Seminar/Talk

Entanglement in Rydberg-blockaded superradiance

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Host: Julian Léonard and Maksym Serbyn

Abstract:Standard Dicke superradiance produces a collective burst of radiation but no entanglement. Using finite-size quantum-jump simulations, we show that adding local Rydberg blockade between atoms generates extensive mixed-state entanglement while preserving superradiance. This enables superradiantly accelerated preparation of correlated dark states on a timescale $\propto (\log N)/N$, supported by an early-time analytical solution and numerical simulations. The physical mechanism is Hilbert-space fragmentation of the Dicke ladder into an exponentially branching decay tree, giving rise to a hierarchy of correlated dark states. We propose an experimental realization using existing cavity-coupled Rydberg atom tweezer arrays and identify a simple stationary-state entanglement witness. More broadly, our results point to Rydberg-blockaded collective decay as a general framework for engineering entangled dark states

Tuesday, June 9, 2026 11:00am - 12:00pm
Office Bldg West / Ground floor / Heinzel Seminar Room (I21.EG.101)

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