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Laser-Plasma Instability Control Using $\mathbf{T}_{\text{Pulse}}$ fixed vs $\mathbf{I}_{\text{max}}$ fixed Spike Trains of Uneven Duration and Delay: The Path to Green ICF Using STUD Pulses[1] BEDROS AFEYAN, Polymath Research Inc. , STEFAN HLLER, Ecole Polytechnique, Palaiseau, France, NATHAN MEEZAN, JIM HAMMER, JOHN HEEBNER, LLNL — We have studied the behavior of laser-plasma instabilities (LPI) as a function of seed noise (varied over seven orders of magnitude) and Rosenbluth gain exponent at the average intensity (varied over a decade) for structured laser beams with and without STUD pulse mitigation. We will show that for each section of the NIF ICF pulse, there are preferred configurations of STUD pulses, whether they be fixed duration of fixed peak intensity, so that maximum use is made of STUD pulse flexibility for LPI control. The duty cycle, hot spot scrambling rate, and cutting a hot spot into pieces (by switching the lasers on and off on the ps time scale), are the three main tools. We explore a variety of phase transitions in reflectivity behavior and in the amplification profile of plasma perturbations. We compare cases where amplification bursts are reinforced coherently or are healed, lead to brush fires or are tamed. The STUD pulse program is best suited for Green light implementation since Green offers higher bandwidth, more energy, and higher damage thresholds. We plan to test these ideas on the Jupiter Laser Facility at LLNL at the pair of 200J lasers level next.

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