Biconical critical dynamics

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Anisotropic Antiferromagnets in an external field (in three spatial dimensions) are fascinating systems showing several phases of magnetic ordering separated by lines of continous phase transitions meeting in a multicritical point. Renormalization group (RG) theory has recently shown that in general the biconical fixed point (related to a tetracritical point) is stable. Under special thermodynamic conditions the Heisenberg fixed point could be stable which then would lead to a bicritical point.

The dynamical critical behavior is especially rich. At the multicritical point two lines belonging to different universality classes meet. A new dynamical universality class (biconical dynamics) is governed by their meeting point (biconical fixed point). At low values of the external magnetic field the dynamics near the transition from the paramagnetic to the antiferromagnetic phase belongs to the universality class of model C (relaxational dynamics of the order parameter coupled statically to a conserved density). At higher values of the external magnetic field the transition from the paramagnetic to the spin flop phase belongs to model F (relaxational dynamics of the order parameter coupled statically and dynamically to a conserved density).

Our results [1] calculated within two loop order of RG theory bring about the presence of small static and even smaller dynamic slow transients. Therefore an effective critical behavior might be expected. The important advantage of this magnetic system is that the dynamical correlations of both the non conserved order parameter and the conserved density are in principle experimentally accessible by neutron scattering.

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