***Laser-Plasma Simulation Environment* (LPSE)**: Calculations of laser–plasma instability important to laser-driven inertial confinement fusion (ICF) can only be made practical by using reduced physics models, i.e., by tailoring the model based on the problem (case by case). The essential physical processes must be retained in a way that is computationally efficient, so that the essential realism of multibeam interactions[1] (most importantly, the correct dimensionality of space) can be simultaneously included. The *LPSE* (laser-plasma simulation environment) code system was constructed with this purpose in mind. The *LPSE* system provides a framework of physics packages that can be assembled for a particular problem.

Using *LPSE*, success has recently been obtained for multibeam two-plasmon decay (TPD), which is an important instability for direct-drive ICF. An established model of TPD-driven electrostatic turbulence that uses wave enveloping[2] was combined with a reduced/hybrid model of kinetic saturation and hot-electron generation. The latter was based on the integration of electron trajectories in the turbulent electrostatic fields using a novel algorithm that takes advantage of hardware (GPU) acceleration. For TPD, these packages permitted large volume, long-time simulations to be performed in three dimensions with realistic multibeam irradiation.

Several recent experiments have provided data that can be compared directly with *LPSE* predictions. The initial results of this work have been very encouraging. So far, *LPSE* correctly predicts the laser-intensity threshold for multibeam TPD[3] and experimental Thomson-scattering spectra from TPD-driven plasma-wave turbulence (Fig. 1 and Ref. 4). Other effects such as TPD localization[5] and hot-electron generation[3] are being investigated and appear to be well reproduced.

The system, which is currently focused on TPD, is being extended to cover a wider class of nonlinear problems involving cooperative parametric instabilities, for example, cross-beam energy transfer.

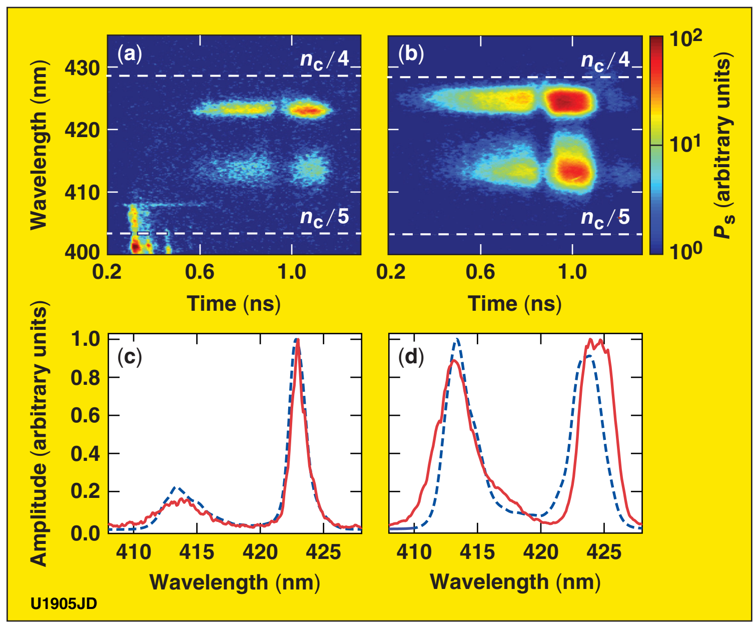

Figure 1. [(a),(b)] Experimental Thomson-scattering spectra probing collective plasma-wave fluctuations driven by two-plasmon decay (TPD) at two different wave numbers. (a) wave numbers associated with collectively driven TPD plasma waves; (b) plasma waves not associated with primary collective decays. [(c),(d)] The red curves are lineouts of the above experimental spectra taken at $t = \sim 1$ ns. The dashed blue curves are *LPSE* predictions (figure taken from Ref. 4).

Omega Facility Operations Summary: During July 2015, the Omega Facility conducted 230 target shots with an average experimental effectiveness (EE) of 95.4% (135 on OMEGA with EE of 94.4% and 95 on OMEGA EP with EE of 96.8%). The ICF program accounted for 103 of these shots for experiments led by LANL, LLNL, LLE, NRL, and SNL scientists. Sixty-four shots were taken for HED program experiments by teams led by LANL, LLNL, and LLE scientists. Four NLUF experiments led by the University of Chicago, MIT, and Princeton University accounted for 50 target shots and 13 target shots were taken for one LBS experiment led by LLE.

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