Multi-qubit gates for Rydberg atoms and their application in entanglement measurements

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Arrays of trapped neutral atoms excited to Rydberg states are a promising component for large-scale quantum information systems. Due to their strong state-dependent interactions, Rydberg atoms are naturally suited to implement quantum gates. Recently two-qubit entangling gates based on the Rydberg blockade mechanism have been implemented in optical tweezers [1]. I will review this work and discuss possible extension thereof to multi-qubit settings. Then I will discuss applications of these multi-qubit gates for measuring entanglement in quantum simulators, and experimentally estimate the central charge of conformal field theories realized in Rydberg atom arrays.

References

[1] H. Levine et al., Phys. Rev. Let. **123** 170503 (2019)

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