9th Summer School

Plasmas in super-intense laser fiels

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Vladimir Tikhonchuk | University of Bordeaux, France

Laser-plasma interaction in inertial confinement fusion

1)

- *Introduction: target design, numerical models and basic physics effects*
- Linear electromagnetic waves in an inhomogeneous plasma: Helmholtz equation, envelope approximation, geometrical optics
- S and P polarization at a linear density profile, resonant absorption; ponderomotive force, profile steepening and electron acceleration
- Gaussian laser beam, speckled beams, spatial and temporal smoothing, intensity contrast

2)

- *Parametric instabilities in the laser plasma interaction – general physics description, temporal and spatial growth (convective and absolute instabilities). Effects of density inhomogeneity.*
- Nonlinear laser plasma interactions (non-relativistic). Parametric decay instability, weak and strong coupling.
- SRS and TPD, temporal growth rate and convective amplification, manifestations in the experiments, hot electron generation.
- SBS backward and forward scattering, plasma induced incoherence. Laser beam filamentation and self-focusing.

3)

- Cross beam energy transfer. Mitigation of parametric instabilities: pump incoherence, SBS and SRS in speckles, effects of laser bandwidth
- Wave-particle acceleration: Landau damping and electron acceleration, electron trapping and modification of the electron distribution function, plasma wave breaking.
- Modeling of LPI in hydro codes: laser intensity distribution in plasma, including the resonance absorption, SRS and TPD as sources of hot electrons. Manifestations of LPI effects in experiments.