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Ultrafast Demagnetization by Extreme Ultraviolet Light

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Free-electron lasers (FELs) enable the study of dynamics in matter on combined femtosecond time and nanometer length scales [1]. One of the most intriguing topics within contemporary research on magnetism, ultrafast near-infrared (IR) laser-induced demagnetization [2,3], has greatly benefited from the advent of FELs [4] as it was shown that optically generated superdiffusive spin currents [5] contribute to that phenomenon [6]. Following a previous campaign [7], here we report on the observation of a breakdown of the magnetic scattering cross section of Co/Pt multilayers for extreme ultraviolet (XUV) fluences >1 mJ/cm² defining the threshold fluence for FEL experiments where the FEL is meant to be a non-invasive probe. By employing a FEL double-pulse scheme, XUV-induced demagnetization is identified to be the major mechanism behind the breakdown. Besides revealing the existence of ultrafast demagnetization in the XUV regime for the first time, our results demonstrate that it proceeds much faster than the demagnetization when using IR radiation.
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