Plenary Talk PV VIII Thu 9:45 ELP 6: HS 3+4

Achieving target gain > 1 from inertial confinement fusion implosions at the National Ignition Facility* — •Tilo Döppner — Lawrence Livermore National Laboratory, Livermore, USA — Indirect Drive Inertial Confinement Fusion Collaboration

Creating a controlled fusion reaction that produces more energy than supplied to initiate it (i.e. target gain >1) is a grand scientific challenge with broad societal implications. Predominantly, current approaches use the fusion of deuterium and tritium nuclei, which generates 17.6 MeV of energy released in a neutron and an alpha particle. The latter, carrying 1/5 of the energy, can further heat the fusion plasma. A plasma in which the alpha self-heating is greater than external heating is termed a burning plasma, and one in which the self-heating dominates over all loss mechanisms, leading to a run-away increase in temperature, is termed ignited. Inertial Confinement Fusion has pursued these scientific milestones using large laser drivers, notably the National Ignition Facility at LLNL. It provides laser energy up to 2.2 MJ to generate a hot x ray bath, which creates ablation pressures of hundreds of Mbar at the outer surface of a fuel-containing capsule. The ablation pressure implodes the capsule, with fuel pressures of several hundred Gbar generated as the fuel stagnates at the center to initiate fusion burn. In recent years several improvements in the scientific design and requisite technologies have enabled increasing performance of NIF experiments through the burning plasma and ignition regimes.

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