Contribution ID: **72** Type: **not specified**

Non-LTE modeling of XFEL produced plasmas

Friday, 19 May 2023 15:00 (20 minutes)

X-ray free electron lasers (XFEL) provide some unique capabilities in high energy density physics due to their ability to create solid density plasmas on very short time scales. The plasmas produced from these systems are typically far from LTE due to the large radiation field and short time scales. In recent years, collisional-radiative (CR) atomic kinetics codes have been adapted to handle these extreme conditions with promising results. Some of these modifications include extension of atomic data sets appropriate for solid density plasmas, treatment of continuum lowering and electron degeneracy. To reduce computational time, most models assume that the free electrons are instantaneously thermalized such that their distribution can be characterized by a Maxwellian or Fermi-Dirac distribution. This assumption breaks down for very short pulses and high XFEL photon energy, and an improved treatment of the electron distribution is required. We discuss the treatment of the electron distribution in the CR modeling framework and modifications to account for continuum lowering and degeneracy effects. We also show simulation results of an XFEL heated copper experiment. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344. Lawrence Livermore National Security, LLC.

Presenting Author

Hai Le

Presenting Author Affiliation

Lawrence Livermore National Laboratory

Presenting Author Gender

Male

Country

USA

Presenting Author Email Address

hle@llnl.gov

Primary authors: LE, Hai (Lawrence Livermore National Laboratory); SCOTT, Howard (Lawrence Livermore National Laboratory)

Presenter: LE, Hai (Lawrence Livermore National Laboratory)

Session Classification: High Energy Density Plasmas and Powerful Light Sources

Track Classification: Fundamental Data and Modelling