

Lee-Yang zeros for the diamond hierarchical lattice and 2D rational dynamics

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Abstract. The renormalization group (RG) approach to the Ising model on the diamond hierarchical lattice leads to an exact mapping R in the 2D phase space of the temperature T and the external magnetic field H . The RG transformation of the Lee-Yang zeros is described by the inverse mapping, R^{-1} . In appropriate coordinates, R is a 2D rational mapping, and the large N asymptotic behavior of the Lee-Yang zeros is determined by the dynamical properties of R . We prove that R is partially hyperbolic on the invariant cylinder C . The Lee-Yang zeros are organized in a transverse measure for the central-stable foliation of $R|_C$. Their distribution is absolutely continuous. Its density is real analytic (and non-vanishing) below the critical temperature. Above the critical temperature, it is real analytic on an open dense subset, but it vanishes on the complementary Cantor set of positive measure.

This is a joint work with Mikhail Lyubich and Roland Roeder.