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Numerical simulation of laser–induced breakdown of air[1]
SHANKAR GHOSH, KRISHNAN MAHESH, University of Minnesota — The laser–induced breakdown of air is studied using numerical simulation. When focused onto a small volume of air, a laser beam heats and ionizes the air, causing a plasma to form. Three models of air with varing levels of physical complexity are considered. The simulations are challenging due to presence of very strong shock waves and very low densities in the plasma core. These challenges are addressed. The time evolution of the flow field resulting from laser energy deposition is compared to experiment. The flow field is classified into three phases: shock formation, shock propagation and subsequent collapse of the plasma core. Each phase is studied in detail. Vorticity generation in the flow is described for short and long times. Scaling analysis is performed for different amounts of deposited laser energy.

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