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BEAM POINTING RESULTS AT THE NATIONAL IGNITION FACILITY

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The National Ignition Facility (NIF) at Lawrence Livermore National Laboratory contains a 192-beam 4.2 MJ neodymium glass laser whose output is frequency converted to 351 nm light. It has been designed to support high energy density science (HEDS), including the demonstration of fusion ignition through Inertial Confinement. To meet the fusion ignition goal, the distribution of the laser beam centroids about the aim points in the plane normal to the beam must be within 80 μm r.m.s.

Beam pointing is achieved with a series of low energy rod shots whose frequency-converted light is recorded on cameras located in the Target Alignment Sensor (TAS) at target chamber center. The conversion efficiency is low but the TAS was designed to reject unconverted 1ω and 2ω light and only record 3ω light.

The first series of 3ω rod shots finds the beams. The second series of 3ω rod shots is a focal scan to find best focus for each beam by moving the final focus lens. In the NIF system shot sequence, the beams are aligned to the TAS camera using 375nm CW alignment laser beams. The third series of rod shots measures the coalignment of the CW with the 3ω rod shot beam. The CW beam is then moved to overlap the pulsed beam.

Beam pointing is verified with a system shot. Ninety-six beams (half the NIF beams) are measured per system shot. The beams are pointed in a rectangular pattern on a flat target, 48 beams per side. Extra beams are used to irradiate holes in the target. An x-ray pinhole camera (one upper and one lower) records the image of the 48 beams plus the back illuminated holes.

The pointing results from the 3ω rod shots and the system shots will be presented. The results show that NIF can meet the pointing requirements of the ignition campaign.

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