



Contribution ID: 242

Type: poster

Single-shot multi-keV X-ray absorption spectroscopy using an ultrashort laser wakefield accelerator source

Wednesday, 18 September 2019 19:00 (1 hour)

X-ray absorption spectroscopy can provide a wealth of information about a sample, including a simultaneous measurement of the temperature and structure of both the electrons and ions, via techniques such as XANES (X-ray Absorption Near Edge Structure). If these measurements can be made using a single ultrashort probe pulse at multi-keV energies, they provide a powerful tool for investigating ultrafast processes and laboratory-based high energy-density (HED) samples. States which are notoriously difficult to probe due to their extreme conditions and transient nature.

The X-rays generated by a laser wakefield driven electron beam are uniquely suited for such measurements. The pulse duration is on the order of 10's of femtoseconds, the photon flux and energy available ($E_{crit} \approx 25$ keV) can penetrate relatively large samples, and the smooth broadband spectrum is ideal for absorption measurements.

We present single-shot XANES measurements of the K-edge of a cold titanium sample from a recent experiment at the Gemini laser facility. Quantitative measurements of the slope and pre-edge absorption features are made. With appropriate experiment setup improvements the post-edge features should be resolvable, providing access to the ion component of the sample.

Primary author: KETTLE, Brendan (Imperial College London)

Co-authors: GERSTMAYR, Elias (Imperial College London); Dr STREETER, Matthew (Imperial College London); Dr BAGGOTT, Rory (Imperial College London); WATT, Robbie (Imperial College London); COLE, Jason (Imperial College London); Dr LOPES, Nelson (Instituto Superior Técnico); ALBERT, Felicie (Lawrence Livermore National Laboratory); CANDEIAS LEMOS, Nuno (Lawrence Livermore National Laboratory); GALLARDO GONZALEZ, Isabel (Lund University); LUNDH, Olle (Lund University); HUSSEIN, Amina; Dr MA, Yong (University of Michigan); Dr SMID, Michal (ELI Beamline); Dr FALK, Katerina (ELI Beamline); Dr BOURGEOIS, Nicolas (Central Laser Facility (CLF)); SYMES, Daniel (Rutherford Appleton Laboratory); SPINDLOE, Christopher (Central Laser Facility); Dr DANN, Stephen (Central Laser Facility); Dr THOMAS, Alec (University of Michigan); Prof. ROSE, Steven (Imperial College London); MANGLES, Stuart (Imperial College London)

Presenter: KETTLE, Brendan (Imperial College London)

Session Classification: Cheese and Wine Poster Session 2

Track Classification: WG4 - Application of compact and high-gradient accelerators