



Beyond Classical Optical Metrology

EMPIR/EURAMET Project 17FUN01

Light-matter interplay for optical metrology beyond the classical spatial resolution limit

Optics-based measurement methods play an important role in Nanotechnology, Micro-nano electronics, Photonics and Advanced materials. Despite the advantages of optical systems (speed, non-invasiveness, high-precision, moderate investments, integrability) the spatial resolution is still limited by the wavelength of the light. Therefore, novel and robust metrology solutions are needed to maintain all the benefits of optical methods while overcoming the current limitations.

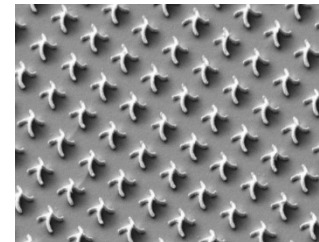
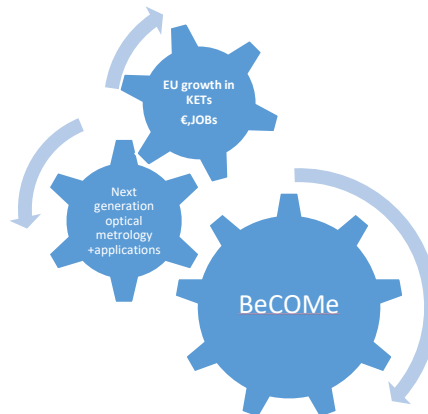
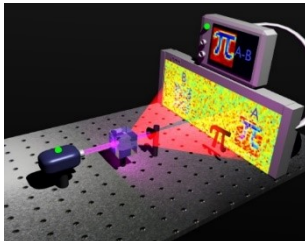
The overall goal of this project is to set the basis for realisation of the next generation of optical metrology systems, with unprecedented performances in terms of spatial resolution, traceability, reliability, robustness.

WP1: Exploiting light-matter interaction under strong spatial-coupling regime

To achieve **deep sub-wavelength (target $\lambda/10$)** spatial resolution, with **sub-nanometric uncertainty**, far-field illumination and far-field detection schemes.

WP2: Topological information and spatial spectroscopy

To exploit **topological structures** in electromagnetic fields and map how such topological information transforms after interacting with matter.



WP3: Coherent-link between optical scale and nanoscale

To realize and demonstrate near-field techniques to measure **deep sub-wavelength** gratings down to the regime $\ll \lambda/10$. To **metrologically link** near-fields methods to far-field methods.

WP4: Spatial entanglement and novel quantum metrology

To apply **sub-shot noise quantum technologies and novel quantum-measurement paradigms** to low and high NA optical systems. To realise input fields with **spatially-entangled optical channels** and to map their coupling with nano-targets.

Visit our website:

<https://www.ptb.de/empir2018/nc/17fun01-become/home/>

Interested in becoming a collaborator in our project?

Please, contact us at oelgawhary@vsl.nl