MAR13-2012-020105

Abstract for an Invited Paper
for the MAR13 Meeting of
the American Physical Society

Quantifying asymmetry of quantum states using entanglement[1]

BORZU TOLOUI[2], Departments of Physics and Astronomy, Haverford College

For open systems, symmetric dynamics do not always lead to conservation laws. We show that, for a dynamic symmetry associated with a compact Lie group, one can derive new selection rules from entanglement theory. These selection rules apply to both closed and open systems as well as reversible and irreversible time evolutions. Our approach is based on an embedding of the system's Hilbert space into a tensor product of two Hilbert spaces allowing for the symmetric dynamics to be simulated with local operations. The entanglement of the embedded states determines which transformations are forbidden because of the symmetry. In fact, every bipartite entanglement monotone can be used to quantify the asymmetry of the initial states. Moreover, where the dynamics is reversible, each of these monotones becomes a new conserved quantity.

[1]This research has been supported by the Institute for Quantum Information Science (IQIS) at the University of Calgary, Alberta Innovates, NSERC, General Dynamics Canada, and MITACS.

[2]Joint work with Gilad Gour.