Super-resolution from single photon emission: toward biological application

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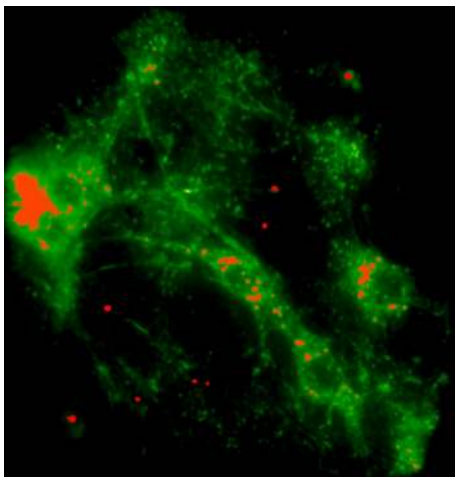
Properties of quantum light represent a tool for overcoming limits of classical optics.
Several experiments have demonstrated this advantage ranging from quantum enhanced imaging to quantum illumination [1].

In this talk, after a general introduction discussing last developments in the field (as sub shot noise quantum microscopy) , I will present a work [2] where we experimentally demonstrate quantum enhanced resolution in confocal fluorescence microscopy. This is achieved by exploiting the non-classical photon statistics of fluorescence emission of single nitrogen-vacancy color centers in diamond. By developing a general model of super-resolution based on the direct sampling of the kth-order autocorrelation function of the photoluminescence signal, we show the possibility to resolve, in principle, arbitrarily close emitting centers.

Finally, ongoing applications in biology will be discussed and presented.



Fluorescence from nanodiamonds in neurons

[1] "Real applications of quantum imaging", M.Genovese, Journal of Optics, 18 (2016) 073002
[2] "Beating the Abbe Diffraction Limit in Confocal Microscopy via Nonclassical Photon Statistics" D. Gatto Monticone, K. Katamadze, P. Traina, E. Moreva, J. Forneris, I. Ruo-Berchera, P. Olivero, I.P. Degiovanni, G. Brida,M. Genovese;
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