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Relaxation via phase-space mixing in integrable few-mode systems RANCHU MATHEW, Joint Quantum Institute, University of Maryland, EITE TIESINGA, Joint Quantum Institute, University of Maryland and National Institute of Standards and Technology — Recently, quenches in isolated quantum systems have become a subject of intense study. We consider quantum few-mode systems that are integrable in their classical mean-field limit and become dynamically unstable after a quench of a system parameter. Specifically, we study a BEC in a double-well potential and a antiferromagnetic spinor BEC constrained to a single spatial mode. We study the time dynamics after the quench within the truncated Wigner approximation and find that due to phase-space mixing the system relaxes to a steady state. Using action-angle formalism, we obtain analytical expressions for the time evolution of expectation of observables and their long-time values. We find that the deviation of the long-time expectation value from its classical value scales as $(\ln N)^{-1}$, where N is the number of atoms. Furthermore, the relaxation is Gaussian in time with a time constant which scales as $(\ln N)^2$. We confirm these results numerically.

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