



**TIFR Centre for Interdisciplinary Sciences,  
Narsingi, Hyderabad 500075**

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## **Seminar**

**Quantum Control of Photons, Atoms and Spins**

**Chinmay Belthangady**

**Harvard-Smithsonian Center for Astrophysics,  
Cambridge, MA- 02138, USA.**

The emerging area of quantum information science is based on exploiting quantum-mechanical effects for faster computing, secure communications, metrology, and simulations. Though several algorithms have been theoretically proposed to carry out these tasks, physical realizations are still at a rudimentary state of development. Of crucial importance is the ability to control objects like photons, atoms, electrons, spins etc. at the single quantum level. Examples of such control include (i) the ability to prepare quantum systems in well-defined initial states, (ii) the ability to coherently manipulate these states, and (iii) the ability to protect these states from loss of coherence caused due to interactions with the environment.

My talk will focus on experimental demonstrations of such quantum control. In the first half I will describe a scheme to generate time-frequency entangled pairs of photons in laser-cooled atomic ensembles using electromagnetically-induced transparency and slow light. I will also discuss experiments that demonstrate amplitude and phase control of single-photon wavepackets. The second half of my talk will focus on a qubit system based on nitrogen-vacancy (NV) colour centers in diamond. I will describe experiments aimed at laser cooling of mesoscopic spin baths, and the use of dynamical decoupling techniques to increase the coherence times of NV spins.

***Thursday, Sep 26<sup>th</sup> 2013***

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

***Conference Hall, TCIS***