UNIVERSITE DE VERSAILLES
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DESCRIPTION OF THE THESIS

Laboratory : LISV (Laboratoire d'Ingénierie des Systèmes – EA4048)
Team CSE : Sensors and embedded systems

Localisation : Versailles (collaboration with UTT de Troyes)

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Platform for multi-scale metrological study: nanometer to millimeter characterization of photonic components

Today, the study and the characterization of components in nanotechnology must be made on a variety of scales in both nanometre but also millimetre, in particular to understand the propagation phenomena at multiple scales. These include the following issues: measures and followed cracks in the glass, characterization spread in the optical guided (millimetre dimensions of the components), for example. But secure nanoscale resolutions and repetabilities over millimetre range provides mechanical, metrology and instrumental constraints (acquisition time, travel speed and enslavement, etc.) that remain today prohibitive for commercial systems.

We intend to develop a system for travel and scanning likely to have performances at nanometric resolution and repeatability, with millimetre ranges. The proposed system will be operating independently and regardless of the equipment used.

This system could fit on a number of commercial systems used in nanotechnology, such as near-field microscopes (AFM - SNOM) or lithography systems. Today this type of device can only scan over a few tens of microns with degraded resolutions (typ 100 nm at full scale or 1 nm on ranges very limited). Both application fields seem perfectly complementary. Being able to make etchings of grounds over millimetre sizes with nanoscale properties may open the door to the design of new structures. The characterization by AFM or optical imaging can then lead to a better knowledge about the components or materials at nanoscopic and millimetre scales.

It should be noted that there it is not here to develop devices called 'metrological', for example-AFM Metrology, but only to ensure the resolution and the repeatability of the scanning system. The fact that this system can be adapted easily to different types of equipment is also a central point of the problem. We believe that the rapid feasibility demonstration can then open up new application fields because the fields of nanotechnology are sometimes forced by the complexity of the instrumental systems.

The objective is to produce a working prototype with marketing constraints integrated from the moment of conception.