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Confined spin waves in a micro strip and the modes evolution

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Spin dynamics properties in micron and sub-micron size structures have attracted much attention because of applications in high-speed memory devices and signal preceding devices, such as MRAM, spin wave bus, and spin wave logic device [1]. Spin wave eigen-modes in lateral confined structures have been investigated with both optical and electrical methods [2,3]. Here, the modes evolution between surface mode, edge mode (EM), and central mode (CM) was investigated in a micro $Ni_{0.79}Fe_{0.21}$ (Py) strip by the microwave photo voltage technique [2]. In a permalloy strip with a thickness of 137 nm, a width of 20 mm and a length of 2.45 mm, spin waves were detected electrically with a microwave excitation, while an external magnetic field H was applied in plane. Spin wave modes due to confinement in the strip were well demonstrated. By tuning the angle theta between the external magnetic field and the axis of the Py strip, an evolution between the surface mode, CM and EM were detected. A crossing point between the CM and EM was observed around 78 degree for a 5-GHz microwave, where both modes coexisted but were spatially separated. This work was funded by NSERC and UPGP (C.-M. Hu). Lihui Bai is supported by Tohoku Univ. G-COE Program, and by JSPS and MEXT Japan.

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