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Modeling Transport of Relativistic Electrons through Warm-Dense Matter Using Collisional PIC[1] J MAY, UCLA, C MCGUFFEY, T YABUUCHI, UCSD, MS WEI, General Atomics, F BEG, UCSD, WB MORI, UCLA — In electron transport experiments performed on the OMEGA EP laser system, a relativistic electron beam was created by focusing a high intensity ($eA/m_ec > 1$) laser onto a gold (Au) foil. Behind the Au foil was a layer of plastic (CH) foam, with an initial density of $200mg/cm^3$. Before the high intensity laser was switched on, this foam was either left unperturbed; or it was shocked using a lower intensity laser ($eA/m_ec \sim 10^{-4}$) with beam path perpendicular to the high intensity laser, which left the CH layer in a warm dense matter (WDM) state with temperature of 40 eV and density of $30mg/cm^3$. The electron beam was imaged by observing the k-α signal from a copper foil on the far side from the Au. The result was that transport was decreased by an order of magnitude in the WDM compared to the cold foam. We have modeled this experiment using the PIC code OSIRIS, with also a Monte Carlo Coulomb collision package. Our simulations indicate that the main cause of the differences in transport is a collimating magnetic field in the higher density, cold foam, created by collisional resistivity. The plasma density of the Au layer, difficult to model fully in PIC, appears to effect the heat capacity and therefore temperature and resistivity of the target.

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