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**Element-selective magnetization dynamics probed using ultrafast soft x-ray beams** S. MATHIAS, C. LA-O-VORAKIAT, M. SIEMENS, M. MURNANE, H. KAPTEYN, JILA, University of Colorado and NIST, Boulder, Colorado, M. AESCHLIMANN, University of Kaiserslautern and Research Center OPTIMAS, Kaiserslautern, Germany, P. GRYCHTOL, R. ADAM, C. SCHNEIDER, Forschungszentrum Juelich, Germany, J. SHAW, H. NEMBACH, T. SILVA, Electromagnetics Division, NIST, Boulder, Colorado, USA — We use few-femtosecond soft x-ray pulses from high-harmonic generation to extract elementally-specific demagnetization dynamics of a compound material for the first time. Using a geometry where high-harmonic beams are reflected from a magnetized Permalloy grating, we observe large changes in the reflected soft x-ray intensity of up to 6% at the M absorption edges of Fe (54eV) and Ni (67eV) when the magnetization is reversed. In a second experiment, an ultrashort laser pulse is used to destroy the magnetic alignment, which allows us to measure the fastest, elementally-specific, demagnetization dynamics to date, with 55 fs time-resolution. Both Fe and Ni demagnetize on the same timescales in this strongly exchange coupled material. The use of high harmonics for probing magnetic materials with nanometer spatial resolution, elemental specificity, and femtosecond-to-attosecond time resolution will be discussed.

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