Physics AT QUEENS COLLEGE

Colloquium Notice

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Lithium niobate integrated nonlinear photonics: new devices and systems on an old material

Despite being an old material in optical and microwave technologies in its bulk form, thin-film lithium niobate (TFLN) has recently emerged as one of the most promising integrated photonic platforms owing to its strong electro-optic (EO) coefficient, quadratic optical nonlinearity, and broadband optical transparency ranging from 250 nm to 5 μm. In this talk, I will first overview the basic optical properties of LN, and how LN nanophotonics can grant us new regimes of nonlinear light-matter interactions. Then I will present some of our recent experimental results on the realization and utilization of dispersion-engineered and quasi-phase-matched ultrafast photonic devices in both classical and quantum domains. I will discuss the realization of 100 dB/cm optical parametric amplification [1], 1.5-3 μm widely tunable optical parametric oscillator (OPO) [2], ultra-wide bandwidth quantum squeezing [3], femtosecond and femtojoule on chip all-optical switching [4], and the integrated mode-locked lasers based on TFLN [5].

[1] L. Ledezma*, R. Sekine*, Q. Guo*, R. Nehra, S. Jahani, and A. Marandi, "Intense optical parametric amplification in dispersion-engineered nanophotonic lithium niobate waveguides," Optica, vol. 9, pp. 303-308, 2022.
[2] L. Ledezma, A. Roy, L. Costa, R. Sekine, R. Gray, Q. Guo, et al., "Widely-tunable optical parametric oscillator in lithium niobate nanophotonics," arXiv preprint arXiv:2203.11482, 2022.
[3] R. Nehra*, R. Sekine*, L. Ledezma, Q. Guo, R. M. Gray, A. Roy, et al., "Few-cycle vacuum squeezing in nanophotonics," Science, 2022.
[4] Q. Guo*, R. Sekine*, L. Ledezma*, R. Nehra, D. J. Dean, A. Roy, et al., "Femtojoule femtosecond all-optical switching in lithium niobate nanophotonics," Nature Photonics, vol. 16, pp. 625-631, 2022.
[5] Q. Guo et. al. Actively mode-locked laser in nanophotonic lithium niobate with Watt-level peak power (To be submitted).

Monday
March 20, 2023
Starts at 12:15 PM
Coffee at 12:00 PM
Physics Conference Room, SB B326
This talk is accessible via **Zoom** or use
meeting ID 829 2687 2594 and **passcode 866995** to join