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Solvable model for a dynamical quantum phase transition from fast to slow scrambling[1] EHUD ALTMAN, University of California - Berkeley, SUMILAN BANERJEE, The Weizmann Institute of Science — We propose an extension of the Sachdev-Ye-Kitaev (SYK) model that exhibits a quantum phase transition from the previously identified non-Fermi liquid (NFL) fixed point to a Fermi liquid like state, while still allowing an exact solution in a suitable large N limit. The extended model involves coupling the interacting N-site SYK model to a new set of pN peripheral sites with only quadratic hopping terms between them. The conformal fixed point of the SYK model remains a stable low energy phase below a critical ratio of peripheral sites p_c that depends on the fermion filling n. The scrambling dynamics throughout the non-Fermi liquid phase is characterized by a universal Lyapunov exponent $\lambda \to 2\pi T$ in the low temperature limit, however the temperature scale marking the crossover to the conformal regime vanishes continuously at the critical point p_c. The residual entropy at $T \to 0$, non zero in the NFL, also vanishes continuously at the critical point. For $p > p_c$ the quadratic sites effectively screen the SYK dynamics, leading to a quadratic fixed point in the low temperature and frequency limit. The interactions have a perturbative effect in this regime leading to scrambling with Lyapunov exponent $\lambda \propto T^2$.

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