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Equilibration of Global Observables to Microcanoical Measure for Complex Systems JOSEPH EMERSON, Dept of Applied Math and IQC, University of Waterloo, COZMIN UDUDEC, Dept of Physics, University of Waterloo — In the last few years we have seen significant progress in understanding how the canonical features of quantum statistical mechanics can be derived rigorously from an exact treatment of the underlying quantum mechanical system. Here we consider a related problem: we determine sufficient conditions under which one can derive an effective equilibration to the microcanonical ensemble for the measurement statistics of the global observables of a closed system. Our central assumption is that the unitary time-evolution operator of the system is sufficiently complex when expressed in the eigenbasis of the observable of interest that its eigenstates can be modeled by a typical unitary chosen from the Haar measure (or Circular Unitary Ensemble). This assumption is well-motivated from numerical studies in the field of quantum chaos where this property has been observed for simple model systems whose classical counterparts are globally chaotic. Further, we discuss the time scale on which equilibration occurs in the context of two models for the eigenvalues of the dynamical system. We argue that our results are a natural consequence of an epistemic view of pure quantum states, but may be surpising or even controversial for adherents of other interpretational perspectives.

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