

A QUANTUM INTERFACE BETWEEN ATOMS AND PHOTONS

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Quantum physics is currently confined to separate ‘worlds’ – separated by deserts of classical physics. One of the main challenges is to link different quantum systems to each other /and/ at the same time preserve the quantum nature over the link; to build /quantum interconnects /between the different domains. Raman transition in atomic ensembles offer a robust physical system to connect photons (flying qubits) to atoms (quantum memory). The talk will present our recent experiments connecting photons to atomic ensembles. The first illustrates limitations due to collisional decoherence in thermal ensembles [1], The other three illustrate the versatility of ultra-cold atoms, by describing a heralded single photon source [2], entangling two independently created single photons [3], and a demonstration of memory built in teleportation of an photonic qubit.

[1] S. Manz et al. Phys. Rev. A *75*, 040101 (2007).

[2] S. Chen et al. Phys. Rev. Lett. *97*, 173004 (2006).

[3] Z-S. Yuan et al. Phys. Rev. Lett. *98*, 180503 (2007).