Abstract Submitted
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DNS of the thermal effects of plasma/turbulence interaction[1]
SHANKAR GHOSH, KRISHNAN MAHESH, University of Minnesota — Direct numerical simulation is used to study the thermal effect of laser energy deposition in (i) quiescent air, and (ii) isotropic turbulence. In quiescent air, two idealizations of the plasma are considered – spherical and tear–drop shaped. The spherical idealization is used to compare to classical solutions (Taylor 1950, Sedov 1959) for shock radius and velocity at the shock front, and to predict the behavior of density in the core of the plasma. The tear–drop shaped idealization resembles the initial shape of the plasma observed in experiments on laser induced breakdown of a gas. Shock radius and jumps in fluid properties at the shock front are compared to experiment. Budgets are computed for the vorticity transport equation, and physical behavior of vorticity will be discussed. For the turbulent simulations, the background flow is developed isotropic turbulence, and only the tear–drop shaped idealization is considered. Regions of compression and expansion are observed to be most intense normal to the axis of the plasma. The propagating blast wave is distorted by the background turbulence. Turbulence levels get suppressed in the core of the plasma and amplify across the blast wave. Turbulent simulations corresponding to the experiments of Comte–Bellot and Corrsin (1971) have been initiated, and will be presented.

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