Generation of spin current by spin pumping under nonlinear magnetization dynamics

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In the field of spintronics, a spin current, a flow of spin angular momentum, is expected to be used in carrying and processing information [1]. Various methods of generating spin currents have been developed and investigated. The investigations, however, have been restricted to linear regime; spin-current generation in nonlinear regime has been hardly investigated despite the potential applications [2]. One of the versatile methods of generating spin currents is a spin pumping technique, which injects spin current from magnetization dynamics across a ferromagnet / normal metal interface. In this work, we investigated spin-current generation via the spin pumping under nonlinear magnetization dynamics.

The experimental set-up is shown in Fig. 1, where the sample consists of ferrimagnet YIG and normal metal Pt. Above a threshold of the incident microwave power, the nonlinear magnetization dynamics, known as magnon auto-oscillations, were observed as frequency modulations of the absorbed microwave by YIG (Fig. 2). In this presentation, we will discuss experimental investigations on the spin pumping by the nonlinear dynamics.

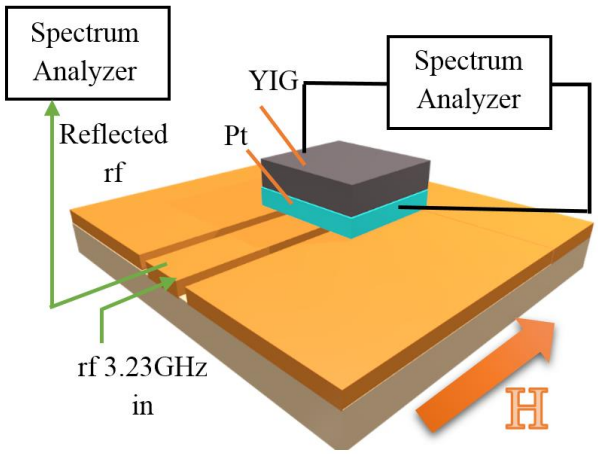

Fig. 1: Experimental set-up

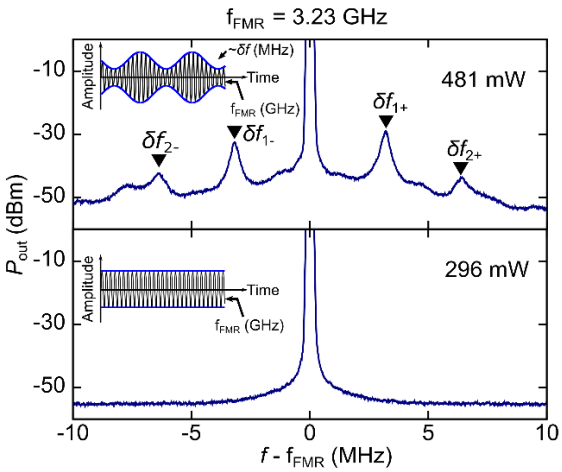

Fig. 2: Frequency spectra in the reflected

References

[1] S. Maekawa, S. O. Valenzuela, E. Saitoh, T. Kimura, *Spin Current* (Oxford Science Publications, 2012)

[2] H. Sakimura, T. Tashiro, K. Ando, *Nature Commum.* **5,** 5730 (2014)

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