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Stimulated Resonant X-Ray Emission in Solids ZHAO CHEN, DANIEL HIGLEY, Stanford University, MARKUS HANTSCHMANN, Helmholtz-Zentrum Berlin, VIRAT MEHTA, HGST, MARTIN BEYE, Helmholtz-Zentrum Berlin, WILLIAM SCHLOTTER, JOACHIM STOHR, SLAC — We present direct evidence of resonant stimulated X-Ray emission in magnetically patterned Co/Pd multilayers. At a free electron laser, we measure X-Ray transmission through Co/Pd of ultrafast (≈2fs) X-Ray pulses at the Co L_3 edge for fluences of up to 2 J/cm^2/fs simultaneously in the transmission and scattering geometries. With increasing fluence, we observe a nonlinear decrease in first-order scattering intensity together with a compensating increase in transmitted forward intensity for all energies within the Co resonant absorption edge. At high enough fluences (>1 J/cm^2/fs), the sample absorption spectrum and scattering intensity are both suppressed by over two orders of magnitude, leaving the sample effectively transparent to X-Rays. In our geometry, these two effects are indicative of elastic stimulated scattering, which favors forward transmission at the cost of scattered intensity in all other directions. We then show that our data is well-described by stimulated emission calculations using the optical Bloch equations. Our dual measurement serves as a pioneering study of X-Ray stimulated processes, and paves the way for experiments on realizing potentially powerful X-Ray spectroscopic techniques such as stimulated RIXS.

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