Abstracts

Jens Siewert: SLOCC invariants as expectation values and their experimental detection
Characterization and quantification of multipartite entanglement is one of the challenges in state-of-the-art experiments in quantum information processing. According to theory, this is achieved via entanglement monotones, that is, functions that do not increase under stochastic local operations and classical communication (SLOCC). Typically such monotones include the wave function and its time-reversal (anti-linear operator formalism) or they are based on not completely positive maps (e.g. partial transpose). Therefore, they are not directly accessible to experimental observations. We show how entanglement monotones derived from polynomial local SL-invariants can be re-written in terms of expectation values of observables. Consequently, the amount of entanglement -- of specific SLOCC classes -- in a given state can be extracted from the measurement of correlation functions of local operators.
http://arxiv.org/abs/1003.4862

Iñigo Urizar: A novel number operator-annihilation operator uncertainty relation and its use for entanglement detection
We consider the number operator-annihilation operator uncertainty as a well behaved alternative of the number-phase uncertainty relation, and examine its properties. We find a formulation in which the bound on the product of uncertainties depends on the expectation value of the particle number. Thus, while the bound is not a constant, it is a quantity that can be easily controlled in many systems. The uncertainty relation is approximately saturated by number-phase intelligent states. This allows us to define amplitude squeezing, connecting coherent states to Fock states, without a reference to a phase operator. We propose several setups for an experimental verification.
http://arxiv.org/abs/0907.3147

Geza Toth: Entanglement and permutational symmetry
We study the separability of permutationally symmetric quantum states. We show that for bipartite symmetric systems most of the relevant entanglement criteria coincide. However, we provide a method to generate examples of bound entangled states in symmetric systems, for the bipartite and the multipartite case. These states shed some new light on the nature of bound entanglement.
http://arxiv.org/abs/0812.4453

Otfried Gühne: A simple algorithm to prove separability of quantum states
To be completed.

Thierry Bastin, multipartite entanglement classes for symmetric photonic qubit states
We solve the entanglement classification under stochastic local operations and classical communication (SLOCC) for all multipartite symmetric states in the general N-qubit case. For this purpose, we introduce 2 parameters playing a crucial role, namely the \emph{diversity degree} and the \emph{degeneracy configuration} of a symmetric state. Those parameters give rise to a simple method of identifying operational families of SLOCC entanglement classes of all symmetric N-qubit states, where the number of families grows as the partition function of the number of qubits.
http://arxiv.org/abs/0902.3230

Bastian Jungnitsch: Increasing the statistical significance of entanglement detection in experiments

Entanglement is often verified by a violation of an inequality like a Bell inequality or an entanglement witness. Considerable effort has been devoted to the optimization of such inequalities in order to obtain a high violation. We demonstrate theoretically and experimentally that such an optimization does not necessarily lead to a better entanglement test, if the statistical error is taken into account. Theoretically, we show for different error models that reducing the violation of an inequality can improve the significance. Experimentally, we observe this phenomenon in a four-photon experiment, testing the Mermin and Ardehali inequality for different levels of noise. Furthermore, we provide a way to develop entanglement tests with high statistical significance.

http://arxiv.org/abs/0912.0645

Sönke Niekamp: Discrimination of graph states in experiments

To be completed.