Postdoctoral position

Magneto-plasmonic circulator design and characterization

(20 to 24 months)

(Starting in 2025)

Laboratory: **Centre for Nanoscience and Nanotechnology**
Address: **University Paris Saclay, CNRS**
10 Boulevard Thomas Gobert, 91120 Palaiseau - France

Contact: Beatrice Dagens

email: beatrice.dagens@c2n.upsaclay.fr

Team website: https://cimphonie.c2n.universite-paris-saclay.fr/en/
Project website: https://www.circulight.eu/

Context : Our connected world is increasingly dependent on a large variety of sensors, which all require low-consuming, efficient and compact systems. Photonics has the potential to answer these requirements. But extreme miniaturization and integration of multiple photonic functions suffer from the lack of one essential building block: the optical circulator, a central device that allows the others to be brought together in Photonic Integrated Circuits (PICs). Such non-reciprocal (NR) element[1,2] would enable full integration of active and passive devices and diversify circuit architectures. The new technology envisioned in the European project CIRCULIGHT[3] will lay the foundations of this essential building block. CIRCULIGHT technological decisive progress is based on magneto-optical (MO) nanoparticle-composite sol-gel material and on magneto-biplasmonic (MBP) effect[4], which will enable the monolithic insertion of circulators on any photonic platform. Within the project, a demonstration will be made on two of them, based on InP and Si respectively, operating at 1.3 or 1.5 µm.

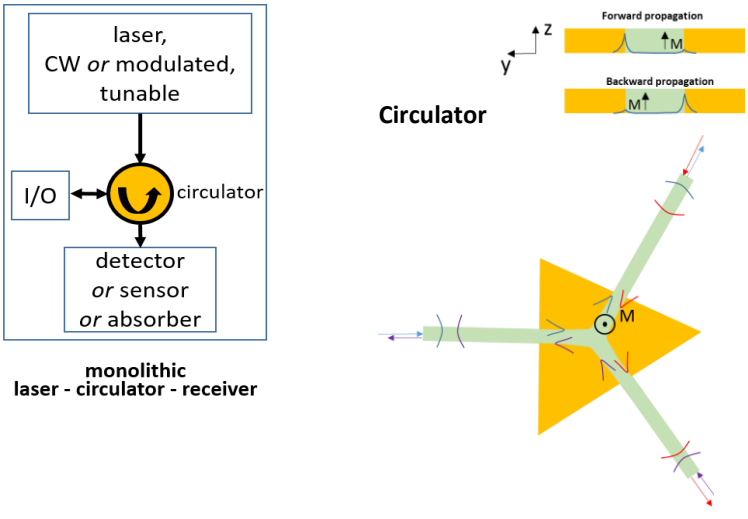

Fig. 1. Left : optical circulator aims at successively connecting integrated light source with photonic circuit (I/O) and detection system, without crosstalk between the different elements. Right : the proposed magneto-biplasmonic circulator is based on the asymmetrization of slot waveguide coupled mode, induced by the Transverse Magneto-optical effect (TMOKE).

Tasks of the postdoctoral fellow: the postdoctoral fellow will be in charge of the static characterization of the magneto-optical waveguides and circulators fabricated within the project. This includes the implementation of the magnetic control in the already available optical transmission setup, contributions to the design and simulation of the device (notably for experiments interpretation and analysis), and co-supervision (simulation, results analysis) of a PhD student working on magneto-optical SNOM (scanning near field microscopy).

The postdoctoral fellow will be part of the EIC Pathfinder Open CIRCULIGHT consortium: he/she will participate to the project meetings and contribute to project results communications and publications.

Profile required

- Education in optics/photonics
- Scientific skills
    - Knowledge of plasmonics and possibly magneto-optics
    - Good knowledge of optical characterisation
    - Good knowledge of optical simulation (FDTD)
- Transversal skills
    - Ability to analyse, solve technical problems and work in a team
    - Capability to communicate and share results in a multidisciplinary and multi-nationality environment
    - Good interpersonal skills and autonomy
    - Good level of written and spoken English; French knowledge appreciated.

1. D. Jalas, A. Petrov, M. Eich, W. Freude, S. Fan, Z. Yu, R. Baets, M. Popović, A. Melloni, J. D. Joannopoulos, M. Vanwolleghem, C. R. Doerr, and H. Renner, "What is-and what is not-an optical isolator," Nature Photonics 7, 579–582 (2013).

2. B. J. H. Stadler and T. Mizumoto, "Integrated magneto-optical materials and isolators: A review," IEEE Photonics Journal 6, (2014).

3. https://www.circulight.eu/

4. Sevag Abadian, Giovanni Magno, Vy Yam, and Beatrice Dagens, "Broad-band plasmonic isolator compatible with low-gyrotropy magneto-optical material," Opt. Express 29(3), 4091-4104 (2021). https://doi.org/10.1364/OE.415969

This postdoctoral position is supported by Horizon Europe research and innovation programme under grant agreement No101129645 (CIRCULIGHT project)