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Comparison of Thomas-Fermi and Impact Ionization models for ultra intense laser-mater interactions[1] P. LEBLANC, Y. SENTOKU, Department of Physics, University of Nevada, Reno, NV — Having a good model of ionization is important to study the hot electron transport in ultra-intense laser-solid interactions. One of the commonly applied models to calculate ionization in a plasma is the Thomas- Fermi (TF) model. This model is derived from equations of state which in turn assumes the plasma is in an equilibrium state. However, for the timescales of interest for the study of laser-matter interactions, laser created plasmas are highly transients and thus are not in an equilibrium state. The predicted ionization levels by the TF model are based on incorrect assumptions about the plasma conditions. In an effort to improve the accuracy of predicted ionization levels, an impact ionization model is applied to particle-in-cell simulations. This model calculates ionization levels from electron-ion collisional cross-sections and should be better suited to predict ionization levels for non-equilibrium plasmas. A comparison between the TF and Impact model is made for different plasma parameters. Preliminary results indicate the discrepancies between the models to increase as the atomic number (Z) of the target increases. Additionally, the laser intensity is varied to explore how each models reacts in different hot electron energy regimes.

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