Title: Adiabatic Rydberg parity gate for quantum optimization

The parity paradigm [1] allows the encoding of challenging optimization problems on a spin-1/2 square lattice with quasi-local four-qubit interactions. In this framework, performing quantum optimization with digitized quantum annealing (QA) or the quantum approximate optimization algorithm (QAOA) requires the application of (four-qubit) parity gates. Here, we describe an implementation of fast, high-fidelity parity gates for quantum optimization suitable for state-of-the-art Rydberg atom platforms. The proposed scheme, which relies on adiabatic laser pulses, allows for efficient execution of digitized QA and QAOA steps with a constant gate-count.

[1] Sci. Adv. 1, e1500838 (2015)