magnetic field will be discussed. Third, in the case of a plasma interacting with several electromagnetic waves, the use of Chirikov's criterion to predict the conditions favouring stochastic heating will be presented. The role of chaos in the acceleration of an electron interacting with two counterpropagating waves in the direction of propagation of the high intensity wave will be discussed. Finally, it will be shown that when considering a low density plasma interacting with a high intensity wave perturbed by a low intensity wave, stochastic heating (or acceleration) can provide electrons with the right momentum for trapping in the wake field and efficient acceleration.

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Fr-7.

Accurate offline dispersion measurement of Petawatt-class chirped pulse amplification compressor and stretcher systems

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The Advanced Radiographic Capability (ARC) on the National Ignition Facility (NIF) is designed to produce energetic x-rays in the range of 10-100 keV for backlighting NIF targets. ARC will convert 4 of the 192 NIF beamlines into 8 split beams, delivering laser pulses with adjustable pulse durations from 1 ps to 50 ps at the kilo-Joule level. Adjustable time delays between the 8 beams enable X-ray "motion-picture" capture with tens-of-picosecond resolution during the critical phases of an ICF shot.

The precise alignment of stretcher-compressor pairs in energetic chirped pulse amplification (CPA) systems is tedious and requires several iterations using advanced temporal diagnostics until the shortest pulse durations and highest peak intensities are achieved. For large, energetic Petawatt laser systems with beam sizes up to 40 cm, diffraction gratings in the compressor reach meter-scale size and are difficult to precisely align. We developed a group delay diagnostic which enables accurate, offline measurements of highly dispersive components such as stretchers or compressors with sub-picosecond accuracy. This diagnostic tool enables us to simply measure each dispersive component offline, and balance the dispersion in each beamline. Furthermore it allows exactly matching the dispersion of ARC's eight, independent four-grating compressors, which is critical for producing eight identical pulses. ARC utilizes a unique, folded compressor design for maximum compactness; two 5.5m long vacuum vessels house 8 compressors with 91cm x 45cm multilayer, dielectric gratings.

The group delay diagnostic utilizes the phase-shift technique for measuring the dispersion characteristics of each individual element, e.g. grating stretcher, chirped fiber Bragg grating, grating compressor, material dispersion, or an entire laser system. The system uses an amplitude modulated, highly-stable, single-frequency laser, which is scanned over the spectral bandpass of the system under test. The amplitude modulation generates sidebands at f_m=1-6 GHz, which is detected with a fast photodiode. Using a network analyzer, we measure the phase difference of the modulation-signal, $\Delta\theta(\nu_m)$ between the input and the output detectors as we scan the laser over the spectral pass band of the dispersive system under evaluation. The group-delay can then be derived from the phase difference divided by the modulation frequency. Using the Treacy formalism we can calculate the angle of incidence and slant distance from the group delay curve at a higher precision than what

physically can be measured. We have achieved a group delay measurement precision of better than 100 fs, exceeding the ARC requirement of ±0.5 ps, and which is currently limited by the network analyzer precision and the maximum modulation frequency.
In this talk we will describe the dispersion management strategy on ARC, and present the results obtained on the ARC injection laser system test-bed, which utilizes the ARC architecture up to the Joule level. Using this technique we achieved 1.3J, 1.02 Terawatt with only one iteration-step, equivalent to 78% temporal Strehl ratio.

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Fr-8.

Validation experiments on laser radiation transmission through nearcritical plasma with several spatial scales

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One of the examples of "validation experiments" was the international collaboration experiments on laser radiation smoothing using foam-layer [1-3] which demonstrated correct idea, but new disadvanced effects were obtained:

1. Preheating of foil (shell-container surface model)
2. Laser radiation transmission through microheterogeneous plasma and polymer aerogel
3. Wave-like radiation transparency (oscillation)

Spatial and temporal uniformity of preheating and laser radiation transmission need for experimental verification.

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