

# Special AMO/QO Physics Mini-Talks

## "Complete three photon Hong-Ou-Mandel interference"

**Dr. Girish S. Agarwal**

*Department of Physics, Oklahoma State University*

It is well known that the Hong-Ou-Mandel effect was a turning point in quantum optics. The effect was first demonstration that the two independent and indistinguishable photons can interfere though previously it was considered impossible. The HOM effect has stimulated similar studies of interference in other disciplines like quantum dots, plasmonics. So far much of the research has been directed in the study and applications of this effect in a variety of physical systems and very little has been done to see if a similar result can be obtained with say three independent photons. We demonstrate for the first time the possibility of HOM effect with three independent photons at a three port device. The device that we consider is an integrated device which can be written with femtosecond lasers. Our work also shows that the HOM effect with three photons can occur over a very large range of the device parameters and can lead to the generation of a variety of entangled states. The effect that we discuss would be generic to many other systems as at a basic level we have bilinear interaction of three oscillators prepared in quantum states.

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## "New light on Dicke superradiance"

**Dr. Joachim von Zanthier**

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Up to today the production of Dicke states with higher number of excitations remains a challenge and has been realized only for selected states in particular setups. A new option is the repeated measurements of photons at particular positions starting from a fully excited system of quantum emitters. In this case the collective system cascades down the ladder of symmetric Dicke states each time a photon is recorded, even for widely separated sources. Following this approach we show that Dicke superradiance, i.e., the directional emission of spontaneous decay, can be produced starting from an initially uncorrelated system. The approach is applicable to a wide variety of quantum sources like trapped atoms, ions, quantum dots or NV-centers. Surprisingly, the method works also for initially uncorrelated incoherent classical emitters. This is demonstrated with up to eight statistically independent incoherent thermal light sources [S. Oppel et al., Phys. Rev. Lett. 113, 263606 (2014)].

**Monday, March 23, 2015**

**IQSE 578, 12:00 Noon**

**Mitchell Physics Building**

Institute for Quantum Science and Engineering

Texas A&M University

(Sandwiches, salad, and soda to be served at 11:30 a.m.)

Host: [Dr. Marlan Scully](#)