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Fisher zeroes and non-analytic real time evolution for quenches in the transverse field Ising model STEFAN KEHREIN, University of Goettingen, MARKUS HEYL, University of Munich, ANATOLI POLKOVNIKOV, Boston University — We study quenches of the magnetic field in the transverse field Ising model. For quenches across the quantum critical point, the boundary partition function in the complex temperature-time-plane shows lines of Fisher zeroes that intersect the time axis, indicating non-analytic real time evolution in the thermodynamic limit (analogous to well-known thermodynamic phase transitions). We obtain exact analytical results for these dynamic transitions and show that the dynamic behavior cannot be obtained from a naive analytic continuation of the thermal equilibrium partition function: Real time evolution across this quantum critical point generates a new non-equilibrium energy scale. We argue that this behavior is expected to be generic for interaction quenches across quantum critical points in other models as well.

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