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Cross-over of universality class in the Ising chain frustrated by long-range interactions ALESSANDRO VINDIGNI, ETH Zurich, FABIO CINTI, University of Florence, OLIVER PORTMANN, DANILO PESCIA, ETH Zurich — We investigate a spin chain in which the ferromagnetic nearest-neighbor exchange interaction J competes with a long-range antiferromagnetic interaction of strength g decaying spatially as $\frac{1}{r^\alpha}$. For α smaller than a certain threshold $\hat{\alpha}$ (with $\hat{\alpha}\left(\frac{J}{g}\right) > 2$), the long-range interaction is able to avoid the global phase separation – the uniformly magnetized state favored by the exchange interaction – even at $T = 0$. The ground state then consists of an ordered sequence of segments with equal length and alternating magnetization, resulting in a superlattice of magnetic domains. A memory of this periodic spin profile is retained at finite T in the two-point correlation function, which oscillates as well but with a temperature-dependent period. Such an oscillation is then exponentially damped over a spatial scale, the correlation length, which diverges asymptotically, roughly, as the inverse of T. This suggests that the long-range interaction drives the Ising chain to acquire a universality class consistent with an underlying continuous symmetry. The $e^{\frac{\Delta}{T}}$-temperature dependence of the correlation length and the uniform ferromagnetic ground state, characteristic of the $g = 0$ discrete Ising symmetry, are recovered for $\alpha > \hat{\alpha}$.

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