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Intense Laser Plasma Interactions on the Road to Fast Ignition[1]

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Successful Fast Ignition (FI) offers the prospect of reduced laser driver energy and greater energy gain, which enhances the possibilities for realistic Inertial Confinement Fusion (ICF) energy power plants. The interaction of high intensity laser pulses with hot dense plasma lies at the core of the FI concept. At the most basic level FI relies on converting high energy, high intensity laser light into a beam of electrons which must propagate for 10's to ∼100 microns and deposit their energy in the compressed fuel. Thus, the process may be divided into two critical processes: 1) the generation of energetic electrons from the laser-matter interaction, and 2) the transport of energetic electrons through hot dense plasma. Experiments to date have only explored part of the FI relevant parameter space concerning laser energy, intensity, pulse duration, and transport of MeV particles. With the approach of first light on OMEGA EP and then NIF ARC, the field is poised to make crucial measurements that will determine the requirements for full scale FI. This talk will present recent results from high intensity laser-cone interactions that help pave the way to the next generation of experiments.

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