OFFRE DE THESE / PhD PROPOSAL

Title: **Label-free super-resolved microscopy for live cell imaging**
Titre : Microscopie super-résolue sans marqueur pour l'imagerie cellulaire

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Établissement de rattachement / Organization: ICube - INSA - CNRS

Collaboration(s) : KIT, IGBMC.

Rattachement à un programme / related projects:
Plateforme IRIS, Axe transverse IRMC, projet SIBIC

Mots clés/ Keywords: Microscopy, interferometry, super-resolution

Résumé/ abstract : (1500 caractères au maximum)

Abstract: The progress made in life sciences is often strongly related to the development of the imaging methods used. Optical microscopy is a safe and fast method for biological sample observation compared with AFM or electron microscopy, but has been for a long time limited in resolution by diffraction. With techniques such as PALM and STED, the optical resolution has been improved far beyond the Abbe limit, making it possible to resolve down to 10 nm. However, the use of specific toxic dyes with these techniques is an issue, motivating the development of label free techniques.
The aim of this doctoral project is to design, build and experimentally test a new microscope that combines label-free super-resolution microsphere imaging with interferometry to perform the 3D nanometrology and characterization of living cells. The principle on which the project is based is the use of a microsphere to detect high-resolution details in the near field and to transmit these to the far field. Improvements of 3 to 4 times in the lateral resolution compared with classical imaging have already been experimentally demonstrated in the reflection configuration, making the observation of details smaller than 50 nm possible in the far field. Combining microsphere imaging with an interference microscope then allows 3D measurement at the nanoscale. The project will investigate the specificities of a transmission configuration. Both the experimental and theoretical aspects will be addressed, with interactions with partners from the biomedical field. The candidate should have knowledge and experience in photonics and imaging. The project will present an opportunity to develop high potential skills in bio-imaging, optical design and electromagnetic modeling.

Descriptif du sujet/ More details:

References

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[4] S. Lecler, S. Perrin, A. L-H., and P. Montgomery
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