

THE MULTIPLE-PULSE DRIVER LINE ON THE OMEGA LASER

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The multiple-pulse driver line (MPD) provides on-shot co-propagation of two separately generated pulse shapes in all 60 OMEGA beams at the Laboratory for Laser Energetics (LLE). The two co-propagating pulse shapes would typically be (1) a series of 100-ps “picket” pulses followed by (2) a longer square or shaped “drive” pulse. Smoothing by spectral dispersion (SSD), which increases the laser bandwidth, can be applied to either one of the two pulse shapes. Therefore, MPD enables dynamic bandwidth reduction, where bandwidth is applied only to the initial picket portion of a pulse shape. SSD decreases the efficiency of frequency conversion from the IR to the UV so that dynamic bandwidth reduction provides an increase in the drive-pulse energy. MPD also provides for the future possibility of propagating different spatial profiles for each pulse shape, which in conjunction with a special phase plate, enables on-shot focal spot size changes or discrete-step focal “zooming.” The design of the MPD required careful consideration of beam combination as well as the minimum pulse separation for two pulses generated by two separate seed sources. A new combined-pulse-shape diagnostic needed to be designed and installed after the last SSD grating. This new driver-line flexibility was built into the OMEGA front end as one component of the initiative to mitigate cross-beam energy transfer on target and to demonstrate hydro-equivalent ignition on the OMEGA laser. The dynamic-bandwidth-reduction capability of MPD has been used on a series of campaigns on OMEGA and performance data is presented.

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