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Magnetic clustering at a quantum critical point: A modified percolation theory[1] JOHN GADDY, University of Missouri, Department of Physics and Astronomy, TOM HEITMANN, University of Missouri, the Missouri Research Reactor, JAGAT LAMSAL, University of Missouri, Department of Physics and Astronomy, WOUTER MONTFROOIJ, University of Missouri, Department of Physics and Astronomy and the Missouri Research Reactor — The formation and dynamics of magnetic clusters have proven to be important for materials that have been driven to a quantum critical point via substantial chemical substitution. Tiny variations in the local exchange interaction lead to the formation of a distribution of Kondo temperatures, which in turn gives rise to a fragmentation of the magnetic lattice. Importantly, the temperature scale at which the clusters form is typically low enough that finite-size effects force the clusters to order internally as soon as they form. We argue that this process defies description by a standard percolation model but that a slight restriction– whereby ordered clusters are not allowed to be broken up– succeeds, but with the consequence that a new universality class emerges. We demonstrate this model with analytics as well as Monte-Carlo numerical results.

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