Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Observable measure of quantum correlations GERARDO ADESSO, DAVIDE GIROLAMI, University of Nottingham, School of Mathematical Sciences — The correlations of multipartite quantum states have nonclassical features that go beyond entanglement. A full theoretical and experimental characterization of these features is necessary to understand their foundational role in quantum theory, and to explore the usefulness of such nonclassical resources for quantum computation and communication. We introduce a measure of general bipartite quantum correlations for arbitrary two-qubit states, expressed as a state-independent polynomial function of the density matrix elements. The amount of quantum correlations can be quantified experimentally by measuring the expectation value of a small set of observables on up to four copies of the state, without the need for a full tomography. We extend the measure to 2 x d systems, providing its explicit form in terms of observables for the relevant class of multiqubit states employed in the DQC1 model for quantum computation. Finally, we study the evolution of quantum correlations between two qubits embedded in a bosonic bath, showing that our measure can reliably identify the transition between weak and strong system-environment coupling regimes. This leads us to propose an experimentally friendly signature of non-Markovianity based on quantum correlations dynamics.

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Date submitted: 29 Dec 2011 Electronic form version 1.4