Title : Quantitative Acousto-Magneto-Plasmonics

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Research Area : Condensed Matter, Optics

Methods: Magneto-optical microscopy, ultrafast magneto-acoustic microscopy, plasmon spectroscopy in hybrid metal-ferromagnet multilayers, magnetic metasurfaces, numerical simulations.

PhD track subject : The project will focus on fundamentals and applications of coupled high-frequency GHz-to-THz acoustic, magnetic and plasmonic excitations in hybrid magnetic nanostructures [1-2]. After a series of introductory theoretical/computational/automated data analysis tasks [3,4] the student will design an ultrafast metasurface-based [5] acousto-magneto-plasmonic modulator sketched in Fig. 1. Its experimental characterization will proceed through the continuous wave (magneto-)optical characterization of magnetic multilayers and periodic metasurfaces, time-resolved pump-probe microscopy. Fundamental questions behind this PhD address the limits of ultrafast energy efficient optical modulation at the nanoscale boosted by the simultaneous excitation of high-Q phonon, magnon and plasmon resonances, possibly enhanced via metasurfaces [6]. This PhD will be part of existing multipartner international collaborations with leading research institutes in France, Germany and Spain, notably taking care of sample nanofabrication.

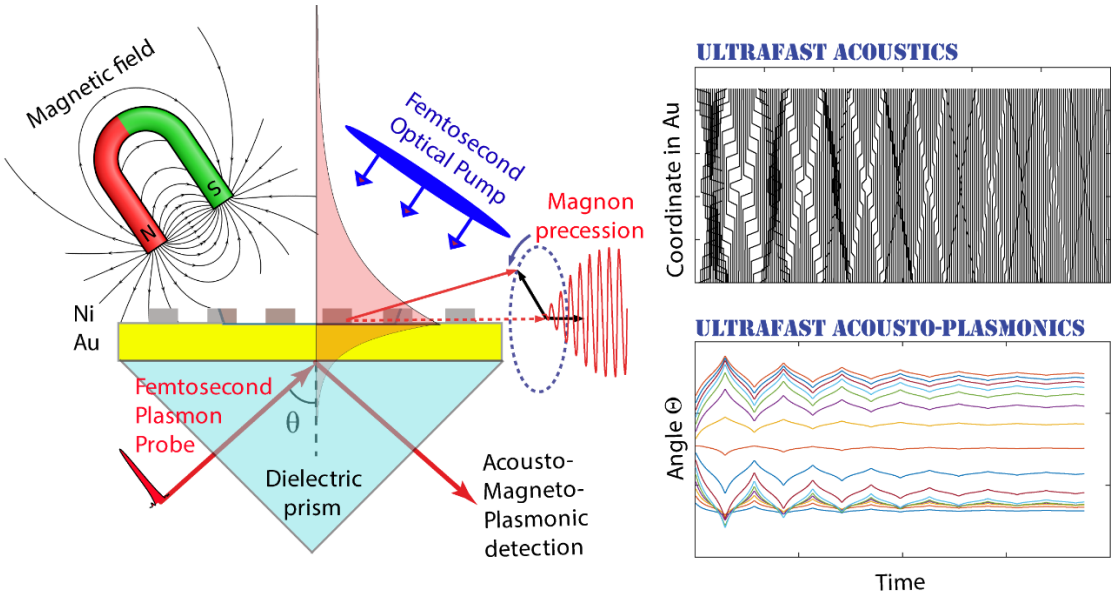

Fig. 1: An ultrafast metasurface-based Acousto-Magneto-Plasmonic modulator.

References :

[1] V.V. Temnov, Nature Phot. 6, 728 (2012); J. Opt. 18, 093002 (2016)
[2] A. Kimel et al., The 2022 Magneto-Optics Roadmap, J. Phys. D: Appl. Phys 55, 463003 (2022)
[3] U. Vernik et al., Phys. Rev. B 106, 144420 (2022)
[4] A. Ghita at al., Phys. Rev. B 107, 134419 (2023)
[5] A. Alekhin et al., Nano letters 23, 9295 (2023)
[6] Full publication list at: https://scholar.google.com/citations?user=zMBeb0YAAAAJ&hl=en