

Entanglement detection with randomized measurements

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Randomized measurements provide a novel toolbox to probe today's noisy intermediate scale quantum devices. In this talk, I will discuss various protocols for the detection of entanglement many-body quantum states. First, I will review protocols for bipartite entanglement detection of weakly mixed states via Renyi entropies, and their implementation in a trapped quantum simulator. Secondly, I will discuss conditions based on moments of a partially transposed density matrix which can reveal bipartite entanglement in highly mixed states. In particular, I will show how such moments, and their symmetry-resolved generalisations, can be estimated with randomized measurements via the classical shadows formalism. As an outlook, I will finally comment on recent robust estimation which can improve the presented measurement techniques and can be used for detecting multi-partite entangled quantum states.