

Relaxation of non-thermal electrons in solid density plasmas heated by the European X-ray free electron laser

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We present recent results from an experiment carried out at the European X-ray free electron laser [1]. We harness the unique capabilities of the instrument to create solid density plasmas with tailored non-thermal electron distributions. By heating solids at photon energies above the k-edge, we create non-thermal photoelectrons that relax via collisional pathways. The k-shell fluorescence is measured to quantify the collisions during the XFEL pulse. The short (~ 25 fs) pulse duration provides an ultrafast snapshot of the ionisation state of the plasma in this temporal window. When compared to collisional-radiative models, this data provides quantitative measurements of the multi-body collisional rates in dense, degenerate plasmas which are notoriously difficult to calculate and measure [2, 3].

References

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