2D Ising Model correlation function: Precise functional forms for comparison to membrane experiments NATALIE PAQUETTE, BENJAMIN MACHTA, YAN-JIUN CHEN, JAMES SETHNA, LASSP, Cornell University — We find a precise form for the 2D Ising correlation function in the entire scaling regime as a function of external field H and temperature T. It is surprising that there is no functional form available, perhaps explained by the surprising complexity of the universal scaling function compared to other statistical mechanics models (e.g. 2D free energy or 3D Ising correlation function). We can use these results to test the hypothesis that heterogeneities found in a wide variety of membrane systems are manifestations of an underlying Ising critical point. We fit Monte Carlo lattice simulations in the (H, T)-plane with a functional form in parametric coordinates, while matching analytical results at $H = 0$ and $T = T_c$ to high accuracy. This functional form allows us to interpret FRET, NMR, or ESR data from membranes, where we can map experimentally controllable variables of composition and temperature onto the Ising axes of reduced temperature and magnetization.

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