**ENS / IISER collaboration**

***Internship subject form***

To be sent back by January 31st, 2020

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| Name of the institution | Ecole normale supérieure Paris-Saclay |
| Name of the host laboratory | LUMIN (FRE 2036) |
| Website of the host laboratory | Under construction |
| Research group | Lasers and Optics |
| Internship number | PHYS 3 |
| Internship subject (title) | Passive mode-locking and bifurcation study in non-conventional nanolasers |
| Prerequisites | Nanophotonics, laser physics, nonlinear dynamics, programming |
| Internship proposal: description and expected training outcomes (15 lines max.) | Semiconductor nanocavities based on photonic band gap materials permit to draw a stimulating analogy between electrons in potentials and photon in nanocavities. In particular, one can show that the photonic band gap material used to build the nanocavity can be engineered in order to create the equivalent of a harmonic potential for photons. In these conditions, the eigenmodes are equally separated in frequency and we have recently predicted that such a comb of modes can be passively mode-locked and lead to the emission of a soliton similar to a quasi-classical state in a harmonic oscillator. The aim of the internship will be to generalize this prediction to difference configurations and to fully analyze the bifurcation diagram of the system.  [1] Y. Sun et al., Phys. Rev. Lett.**123**, 233901(2019) - doi:10.1103/PhysRevLett.123.233901 |