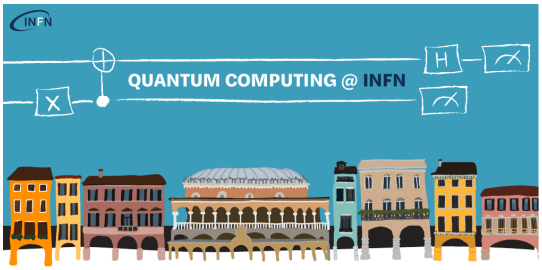

Contribution ID: **30** Type: **not specified**

Universal quantum computation in globally-driven Rydberg atom arrays

Wednesday, 30 October 2024 10:35 (20 minutes)

Individually trapped neutral atoms offer a promising path for engineering controllable many-body quantum systems: coherent manipulation has been demonstrated for arrays featuring hundreds of atoms, encouraging to envision atom-based quantum processors.

In this talk, I will present a novel approach to use Rydberg atom arrays as platforms for quantum information processing. Our model has the crucial feature of not requiring any local addressing or dynamical rearrangement of the atoms: instead, any quantum algorithm can be executed by driving a universal arrangement of atoms with a global laser field in the Rydberg blockade regime. The arrangement is circuit-independent, and any algorithm is imprinted in the phase profile of the laser; our model thus highlights new ways to understand quantum computation as programmable out-of-equilibrium many-body phenomena.

After briefly introducing the principles of Rydberg-based quantum physics, I will give an overview of our model for universal quantum computation, and make connections with classical cellular automata patterns. I will also discuss the feasibility of the scheme, focussing on error-suppression techniques specific to our model.

Reference: Francesco Cesa and Hannes Pichler, Physical Review Letters 131, 170601 (2023) .

Sessione

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