Abstract Submitted
for the SES21 Meeting of
The American Physical Society

Generating short wavelength spin waves in Y-shaped Permalloy structures JASON LIU, Georgia Southern University — Short wavelength or high wavevector spin waves are desirable for magnonic applications as devices scale to the order of the spin wave wavelength (micrometers to nanometers). Methods of generating high wavevector spin waves involving tapered waveguides, magnetic gratings, and nonlinear effects have been proposed in previous works but have their limitations. In this work, high wavevector spin waves are shown to be efficiently generated in Y-shaped microstructures. The structures are made of 2.7-μm wide and 40-nm thick Permalloy branches. Spin waves were driven in the arms of the structure with a microstrip antenna and channeled into the base. An in-plane external magnetic field was applied perpendicular to the base, and at an angle with the arms. Experiments conducted with micro-focus Brillouin light scattering (BLS) and calculations conducted with micromagnetic simulations reveal that spin waves excited in the arms undergo a process of wavevector up-conversion as they transition into the base. BLS measurements show additional spin wave frequencies in the base of the structure as compared to a straight microstrip. When compared to dispersion relations, the additional frequencies observed in the base correspond to those in the arms, which are at higher wavevectors in the base. These results represent new opportunities for efficiently generating short wavelength spin waves, which may be useful in nanomagnonic applications.

Jason Liu
Georgia Southern University

Date submitted: 30 Sep 2021 Electronic form version 1.4