TIFR Centre for Interdisciplinary Sciences
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Seminar

Entanglement in light-matter system

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We propose [1,2] and study the use of photon-mediated interactions for the generation of long-range steady-state entanglement between N atoms. Through the judicious use of coherent drives and the placement of the atoms in a network of cavity QED systems, a balance between their unitary and dissipative dynamics can be precisely engineered to stabilize a long-range correlated state of qubits in the steady state. We discuss the general theory behind such a scheme and present an example of how it can be used to drive a register of N atoms to a generalized W state and how the entanglement can be sustained indefinitely. The achievable steady-state fidelities for entanglement and its scaling with the number of qubits are discussed for presently existing superconducting quantum circuits. While the protocol is primarily discussed for a superconducting circuit architecture, it is ideally realized in any cavity QED platform that permits controllable delivery of coherent electromagnetic radiation to specified locations. The case of N=2 has been recently realized in collaboration with the experimental group at UC Berkeley [3].

References:

[1] C. D. Aron, M. Kulkarni, H. E. Tureci, Phys. Rev. X 6, 011032 (2016)
[2] C. D. Aron, M. Kulkarni, H. E. Tureci, Phys. Rev. A 90, 062305 (2014)
[3] M.E. Schwartz, L. Martin, E. Flurin, C. Aron, M. Kulkarni, H.E. Tureci, I. Siddiqi (PRL, 2016)

Thursday, Aug 11th 2016

11:30 AM (Tea/Coffee at 11:15 AM)

Seminar Hall, TCIS