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Lyapunov Exponent and Four-Point Correlators Growth Rate in a Chaotic System EFIM ROZENBAUM, Univ of Maryland-College Park, SRIRAM GANESHAN, Simons Center of Geometry and Physics, Stony Brook, VICTOR GALITSKI, Univ of Maryland-College Park — It was proposed recently that the out-of-time-ordered four-point correlator (OTOC) may serve as a characteristic of quantum-chaotic behavior, because in the semi-classical limit, $\hbar \to 0$, its rate of exponential growth resembles the classical Lyapunov exponent. We calculate OTOC for the classical and quantum kicked rotor and compare its growth rate at initial times with the standard definition of the classical Lyapunov exponent. We show that the OTOC's growth rate and the Lyapunov exponent are in general distinct quantities, corresponding to the logarithm of phase-space-averaged divergence rate of classical trajectories and to the phase-space average of the logarithm, respectively. The difference approaches a constant in the regime of high kicking strength, where classical chaos is global. We also show that the quantum correlator as a function of time exhibits a clear singularity at the Ehrenfest time t_E: transitioning from a time-independent value of $t^{-1} \ln C(t)$ at $t < t_E$ to its monotonous decrease with time at $t > t_E$. Besides that, deep in the quantum regime, $\hbar = 1$, we show that the two-point correlator averaged over very large time windows reveals classical regular-to-chaotic transition as a function of the kicking strength.

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