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Investigation of the timescale of the spin-Seebeck effect in yttrium iron garnet from pico to nanoseconds[1] JOHN JAMISON, ZIHAO YANG, ROBERTO MYERS, Ohio State Univ - Columbus — We investigate the timescale of the spin-Seebeck effect (SSE) in yttrium iron garnet (YIG) by exciting transient thermal gradients with 150-fs laser heating pulses. The transient thermal gradient generates a spin current which is measured by a Pt top contact via the inverse spin Hall-effect (ISHE). A pulse selection system is used to lower the repetition rate of the laser to low frequencies (e.g. 10 kHz) such that the transient thermal gradient decays completely before the arrival of the next pulse. Lock-in detection, referenced at the laser repetition rate, is used to measure ISHE as a function of magnetic field, verifying that SSE is generated from the individual ultrafast laser pulses. Next, utilizing an optical delay line we vary the time delay between two equal fluence pulses. The correlated ISHE signal is measured with lock-in detection as a function of delay time with 0.1 ps resolution out to 1 ns to examine the characteristic decay times of the ultrafast laser pulse induced spin-Seebeck effect.

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