OPTICAL TRANSPORT IN NANOSTRUCTURED SURFACES

LABORATORY : Institut Lumière Matière

LEVEL : M2
TEAM(S) : AGNANO

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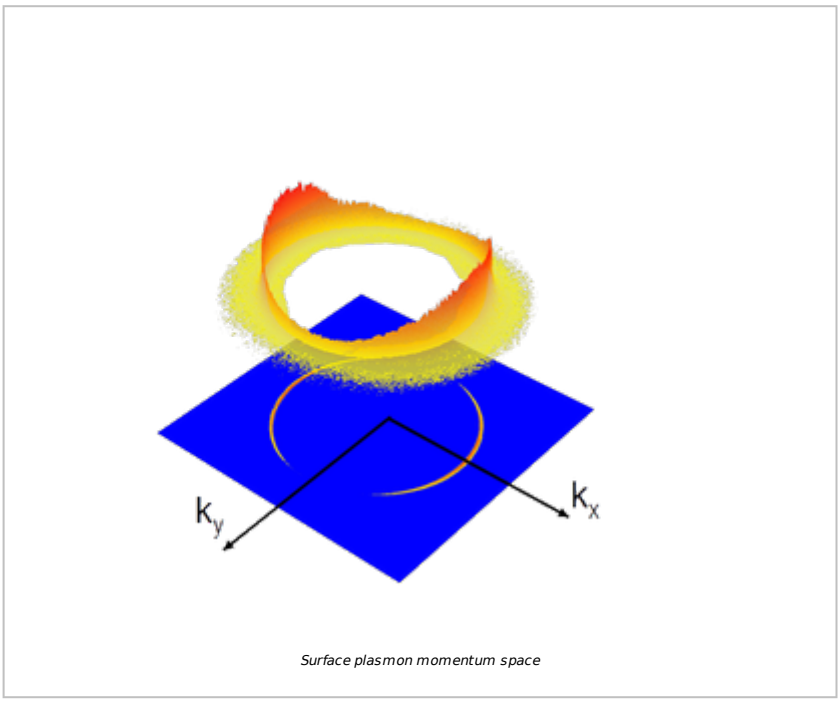
KEYWORD(S) : Microscopy / Nanophotonics / Surface wave

SCIENTIFIC CONTEXT :

The ability to precisely localize the light at the nanoscale represents a major challenge with many potential applications in energy storage, for highly-sensitive sensors, for optical communications with slow light and for quantum optics. In this context, our team at ILM studies optical nanostructures for light manipulation and propagation at the scale of single nano-objects such as single emitters (molecules or quantum dots), single plasmonic nanoantennas or plasmonic crystals. The Master 2 project will possess theoretical as well as experimental work.



Surface plasmon momentum space

MISSIONS :

Based on our previous results, a tool box will be developed to design nanostructures to achieve specific optical modes. After validation of the simulations on a dielectric Bragg mirror, other organizations will be pursued such as disorder or coupled Fabry-Perot cavities to achieve mode coupling such as bonding and antibonding. Lossy materials such as gold will be introduced into the designed structures. A point of great interest will be to numerically set an emitter inside the structure to enhanced its quantum properties such as the emission rate (Purcell effect) and its emission direction (emission diagram).The experimental work will consist to design original experiments to manipulate two dimensional wave-packets called plasmon inside a 2D nanostructure with controlled light momentum. In close collaboration with F. Lerouge and Y. Bretonière at ENS-Lyon, single molecule or single layer of molecules will be functionalized onto a gold surface. Characterization of the fluorescence emission such as radiation pattern, spectrum and lifetime will be investigated and will reveal the density of excited modes.

OUTLOOKS :

The work may lead to a PhD funded by application to the ED PHAST

BIBLIOGRAPHY :