 91, 066404 (2003).
[2] A.W. Rost et al, Science 325, 1360 (2009).
[3] J. Wu, L. Zhu, and Q. Si, arXiv:1010.4593, to appear in J. Phys.: Conf. Series.

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