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Characterization and scaling effect of the resistive magnetic field on guiding laser generated fast electrons in solid targets YASUHIKO SENTOKU, PHILIPPE LEBLANC, University of Nevada, Reno — For applications such as fast ignition, laser generated fast electrons play an essential role in determining energy deposition mechanics. However, the physics behind the electron beam self-guiding in solid materials is poorly understood. Upon examination of experimental results and simulation data, it has been determined that understanding the resistive magnetic field is crucial in determining laser produced fast electron transport patterns in solid targets. The scaling of the resistive magnetic field and confinement conditions are derived and are compared with 2-dimensional collisional particle-in-cell simulations. We study the impact of the initial state of the material (Z dependence, conductor or insulator) on global electron transport patterns. The fast electron transport seen in the simulations are found to be consistent with our scaling rule. Previous experimental observations (e.g. Stephens PRE 2004 and Sentoku PRL 2011) that show confinement or divergence in various materials are explained by this empirical resistive scaling. Our scaling is a powerful tool to design applications of compact radiation source, where controlling fast electron transport is critical.

Philippe Leblanc
University of Nevada, Reno

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