Università di Genova | Dipartimento di Fisica

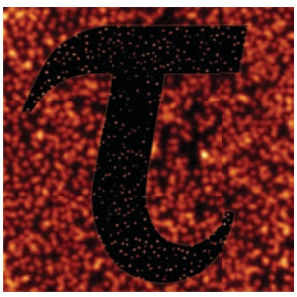
Seminar announcement

January 12th, 2021
h 15:30, Teams code: hzo4tgo

Time meets super-resolution towards live-cell imaging at the nanoscale

Alberto Diaspro
Biophysics@DIFILab, Department of Physics, University of Genoa.

Since 1665, when English physicist Robert Hooke coined the term cell, scientists have been developing a variety of microscopy approaches. The continuing progress enabled molecular imaging of living cells while preserving physiological conditions. Contemporary developments allow the visualization of biomolecules in living cells at resolutions of 10 nm or less. The diffraction limit is crumbling, and the super-resolution concept developed by Giuliano Toraldo di Francia is the driving force of the modern microscope. In the era of super-resolved fluorescence microscopy, stimulated emission depletion - STED - microscopy plays a pivotal role for application in medicine, biology, biophysics, biochemistry and bioengineering. STED microscopy does not require any processing to produce a super-resolved image except switching on a second illumination beam. The STED principle relies on the ability to control the states of a fluorophore, i.e. emitting vs dark states in a well-defined region around the diffraction-limited excitation area. Such a control ability allows reducing the practical volume of emission below the diffraction limit. Coupling to the spatial control those temporal aspects related to the photophysics of the fluorescent molecules allows improving the performances of the microscope further. Separation and classification of photons in terms of arrival time allows accessing to spectroscopic information pixel by pixel of the formed image. Stellaris 8-TAU-STED, the latest microscope realized by Leica Microsystems, implements the fundamental advances in the field of super-resolution in one architecture. The integration with two-photon excitation of fluorescence and atomic force microscopy boosts Stellaris 8 TAU STED, a unique machine tunable for a large variety of scientific questions.



Diaspro, A., Bianchini, P. Optical nanoscopy. Riv. Nuovo Cim. 43, 385–455 (2020). https://doi.org/10.1007/s40766-020-00008-1