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XAS measurements at LCLS: Investigating Electronic Damage at an X-Ray FEL CATHERINE GRAVES, DAVID BERNSTEIN, Stanford University, SLAC, JOSHUA TURNER, WILLIAM SCHLOTTER, HERMANN DÜRR, ANDREAS SCHERZ, JOACHIM STÖHR, SLAC — As X-ray FEL sources such as the LCLS ramp up scientific studies, the damage caused by the intense x-ray pulses has become a central question. X-ray FEL investigations of solid-state materials must consider the change in the electronic system during the x-ray pulse, in contrast to proposed biomolecular imaging experiments which must suppress atomic motion.\(^1\) The potential electronic damage to the system is also amplified in many materials investigations which probe absorption edges. Therefore, a key need of all studies involving materials research with X-ray FELs is to mitigate or overcome the electronic damage when probing the system. We report the first x-ray absorption spectroscopy (XAS) results from LCLS, which show significant line shape changes dependent on the fluence and x-ray pulse length. We employ a technique previously developed at FLASH which also allows us to visualize the beam dispersion.\(^2\) Our spectroscopy results from LCLS demonstrate a safe fluence and pulse length regime at which material investigations can be conducted without perturbing the ground state of the system during the probing x-ray pulse.


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