

Inflationary Stimulated Raman Scattering has been observed in simulations at intensities relevant to shock-ignition inertial confinement fusion.

Inflationary Stimulated Raman Scattering in Inhomogeneous Plasmas.

• A. G. Seaton, S.-J. Spencer, T. D. Arber

Background

Inflationary Stimulated Raman Scattering (iSRS) has been observed experimentally [1] and modelled theoretically [2] for indirect-drive inertial confinement fusion (ICF) schemes, where the ablation plasma is homogeneous.

Objective

To identify iSRS in simulations of shock-ignition scale length plasmas, and to explain its dependence on density scale length.

Methods

Used the Particle-in-Cell code EPOCH [3] to simulate a section of the ablation plasma with different density scale lengths. Measured: reflectivity due to SRS [1]; distribution function flattening [2]; and the electrostatic dispersion relation [4].

Simulation set-up

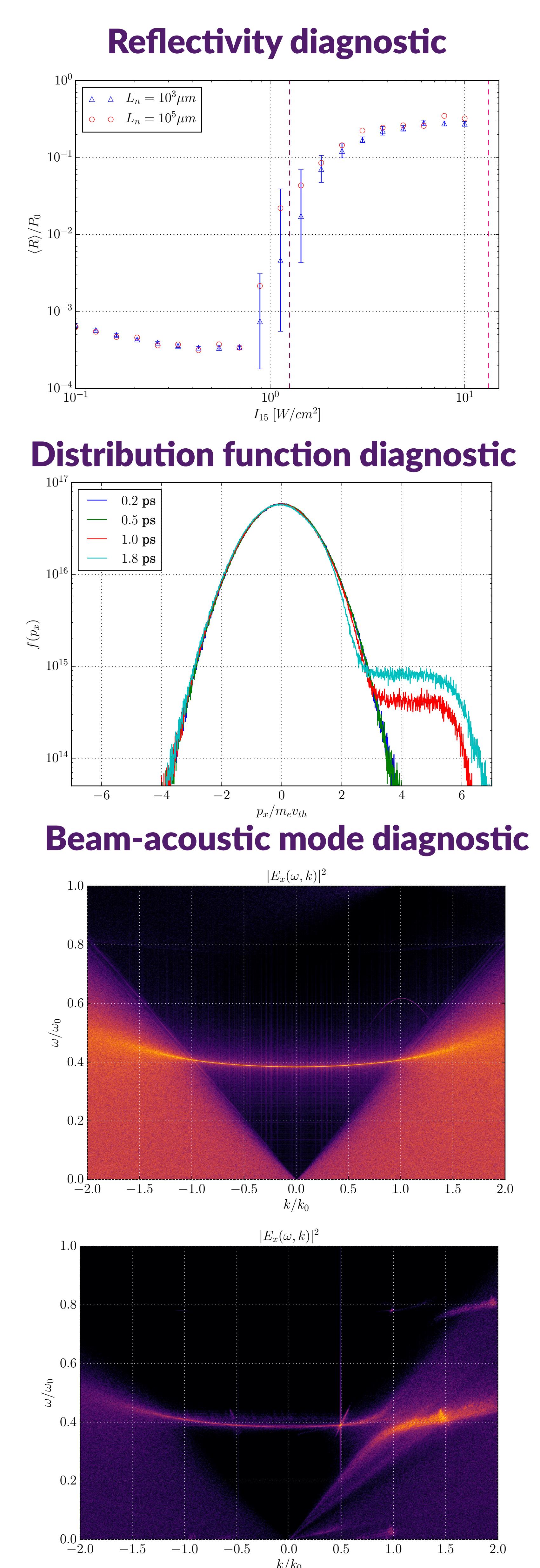
1D box; 100 microns long; 2048 PPC; density profile centred at 0.15 critical; electron temperature 4.5keV.

Results

For plasma parameters relevant to direct-drive shock-ignition schemes, inflationary SRS switches off completely somewhere between $L_n = 1000 \mu\text{m}$ and $L_n = 100 \mu\text{m}$.

Discussion

Ignition-scale density scale lengths on the NIF are predicted to be at least $600 \mu\text{m}$, this implies that iSRS could be an important consideration for shock-ignition schemes. Next step is to understand precisely how this density scale length threshold arises, and derive and analytical model [5].



References

- [1] Montgomery, D. S. et al., Phys. Plasmas 9, (2002)
- [2] Vu, H. X. et al., Phys. Plasmas 9, (2002)
- [3] Arber, T. D. et al., Plasma Phys. Control. Fusion 57, (2015)
- [4] Yin, L. et al., Phys. Plasmas 16, (2006)
- [5] Chapman, T. et al., Phys. Rev. Lett. 108, (2012)