VENDREDI 24 MAI À 14H

SALLE SÉMINAIRE F200 – BÂT F

“Integration of waveguides and nanomaterials towards miniaturized pulsed lasers”

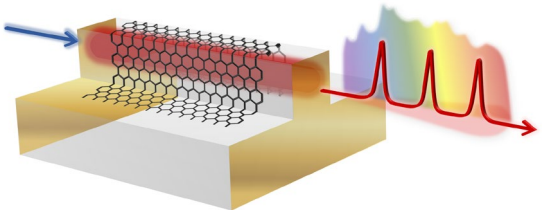
JI EUN **BAE**

Postdoctoral Fellow at CIMAP (Caen, France)

Compact pulsed lasers have been actively studied for practical applicability, integrated photonics, and their potential high-repetition-rate mode-locking [1]. GHz-level repetition frequencies particulaly provide fast sampling and high precision for wide application areas including spectroscopy, optical communication and material processing. One of the most reliable strategies to downsize solid-state lasers is embedding waveguide structures into dielectric laser gain materials by femtosecond-laser inscription [2,3] or diamond-saw dicing [4].

As a nonlinear switching device for pulsed operation of lasers by passive Q-switching and mode-locking, low-dimensional nanomaterials such as graphene and carbon nanotubes exhibit superior optical properties including intrinsic ultrabroadband nonlinear absorption. Especially for compact cavities with short round-trip time and low critical mode-locking pulse energy, carbon nanomaterials are highly advantageous thanks to ultrashort relaxation times, finely controllable nonlinearity with low non-saturable loss, and flexible integration types [3,5].

This talk discusses recent advances in miniaturized pulsed lasers by effective integration of femtosecond-laser inscribed waveguides and carbon-nanomaterial-based saturable absorbers. By utilizing their unique optical properties, diverse pulsed operation regimes are demonstrated from Q-switching to continuous-wave mode-locking. Pulsing mechanism and key parameters in waveguide lasers are investigated for development of novel on-chip ultrafast lasers.



[1] J. E. Bae *et al.*, Photonics Research 10(11), 2584-2589 (2022).
[2] T. Calmano *et al.*, IEEE Journal of Selected Topics in Quantum Electronics 21(1), 1602213 (2015).
[3] J. E. Bae *et al.*, Laser & Photonics Reviews 16(4), 2100501 (2022).
[4] P. Loiko *et al.*, Optics Express 26(19), 24653-24662 (2018).
[5] J. E. Bae *et al.*, Optics Letters 45(1), 216-219 (2020).

SÉMINAIRE

CENTRE DE RECHERCHE SUR LES IONS, LES MATÉRIAUX ET LA PHOTONIQUE
CIMAP