

QSIT Seminar Talk:

Date: Monday, 25. August 2014, 13:15h

Location: **HIT E 41.1**

Speaker: Dr. Osip Schwartz, Algorithm Developer, Nova Measuring Instruments Inc., Weizmann Science Park, Rehovot, Israel

Title: Cooperative effects and quantum optics with arrays of single photon emitters

Abstract:

Single photon emitters are the most basic and ubiquitous source of non-classical light. Although properties of an individual emitter may be simple, a mesoscopic ensemble of such systems can exhibit complex collective behavior, generating highly nontrivial quantum states of light.

In this talk, I will discuss two recent experiments with multiple single photon emitters. In the first one (*Nano Lett.*, 2013, 13 (12), pp 5832), we studied quantum statistics of light emitted by room temperature colloidal quantum dots in context of fluorescent microscopy. Detecting two- and three-photon correlation functions in the image plane of a microscope, we were able to image quantum dots randomly distributed on a surface with sub-diffraction limited resolution.

In the second experiment (arXiv:1312.5933), we studied cooperative effects and resonance dipole-dipole interaction (RDDI) in arrays of Sr ions suspended in an RF trap. Although RDDI and the associated frequency shift, known as cooperative Lamb shift, have mostly been studied as near-field phenomena, we show that it persists at inter-ion separations much larger than the resonance wavelength. We report a direct spectroscopic observation of the cooperative Lamb shift in chains of up to eight ions, providing a tool for experimental exploration of cooperative emission phenomena in extended mesoscopic arrays of quantum emitters.