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Testing Zurek's scaling law in non-equilibrium lattice simulations

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We present numerical results of a set of spin models with topological charges, local topological defects or kinks. We study these defects under rapid cooling, which takes the system out of thermal equilibrium, decreasing the temperature from above to below its critical value. This is a a toy study for the Kibble mechanism in the Early Universe, which describes the formation of cosmic strings. We are interested in the density of persisting defects, in excess of the equilibrium density. Zurek predicted a scaling law which relates this excess density to the cooling rate. For a variety of models, types of defects and Monte Carlo algorithms, such scaling laws with a single power are observed to high accuracy. The exponents of these power laws, however, do not agree with Zurek's conjecture.

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