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Overview of the National Ignition Campaign (NIC)

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The 192-beam National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL) is now operational. NIF has conducted 192-beam implosion experiments with energies as high as 1.2 MJ and has also demonstrated the unprecedented energy and pulse shaping control required for ignition experiments. The successful commissioning of the NIF laser is the first step in demonstrating inertial confinement fusion (ICF) ignition in the laboratory. The NIF ignition program is executed via the National Ignition Campaign (NIC)—a partnership between Los Alamos National Laboratory, Lawrence Berkeley Laboratory, LLNL, General Atomics, the University of Rochester Laboratory for Laser Energetics, Sandia National Laboratories, the Massachusetts Institute of Technology, and other national and international partners. The NIC relies on a novel integrated experimental and computational program to tune the target to the conditions required for indirect-drive ignition. This approach breaks the tuning process into four phases. The first two phases involve tuning of the hohlraum and capsule to produce the correct radiation drive, symmetry, and shock timing conditions. The third phase consists of layered cryogenic implosions conducted with a 50%/49%/1% mixture of tritium, hydrogen, and deuterium (THD) respectively. The reduced yield from these THD targets allows the full diagnostic suite to be employed and the presence of the required temperature and fuel areal density to be verified. The final step is DT ignition implosions with expected gains of 10-20. DT ignition experiments will be conducted with Elaser $\sim$1.2 MJ. Laser energies of 1.8 MJ should be available for subsequent experiments. This talk will review the multi-phase tuning approach to the ignition effort, including the physics issues associated with the various steps, and current and future plans for the NIF ignition program.