# Séminaire de Satoshi Iihama

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## Ultrafast direct photonic generation and manipulation of magnetization in heterostructure thin films

Irradiation of laser pulse on thin film metallic nanomagnets enables us to realize ultrafast control of magnetization direction. Recently, all-optical magnetization switching (AOS) has been demonstrated in a wide variety of magnetic materials, which has potential to be used for future photonic memory devices where photonic information can be stored by direction of nanomagnets. Helicity-dependent AOS has been reported in various kinds of magnetic material, such as ferromagnetic/ferrimagnetic alloy/multilayer and granular magnetic recording media. However, the mechanism of magnetization switching mainly originated from magnetic circular dichroism, i.e., small difference of heating effect. Thus, speed and energy-efficiency are not superior compared with single-shot helicity-independent AOS observed mainly in Gd-based ferrimagnets. A promising way to realize ultrafast magnetization manipulation is to utilize photonic generation of electron spins and/or magnetic field such as inverse Faraday effect. Ultrafast photonic generation of electron spins and magnetic field can be quantitatively evaluated by measuring circularly-polarized laser induced magnetization dynamics. In this talk, I will introduce recent experimental evaluation of photon-induced electron spins and magnetic field in metallic thin film magnets [1,2] and discuss a potential for ultrafast photonic control of magnetization direction. Also, photonic generation of electron spins in semimetal Bi observed recently by using laser-induced terahertz emission measurement [3] will be introduced.

[1] S. Iihama, K. Ishibashi, S. Mizukami, Nanophotonics 10, 1169 (2021)
[2] S. Iihama, K. Ishibashi, S. Mizukami, J. Appl. Phys. 131, 023901 (2022)
[3] K. Ishibashi, S. Iihama, S. Mizukami, Phys. Rev. B in-press

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