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Title: **CONE TARGET DYNAMICS REVEALED BY ANTHEM MODELING**

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CONE TARGET DYNAMICS REVEALED BY ANTHEM MODELING

The Fast Ignitor is a modern approach to laser fusion that uses a short pulse laser to initiate thermonuclear burn. A first approach uses short pulse lasers to heat pre-compressed fusion fuel. Experiments at ILE in Japan have achieved 800 eV CD fuel temperatures in cone guided targets under a 100 J in a short pulse picosecond beam. The Los Alamos implicit/hybrid simulation code ANTHEM has successfully modeled the complex cone target high-density environment. The code has shown that joule heating from the return current is the dominant heating mechanism.

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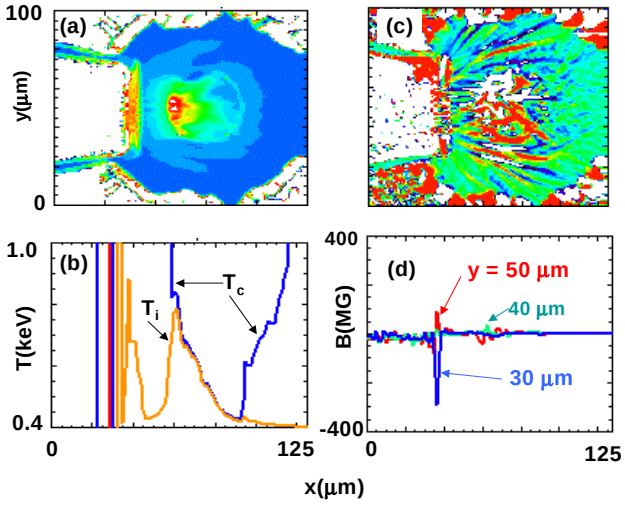
The Cone Targets at ILE consist of a pre-compressed CD core at 200 g/cm^3 and 400 eV surrounded by a CD cloud at 100 times lower densities. The cloud is penetrated by a gold cone, providing a delivery path for short pulse light. A 10^{19} W/cm^2 picosecond glass laser then delivers a 100 J burst of energy to the inner cone surface. This generates MeV hot electrons, which flood the cloud to deposit in the core. Experiments at ILE Osaka have reported 800 eV temperatures registered in such cores. This heating has been previously attributed to magnetic stopping. However, the implicit ANTHEM model has shown that, in fact, joule heating by the background resistivity is responsible. In the code generated figure below for 1 picosecond a peak core temper-



ature T_i of 770 eV is generated in the full cone-target environment, marked by the bright center in frame (a). Magnetic filamentation is seen in the core (c), and 300 MG fields arise on the cone surface (but only 30 MG fields arise in the core). Remarkably, when the B-field is suppressed in alternate calculations (by acquiring an electrostatic solution to Maxwell's equations) T_i still rises to 710 eV at 1 ps. However, when the cold electron-ion scattering rate is set to zero the electron temperature in the core reaches only 450 eV and the ions remain at the original 400 eV. ANTHEM is now providing a wealth of additional guidance for future cone experiments, suggesting optimized target surface and laser spot conditions and predicting, for example, higher core temperatures from a green short pulse laser, and improved hot electron directivity through the use of nested cones.

APS-DPP '05 Talks: Session KZ1 (Minicourse): "Advanced concepts for fast-ignition from 2D ANTHEM Modeling"; Session GO1: "2D ANTHEM simulation of electron transport with B-fields in compressed cone-guided fast ignition targets"