Ultraviolet Thomson Scattering from Direct-Drive Coronal Plasmas

4ω scattered from ion-acoustic waves

4ω scattered from electron plasma waves

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Time-resolved UV Thomson-scattering spectra show that multilayer targets have higher coronal electron temperatures than CH targets

- Experiments compared layered spherical shells containing Si-doped CH, Si, and Be to CH targets in direct-drive implosions
- Measurements from UV Thomson scattering show that multilayer targets have 10% higher electron temperatures than CH targets at the end of the drive
- Multilayer targets reduce the hot electrons from two-plasmon decay (TPD)
Collaborators


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Multilayer targets are designed to reduce imprint and laser–plasma instabilities (LPI’s), and increase the hydrodynamic efficiency.

Reduced imprint*
Reduced LPI
Increased rocket efficiency**

Motivation

Plasmas are well characterized by a suite of diagnostics at the Omega Laser Facility.

Thomson scattering was used to take local measurements of temperature and density in the corona.
Simulations of scattered light and trajectories are in agreement with the measurements.
Simultaneous measurements of collective Thomson scattering from ion-acoustic waves (IAW’s) and electron plasma waves (EPW’s) provide local plasma conditions.
Adjusting plasma parameters within the noise of the data determines the accuracy of the fit
Electron temperature is higher in the coronal plasma of multilayer targets than in CH targets at the end of the drive.
The difference in electron temperature between the two types of targets is more evident closer to the target.

Electron temperature spatial profile at \( t = 2 \) ns

Electron density spatial profile at \( t = 2 \) ns
The higher coronal temperatures reduce two-plasmon–decay produced hot electrons.

Multilayer targets produce 8 times fewer hot electrons than CH targets.
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