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An ultrafast x-ray detecting system at an Elliptically Polarization Undulator beamline

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Abstracts: An ultrafast x-ray detecting system is under development at LBNL for application primarily to studies of ultrafast magnetization dynamics. The system consists of a fs laser, a x-ray streak camera and an elliptically polarization undulator (EPU) beamline. Polarized x-rays from an elliptically polarized undulator can be used to measure magnetic circular dichroism (XMCD) of a sample. XMCD has the unique ability to independently measure orbit and spin magnetization with sub-monolayer sensitivity and element specificity. The streak camera has simultaneously a sub-picosecond temporal resolution and a high spatial resolution. The combination of the streak camera and EPU allows us to study the transfer of angular momentum from spin to orbit to the lattice in the sample on an ultrafast time scale. We describe here the detailed performance of the ultrafast detecting system, and in particular development of high repetition rate photoconductive switches with fast rise time, temporal fiducialization using a reference UV pulse to eliminate jitter, and optimization of the performance of the camera by detailed simulation of electron optics and of the action of the deflection system. Some perspectives are given of additional ways to improve the performance of the system. The primary experimental results of different samples such as Fe/Gd, Ni show the observation of ultrafast magnetization dynamics.