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Criticality in Inhomogeneous magnetic systems: Applications to Quantum Ferromagnets R. SAHA, Dept. of Physics, Univ. of Oregon, Eugene, OR 97403 & Dept. of Physics, Univ. of Maryland, College Park, MD 20742, T.R. KIRKPATRICK, Dept. of Physics, Univ. of Maryland, College Park, MD 20742, D. BELITZ, Dept. of Physics, Univ. of Oregon, Eugene, OR 97403 — In standard phase transitions such as the liquid-gas transition, a homogeneous order parameter (OP) vanishes as one crosses from the ordered phase to the disordered one. An external field may preclude a homogeneous OP. This happens for a fluid in a gravitational field, where the transition becomes smeared[1] in the sense that the OP is nonzero everywhere, albeit very small in some regions of the phase diagram. A ferromagnet (FM) subject to mechanical stress is another realization of a system in an external field that has an inhomogeneous OP. We first investigate a classical Heisenberg FM, which is modeled by a ϕ^4 theory with a spatially dependent mass $r(x)$. In contrast to the fluids case, we find a sharp phase transition where the envelope of the local magnetization vanishes uniformly, and mean-field critical exponents. The first order transition in quantum itinerant FMs also remains sharp and the fluctuation effects leading to a tricritical point are suppressed, and one recovers a quantum critical point with mean field exponents[2]. [1] J.V. Sengers and J.M.J. van Leeuwen, Physica A, 116, 345 (1982). [2] D. Belitz, T.R. Kirkpatrick, and R. Saha, Phys. Rev. Lett., 99, 147203(2007).

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