

Internship /Proposition de stage recherche
Master /PFE Ingénieur et/ou Master M2
Université de Strasbourg - Laboratoire ICube
Mars- août 2020 / March-August 2020

Integrated super-resolved microsphere assisted microscope for biological applications

Lab: ICube Strasbourg, France
(Laboratoire des Sciences de l'Ingénieur, de l'Informatique et de l'Imagerie)
Engineering science, computer science and imaging research institute

Equipe / Team : IPP (Instrumentation et Procédés Photoniques / Photonics Instrumentation and Processes)
en collaboration avec la SATT Conectus Alsace

Context:

The recent advances in molecular-biology and life sciences understanding are highly related to the biological observation technology developments. Electronic microcopy, and new optical (PALM/ STED) techniques, awarded by the Nobel price in 2014 [1], are among the most powerful. However, these methods are still complex to implement and cannot be used inside biological incubator for long term observation. Sample must be prepared for the first technique and toxic dyes and high-power density laser are used for the second ones. So, easier, label free, integrated observation techniques are still required. Microsphere-assisted microscopy is one of these techniques [2,3]. A transparent microsphere used as a lens near the sample allows a resolution better than the diffraction limit to be reach due to evanescent wave collection. Our team works on this method for 2D and 3D imaging of biological samples [3,4].

Description:

During the internship, you will contribute both to the simulation and experimental development of a more integrated version of such a microsphere assisted microcopy. Biological sample will be considered.

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Traineeship grant /Gratification de stage :

Gratification de stage conformément aux règles en vigueur (3,90 €/h ~ 600 €/mois).

References:

[1] S. W. Hell and J. Wichmann, "Breaking the diffraction resolution limit by stimulated emission: stimulated-emissiondepletion fluorescence microscopy," Opt. Lett. 19, 780–782 (1994)

- [2] Z. Wang, W. Guo, L. Li, B. Luk'yanchuk, A. Khan, Z. Liu, Z. Chen, and M. Hong, "Optical virtual imaging at 50 nm lateral resolution with a white-light nanoscope," Nat. Commun. 2, 218 (2011).
- [3] S. Lecler, S. Perrin, A. Leong-Hoi, and P. Montgomery, "Photonic jet lens," Nature Sci. Reports 9, 4725 (2019).
- [4] S. Perrin, H. Li, K. Badu, T. Comparon, G. Quaranta, N. Messaddeq, N. Lemerrier, P. Montgomery, J-L. Vonesch, S. Lecler, "Transmission microsphere-assisted dark-field microscopy", Physica Status Solidi -Rapid research letters, p.1800445, 2019.