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Quantum Griffiths singularities in ferromagnetic metals DAVID NOZADZE, THOMAS VOJTA, Missouri University of Science and Technology — We present a theory of the quantum Griffiths phases associated with the ferromagnetic quantum phase transition in disordered metals. For Ising spin symmetry, we study the dynamics of a single rare region within the variational instanton approach. For Heisenberg symmetry, the dynamics of the rare region is studied using a renormalization group approach. In both cases, the rare region dynamics is even slower than in the usual quantum Griffiths case because the order parameter conservation of an itinerant ferromagnet hampers the relaxation of large magnetic clusters. The resulting quantum Griffiths singularities in ferromagnetic metals are stronger than power laws. For example, the low-energy density of states $\rho(\epsilon)$ takes the asymptotic form $\exp[\{-\tilde{\lambda}\log(\epsilon_0/\epsilon)\}^{3/5}]/\epsilon$ with $\tilde{\lambda}$ being non-universal. We contrast these results with the antiferromagnetic case in which the systems show power-law quantum Griffiths singularities in the vicinity of the quantum critical point. We also compare our result with existing experimental data of ferromagnetic alloy Ni_xV_{1-x}.

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