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Optimization of the Diode-Pumped Solid State Nd:YLF Amplifier Chain for the 263 nm Drive Laser at the FAST Facility[1] JULIE M. GILLIS, THEODORE A. CORCOVILOS, Dept. of Physics, Duquesne University, Pittsburgh, PA, DEAN R. EDSTROM JR., JINHAO RUAN, JAMES K. SANTUCCI, Accelerator Division, Fermi National Accelerator Laboratory, Batavia, IL
— The RF photoinjector of the 50 MeV superconducting electron linear accelerator at the Fermilab Accelerator Science and Technology (FAST) Facility is driven by a phase-locked laser system. The neodymium-doped yttrium-lithium fluoride (Nd:YLF) seed laser provides short (3 ps) infrared (1053 nm) pulses to an amplifier chain before conversion to ultraviolet (263 nm) through two frequency-doubling BBO crystals. The amplification section consists of seven diode-pumped solid state (DPSS) amplifiers, which increase the pulse energy of the seed laser using optically end-pumped Nd:YLF crystals. To maximize the total gain of the amplifier chain, each stage must be properly tuned with optimized optics, alignment, and laser beam characterization. In this paper we report on one of the single-pass amplifier improvements to achieve a consistent gain of 4.83 with stabilized output pulse trains for up to 1500 seed pulses. The final ultraviolet pulses imaged onto the Cs_2Te photocathode of the RF electron gun have been doubled in energy to 10.2 μJ per pulse as a result of these alterations.

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Julie Gillis
Dept. of Physics, Duquesne University, Pittsburgh, PA

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