Critical Exponents of Dilute Ferromagnetic Insulator Ga$_{1-x}$Mn$_x$N

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Insulating ferromagnet (Ga,Mn)N brings a new paradigm into the semiconductor family. It is therefore important to comprehensively characterize its magnetic ground state. To this end we analyze the critical exponents $\beta$ and $\gamma$ for MBE grown layers with $0.04 < x < 0.10$ [1] and superlattice structures Ga$_{1-x}$Mn$_x$N/GaN:Mg. In all samples the critical behavior shows strong deviations from the magnetically clean case ($x = 1$): an apparent breakdown of the Harris criterion, a nonmonotonic crossover in the values of the $\gamma_{\text{eff}}$ between the high temperature and critical regimes, and a smearing of the critical region by macroscopic inhomogeneities in the spin distribution.

References:

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