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**Imaging of precessional phase variations in spin Hall devices using picosecond heat pulses** FENG GUO, JASON BARTELL, GREGORY FUCHS, Cornell University — We introduce a new approach of studying the spin Hall effect in patterned magnetic multilayers by imaging ferromagnetic resonance (FMR) precession phase. Using time-resolved anomalous Nernst effect (TRANE) microscopy, we quantify the amplitude and phase of local magnetic precession, which allows us to image the total driving field vector orientation. In a 5 $\mu$m wide channel, we observe a substantial variation of the driving field vector as a function of lateral position that we attribute to variations in the total Oersted field angle and the demagnetization field. Next, using the same device, we compare TRANE phase imaging measurements to all-electrical spin-transfer torque ferromagnetic resonance (STFMR) measurements that sense the spatially averaged precession phase. We find that spatial phase variations introduce a systematic error in the spin Hall efficiency measured using conventional STFMR analysis in our devices. These results underscore the importance of phase-sensitive dynamic imaging to augment all-electrical FMR techniques in quantifying the spin Hall efficiencies of devices.

Feng Guo
Cornell University

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