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## In Brief

The three-month period of October–December 1993 is covered by this volume of the LLE Review. During this quarter, the visible fruits of our long design labors on the OMEGA Upgrade began to appear. The target mirror structure was put in place, along with the target chamber itself. The laser bay structures were also installed, and the bay is now being prepared to receive optomechanical, control, and laser assemblies. Further details are in the OMEGA Upgrade Status Report in this issue.

Theory and analysis of previous experiments continued during this reporting period. Articles contained herein describe an improved theory of the ablative Rayleigh-Taylor instability; a novel proposal for characterizing plasma-density profiles by using grid image refractometry; a much-improved treatment of the damping of ion sound waves in a mixture of light and heavy ions; and, finally, a new interpretation of measurements of 3/2-harmonic radiation emitted from the long-scale-length plasmas created in earlier OMEGA experiments.

Highlights of the research reported in this issue include

- Linear stability analysis of unsteady ablation fronts is carried out for a semi-infinite uniform medium. For a laser-accelerated target, it is shown that a properly selected modulation of the laser intensity can lead to the dynamic stabilization or growth-rate reduction of a large portion of the unstable spectrum. The theory is in qualitative agreement with the numerical results obtained by using the two-dimensional hydrodynamic code *ORCHID*.
- Grid image refractometry (GIR) is a more general Schlieren technique for experimental determination of density profiles. Here the technique is illustrated by analysis of an experiment carried out at KMS Fusion on the CHROMA laser. The extracted profiles compare quite closely with those obtained using the code *SAGE*.
- Collisional damping of ion-acoustic waves was calculated for a mixture of light and heavy ions. The results are strikingly different from those using a single-species average-ion model. The improved result includes a new joule term as well as thermal diffusion and viscous damping contributions. The overall damping rate can be increased as much as 58-fold, when evaluated properly.
- Analysis of the observed emission of radiation near the 3/2 harmonic of the irradiating laser frequency shows that any interpretation in terms of self-interaction of the laser beam with the primary plasmons it created via the two-plasmon instability (TPI) is not credible. Rather, it seems necessary to invoke a secondary electron-plasma-wave decay (EPD) of the "blue" plasmon resulting from the TPI. This secondary EPD has its own threshold, exceeded only when the TPI is well above its threshold. Hence, onset of this 3/2 signal is not a good measure of onset of the TPI. The *k*-dependence of the EPD also explains why only spectral splittings corresponding to the Landau cutoff are observed.

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