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Using XFELs to probe fast electron generation and filamentation in ultra-intense laser-solid interactions THOMAS KLUGE, HZDR, CHRISTIAN GUTT, DESY, LINGEN HUANG, HZDR, SIOM, JOSEFINE METZKES, MICHAEL BUSSMANN, HZDR, ULRICH SCHRAMM, THOMAS COWAN, HZDR, TU Dresden — The interaction of ultra-intense lasers with solid density matter produces extreme current densities of relativistic electrons which are useful in many wide-ranging applications including high-gradient laser-ion acceleration, intense surface harmonic generation, isochoric heating, and investigation of fast ignition inertial fusion. The fundamental electron generation and transport physics is difficult to accurately model with PIC simulations, due to the strong influence of return current neutralization which relies on the full bulk material and plasma response of the target. Directly probing the laser-solid interaction, including the ionization dynamics, surface electron acceleration, and bulk return current structure would provide a major step forward in validating our modeling and understanding. The use of small angle x-ray scattering (SAXS) at hard x-ray XFELs will be described as a means to directly measure the solid-density plasma electron-electron correlations, and the resulting fast electron generation and associated filamentation instabilities. [see T. Kluge, C. Gutt et al, arXiv:1306.0420]

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