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Spectroscopy With Free Electron Lasers DAVID BERNSTEIN, MARK BURKHARDT, SLAC and Stanford University, ANDREAS SCHERZ, JOACHIM STÖHR, WILLIAM SCHLOTTER, SLAC, YVES ACREMANN, ETH Zurich, MARTIN BEYE, TORBEN BEECK, FLORIAN SORGENFREI, ANNETTE PIETZSCH, WILFRED WURTH, ALEXANDER FÖHLISCH, FLASH and University of Hamburg — We demonstrate the feasibility of near edge x-ray absorption fine structure spectroscopy on solids by means of femtosecond soft x-ray pulses from a free-electron laser (FEL). Our experiments, carried out at the FEL at Hamburg used a special sample geometry, spectrographic energy dispersion, single shot position-sensitive detection, and a data normalization procedure that eliminates the severe fluctuations of the incident intensity in space and photon energy. As an example, we recorded the $^3D_1$ $N_{4,5}$ edge absorption resonance of La^{3+} ions in $LaMnO_3$. Our study opens the door for x-ray absorption measurements on future x-ray FEL facilities

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