Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Entanglement entropy at the MBL transition: evidence for a discontinuous change TRITHEP DEVAKUL, Princeton Univ, DAVID HUSE, Princeton University, RAJIV SINGH, University of California, Davis — The many-body localization phase transition is further investigated in the random-field Heisenberg chain using the numerical linked cluster (NLC) expansion technique. Following a recently proposed method of series analysis, an analysis is performed on the NLC coefficients of the entanglement entropy. We find evidence for a weak singularity at a critical value $h_c \approx 4.5$ that is inconsistent with the Harris criterion and the scaling behavior expected for a continuous transition. We construct a series for the cumulative eigenstate-entanglement probability distribution, which we show is related to the structure of the local integrals of motion of the system. A natural interpretation of our results is that, in the critical regime, while the majority of the integrals of motion remain highly localized, an increasing number of very delocalized integrals of motion show up as the order is increased. We argue that our results are indicative of a very sparse interconnected thermal subregion that is able to thermalize the entire system only in the thermodynamic limit, leading to a discontinuous change in the entanglement entropy.

Trithep Devakul
Princeton Univ

Date submitted: 11 Nov 2016 Electronic form version 1.4