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Expanding Blaschke Products for the Lee-Yang zeros on the Diamond Hierarchical Lattice.

In a classical work, Lee and Yang proved that zeros of certain polynomials (partition functions of Ising models) always lie on the unit circle. Distribution of these zeros control phase transitions in the model. We study this distribution for a special “Migdal-Kadanoff hierarchical lattice”. In this case, it can be described in terms of the dynamics of an explicit rational function in two variables.

More specifically, we prove that the renormalization operator is partially hyperbolic and has a unique central foliation. The limiting distribution of Lee-Yang zeros is described by a holonomy invariant measure on this foliation. These results follow from a general principal of expressing the Lee-Yang zeros for a hierarchical lattice in terms of expanding Blaschke products allowing for generalization to many other hierarchical lattices. (Received April 12, 2010)