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Laser-Plasma Instabilities by Avoiding the Strong Ion Landau Damping Limit: The Central Role of Statistical, Ultrafast, Nonlinear Optical Laser Techniques (SUNOL)[1] BEDROS AFEYAN, Polymath Research Inc., STEFAN HÜLLER, Centre de Physique Theorique, Ecole Polytechnique, FR, DAVID MONTGOMERY, Los Alamos National Laboratory, JOHN MOODY, Lawrence Livermore National laboratory, DUSTIN FROULA, Laboratory for Laser Energetics, JAMES HAMMER, OGGIE JONES, PETER AMENDT, Lawrence Livermore National laboratory — In mid-Z and high-Z plasmas, it is possible to control crossed bean energy transfer (CBET) and subsequently occurring single or multiple beam instabilities such as Stimulated Raman Scattering (SRS) by novel means. These new techniques are inoperative when the ion acoustic waves are in their strong damping limit, such as occurs in low Z plasmas with comparable electron and ion temperatures. For mid-Z plasmas, such as Z = 10, and near the Mach 1 surface, the strong coupling regime (SCR) can be exploited for LPI mitigation. While at higher Z values, it is thermal filamentation in conjunction with nonlocal heat transport that are useful to exploit. In both these settings, the strategy is to induce laser hot spot intensity dependent, and thus spatially dependent, frequency shifts to the ion acoustic waves in the transient response of wave-wave interactions. The latter is achieved by the on-off nature of spike trains of uneven duration and delay, STUD pulses. The least taxing use of STUD pulses is to modulate the beams at the 10 ps time scale and to choose which crossing beams are overlapping in time and which are not.

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