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Quantum networks with Neutral Atoms in Optical Cavities

Tuesday 30 September 2025 15:40 (30 minutes)

Quantum networks rely on efficient light–matter interfaces to connect optical photons with long-lived quantum memories. In this talk, I will present two complementary approaches using neutral atoms coupled to optical cavities. The first employs ordered arrays of individually trapped atoms in a hybrid tweezer–lattice architecture, enabling precise control, low decoherence, and highly efficient atom–photon entanglement generation with multiplexing capabilities. The second approach uses a cold atom cloud in a low-finesse cavity, where collective spin-wave excitations couple strongly to the cavity field, leading to enhanced retrieval efficiencies and clear signatures of vacuum-Rabi splitting. Together, these results demonstrate distinct pathways toward scalable and versatile quantum network nodes.

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Session Classification: Invited Speakers