567th ASRC Seminar

Date: 13:30 ～15:00, 15 October

Location: Meeting room 302, ASRC Building

Speaker: Dr. Yusuke Hashimoto
(Radboud University Nijmegen,
Institute for Molecules and Materials)

Title: Propagation dynamics of optically-excited spin-waves in a garnet film visualized by new ultrafast time-resolved magneto-optical microscope

We demonstrate k-selective optically-excited spin-waves in a garnet film, observed by a newly developed ultrafast time-resolved magneto-optical (TRMO) microscope. Our system realizes magneto-optical (MO) imaging of spin-waves with sub-picosecond time-resolution, a micrometer spatial-resolution, and a million pixels per image [1]. The system relies on the rotation analyzer method, which determines the angle of the light polarization with milli-degrees accuracy, and a low-noise CCD camera for the detection. A short experimental time of 15 seconds to get a complete MO image, which is thousands times shorter than the conventional scanning method, is also a major feature of our system. The obtained data clearly show the optically-excited spin waves, propagating with five modes. The data were analyzed with model calculations based on the Damon-Eshbach theory. Interestingly, one mode is tentatively attributed to the spin-Seebeck effect, which is caused by the pulsed and focused light illumination giving a huge temperature gradient of hundreds of Kelvins in a micrometer region.

[1] Y. Hashimoto, et al., Rev. Sci. Instrum. 85, 063702 (2014).

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Sadamichi Maekawa (81-5093)
Advanced Science Research Center