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Periodic striped ground states in Ising models with competing interactions

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We consider Ising models in two and three dimensions, with short range ferromagnetic and long range, power-law decaying, antiferromagnetic interactions. The competition between these two kinds of interactions induces the system to form domains of minus spins in a background of plus spins, or vice versa. If the decay exponent p of the long range interaction is large enough, this happens if the ratio J between the strength of the ferromagnetic and antiferromagnetic interactions is smaller than a critical value J_c, beyond which the ground state is homogeneous. We give a characterization of the infinite volume ground states of the system, for J in a left neighborhood of J_c. In particular, we prove that the quasi-one-dimensional states consisting of infinite stripes ($d = 2$) or slabs ($d = 3$), all of the same optimal width and orientation, and alternating magnetization, are infinite volume ground states. Our proof is based on localization bounds combined with reflection positivity.

This is joint work with Alessandro Giuliani.

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