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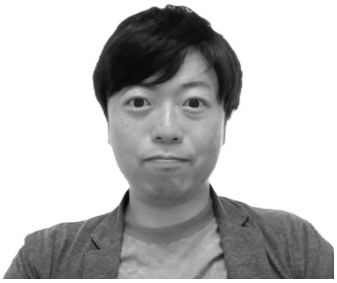
Magnetization dynamics induced by circularly-polarized light
~ Transfer of photonic spin angular momentum to magnetization ~



During the last decade, it has been demonstrated that magnetization of thin film metallic ferromagnets can be reversed by irradiation of circularly-polarized light and magnetization directions are determined by the light-helicity, referred to as all-optical helicity-dependent switching (AO-HDS) [1-5]. AO-HDS has been mainly explained by helicity-dependent heating effect due to magnetic circular dichroism. On the contrary, transfer of photonic angular momentum to magnetization in AO-HDS has also been discussed [4, 5], which is promising towards ultrafast optical manipulation of magnetization. Recently, helicity-dependent magnetization dynamics induced by circularly-polarized light via a stroboscopic measurement has been reported in ferromagnetic thin films and ferromagnet/ heavy metal heterostructures [6-10], which enables us to quantify transfer of photonic angular momentum to magnetization of ferromagnetic thin film. Electronic spin and orbital angular momentum induced by spin angular momentum of light give rise to angular momentum transfer torque on magnetization. Quantitative consideration of the angular momentum conversion will be discussed in the presentation.

[1] C. H. Lambert *et al*., Science **345**, 1337 (2014). [2] Y. K. Takahashi *et al*., Phys. Rev. Appl. **6**, 054004 (2016). [3] M. S. El Hadri *et al*. Phys. Rev. B **94**, 064412 (2016). [4] R. John *et al*., Sci. Rep. **7**, 4114 (2017). [5] G. Kichin *et al*. Phys. Rev. Lett. **12**, 024019 (2019) [6] G. M. Choi *et al*., Nat. Commun. **8**, 15085 (2017). [7] G. M. Choi *et al*., Nat. Commun. **11**, 1482 (2020). [8] S. Iihama *et al*., Nanophotonics **10**, 1169 (2020). [9] S. Iihama *et al*., J. Appl. Phys. **131**, 023901 (2022). [10] K. Nukui, S. I. *et al*., Phys. Rev. Lett. **134**, 016701 (2025).

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