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Thermoelectric detection of spin waves[1] HELMUT SCHULTHEISS, JOHN E. PEARSON, SAMUEL D. BADER, AXEL HOFFMANN, Materials Science Division, Argonne National Laboratory — We report on the thermoelectric detection of spin waves in permalloy stripes via the anomalous Nernst effect[2]. Spin waves are locally excited by a microwave current flowing in a coplanar waveguide placed on top of a permalloy stripe, which acts as a waveguide for spin waves. Electric contacts at the ends of the permalloy stripe measure a dc voltage generated along the stripe. Magnetic field sweeps for different applied microwave frequencies reveal, with remarkable signal-to-noise, an electric voltage signature characteristic of spin-wave excitations. The symmetry of the signal with respect to the applied magnetic field direction indicates that the anomalous Nernst effect is responsible; Seebeck effects, anisotropic magnetoresistance, and voltages due to spin-motive forces are excluded. The dissipation of spin waves causes local heating, that drains into the substrate giving rise to a temperature gradient perpendicular to the sample plane, resulting in the anomalous Nernst voltage. Since this method is solely based on the heat generation inside the magnetic film due to the relaxation of the magnetization it has practically no lower limit for the wavelength of the detected spin waves.

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[2]H. Schultheiss, J.E. Pearson, S.D. Bader, and A. Hoffmann, Phys. Rev. Lett. in press.

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