PRELIMINARY MEASUREMENTS OF PERFORMANCE OF NIF BEAMLINES FOR FUTURE EXPERIMENTS TO SUPPORT POLAR DIRECT DRIVE

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A collaboration between the National Ignition Facility (NIF) and the Laboratory for Laser Energetics (LLE) is studying the implementation of polar direct drive (PDD) ignition experiments on the NIF laser system[1] in the 2019 time frame. One aspect of this preparation involves testing the performance of the NIF laser system over a much broader span of center wavelengths, 36Å, than the laser currently operates and that gain models accurately describe. The temporal shape for the PDD pulses consists of a drive pulse preceded by three lower power "picket pulses". These picket pulses require a multi-FM sinusoidal format with a bandwidth of ~ 200 GHz, compared to the 90 GHz NIF BW, and a more dispersive grating in the preamplifier module (PAM) for smoothing-by-spectral-dispersion (SSD). In this paper we discuss recent measurements of gain on the NIF laser system over this much broader wavelength range and the models that support our measurements. We measure FM-to-AM conversion over the 200 GHz BW required for PDD picket pulses and discuss the implications for power balance. We made these measurements on four, inner-cone bundles (a bundle equals eight beamlines) on NIF and on an offline facility that contains a preamplifier module that is identical to the PAMs on the NIF laser system. The possibility of pinhole closure due to the larger bandwidth and dispersion associated with multi-FM SSD was also studied at LLE on the OMEGA EP laser, which has a similar beamline architecture to the NIF.

[1] T. J. B. Collins, et. al., *Physics of Plasmas* **19**, 056308 (2012).

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