

# Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars)

## Proposition de stage (ne pas dépasser 1 page)

Date de la proposition :

<b>Responsable du stage / internship supervisor:</b>	
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Lieu du stage / internship place: <b>LCF, même adresse</b>	

<b>Titre du stage / internship title: Plasmonic hybrid waveguides for active miniature devices</b>
Résumé / summary <b>Guides plasmoniques hybrides pour dispositifs actifs miniatures / Plasmonic hybrid waveguides for active miniature devices</b>
<p>Plasmonics, the use of metals and their surface fields, can be exploited to obtain very tiny waveguides in the visible and near infrared. However, there is a need to diminish the impact of metal losses at optical or near infrared frequencies. We propose in this internship to accomplish this in two ways in the context of miniature integrated optics:</p> <p>Firstly, a lot of the miniturization brought by plasmonics can be obtained by hybrid waveguides, with a thin rib dielectric structure close to a flat and clean metal surface. We have proposed a technological path [2] to reach this structure and made preliminary attempts to show its feasibility. It is part of the general category of hybrid plasmonics waveguides. Technology will be made in collaboration with IEF (Paris-Sud) and experiments possibly with PMC (Polytechnique) for solgel layers and LPL (Paris 13).</p> <p>This hybrid approach is also the only that has shown a potential for adding gain to plasmonic structures [1] and reach for instance lasing action : these are the so-called « spasers », demonstrated in 2009 by best teams worldwide [3]. Our approach also allows to incorporate gain, and is much more deterministic than the partly self-assembled approach of the 2009 pioneers.</p> <p>During the internship, attempts to fabricate such waveguides with proper couplers to excite them will be done, and a corresponding setup in the visible will be arranged. The internship can be continued by a thesis.</p> <p>1. H. Benisty and M. Besbes, "Plasmonic inverse rib waveguiding for tight confinement and smooth interface definition " J. Appl. Phys. 108, 063108 (063101-063108) (2010). 2. H. Benisty, et al. "Implementation of PT symmetric devices using plasmonics: principle and applications," Optics Express 19, 18004-18019 (2011). 3. R. F. Oulton, V. J. Sorger, T. Zentgraf, R.-M. MA, C. Gladden, L. Dai, G. Bartal, and X. Zhang, "Plasmon lasers at deep subwavelength scale," Nature 461, 629-632 (2009).</p>
<b>Toutes les rubriques ci-dessous doivent obligatoirement être remplies</b>

<b>Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : OUI</b>
<b>Si oui, financement de thèse envisagé/ financial support for the PhD: EDOM, ...</b>

Lasers, Optique, Matière	<b>x</b>	Lumière, Matière : Mesures Extrêmes	
Plasmas : de l'espace au laboratoire			

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