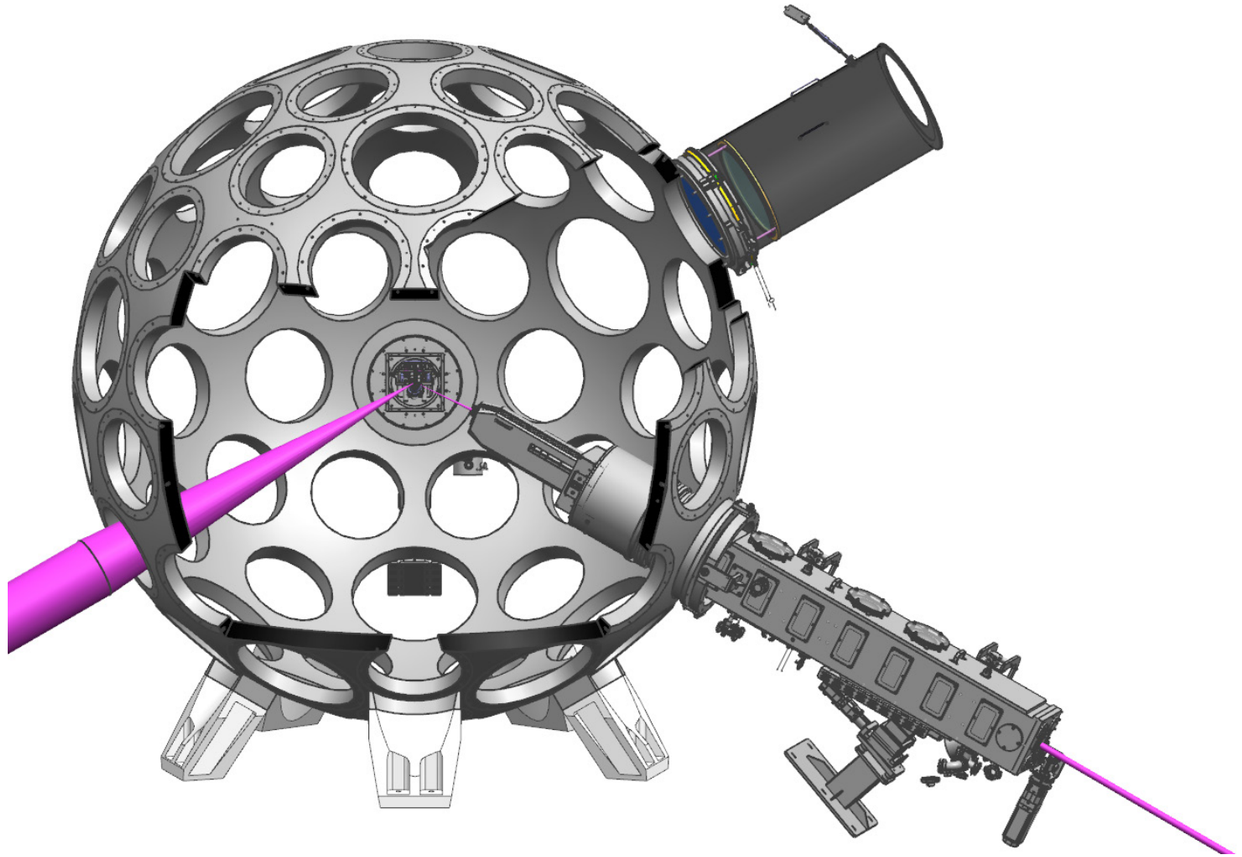
Cross-Beam Energy Transfer Platform on OMEGA



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Physical Society Division of Plasma Physics
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Summary

Cross-beam energy transfer (CBET) has been measured using the Tunable OMEGA Port 9 (TOP9) system

- A new laser–plasma interaction (LPI) platform with a gas-jet target and transmitted-beam diagnostics has been activated on OMEGA
- Laser transfer was measured as a function of the wavelength shift between pump and probe beams
- Thomson scattering provided spatial and temporal measurements of plasma parameters

Collaborators

D. Turnbull, D. Haberberger, J. Katz, D. Mastrosimone, A. Colaïtis, A. B. Sefkow, R. K. Follett, J. P. Palastro, and D. H. Froula

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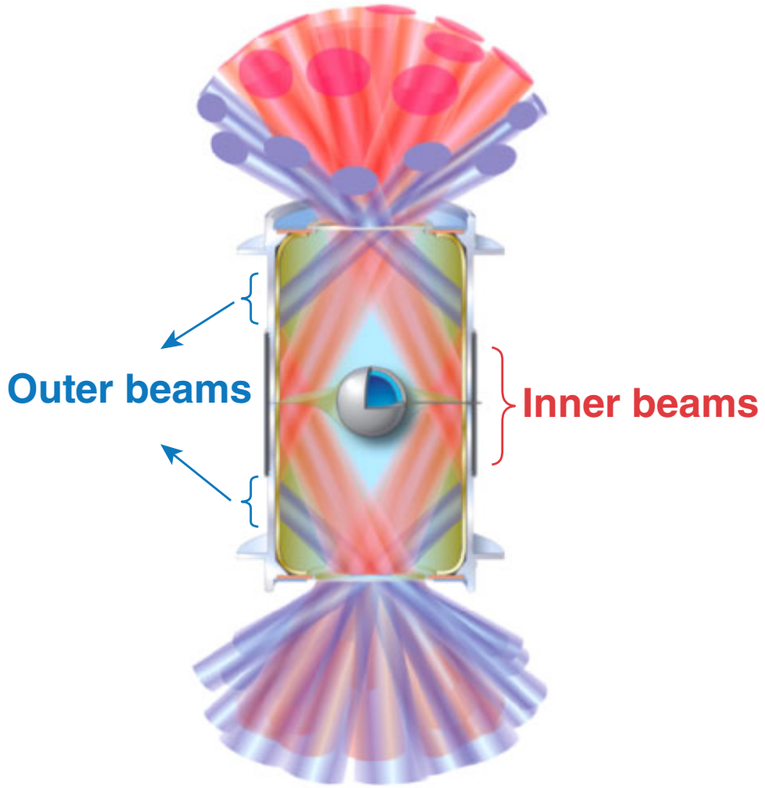
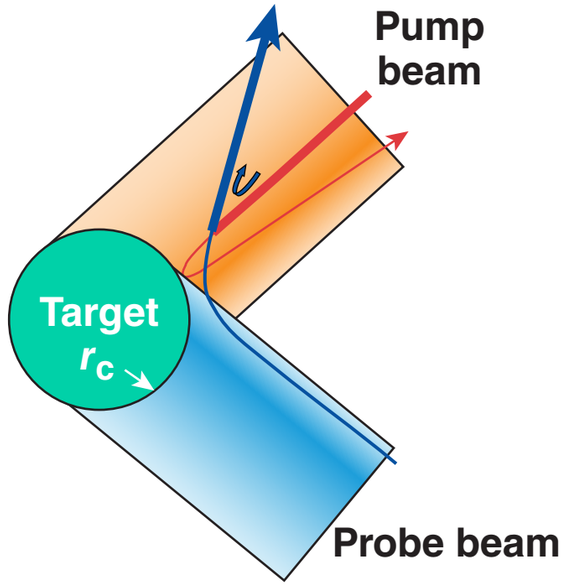
Laboratory for Laser Energetics

Current CBET models are insufficient to predict laser coupling in direct drive and implosion symmetry in indirect drive



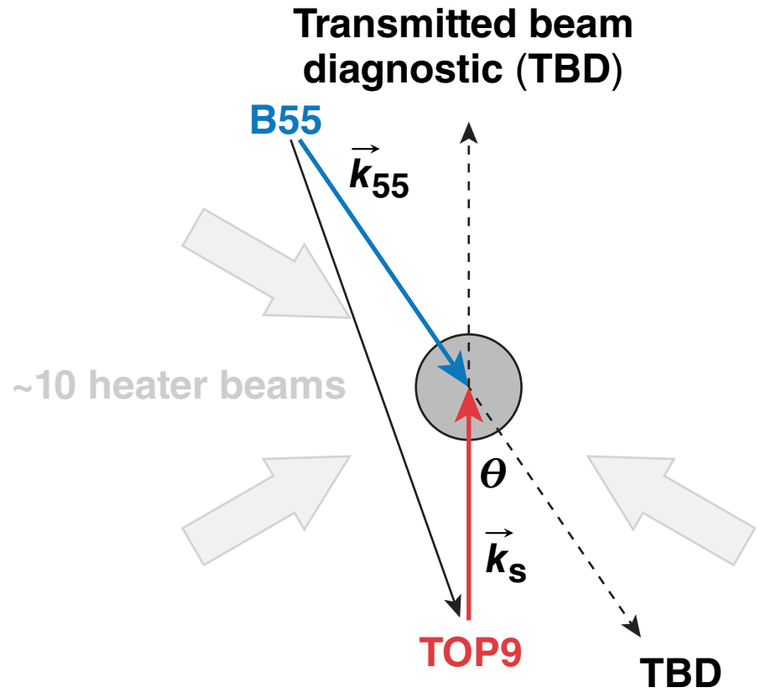


E25588c

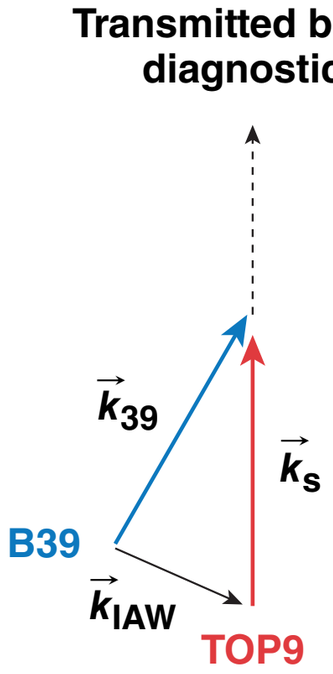
The TOP9 CBET platform will investigate beam configurations relevant to both direct- and indirect-drive inertial confinement fusion schemes

$$\Delta\lambda \approx \lambda_0 \frac{c_s}{c}\left[1+\cos(\theta)\right]$$

Backscattering geometry



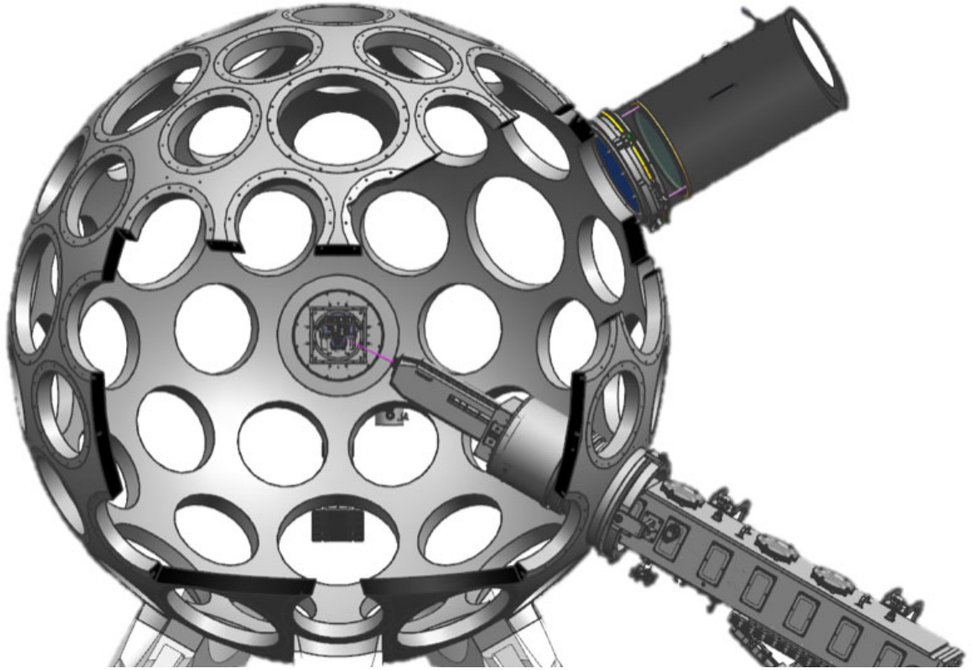
Forward-scattering geometry



IAW: ion-acoustic wave

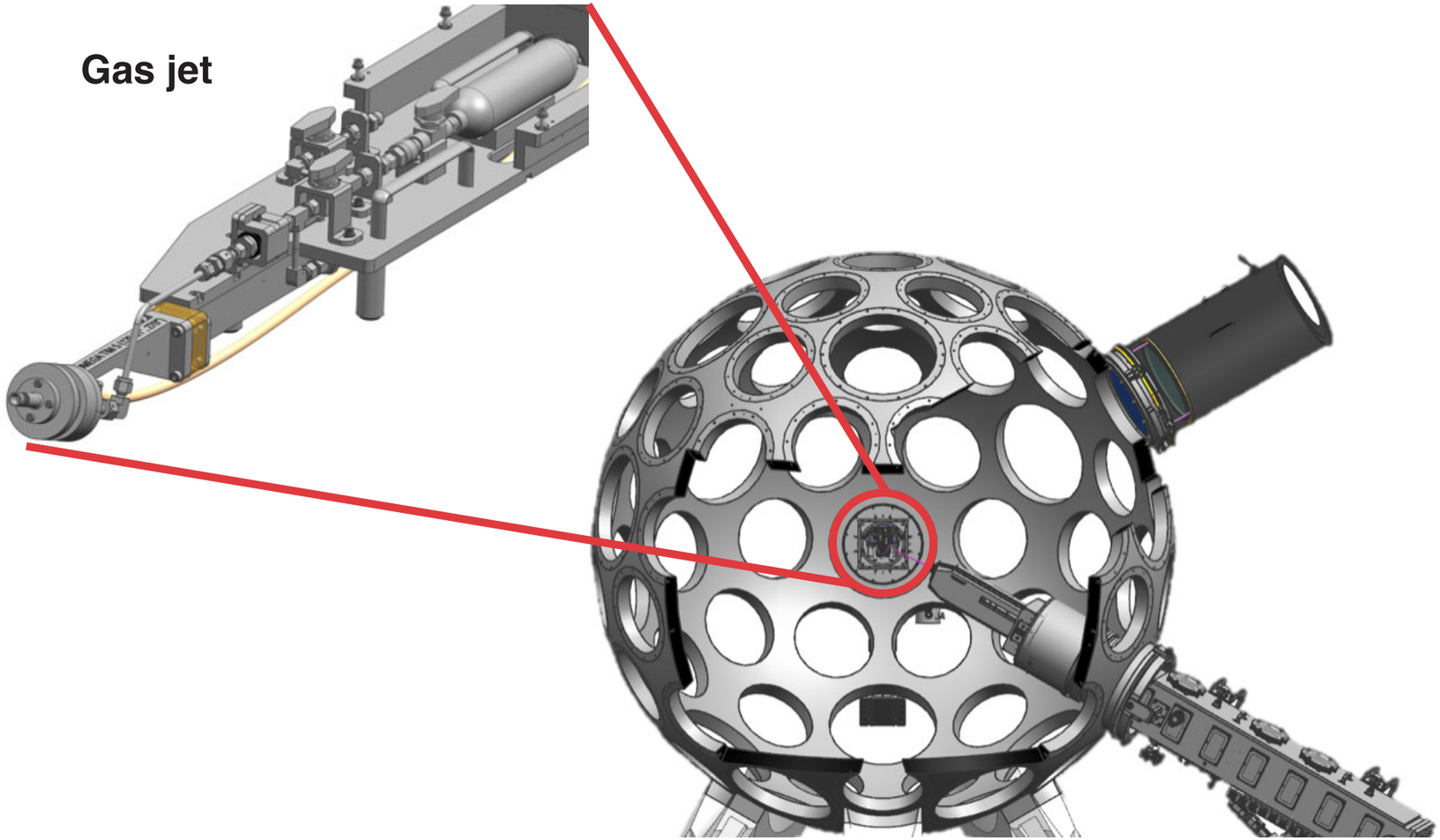
E27522b

The OMEGA LPI platform's diagnostic suite meticulously characterizes beam and plasma conditions



E27947

The OMEGA LPI platform's diagnostic suite meticulously characterizes beam and plasma conditions



E27947a

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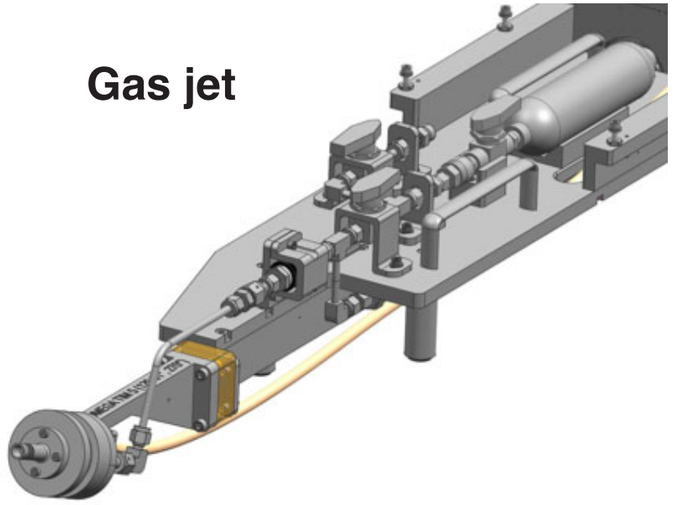
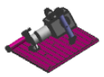
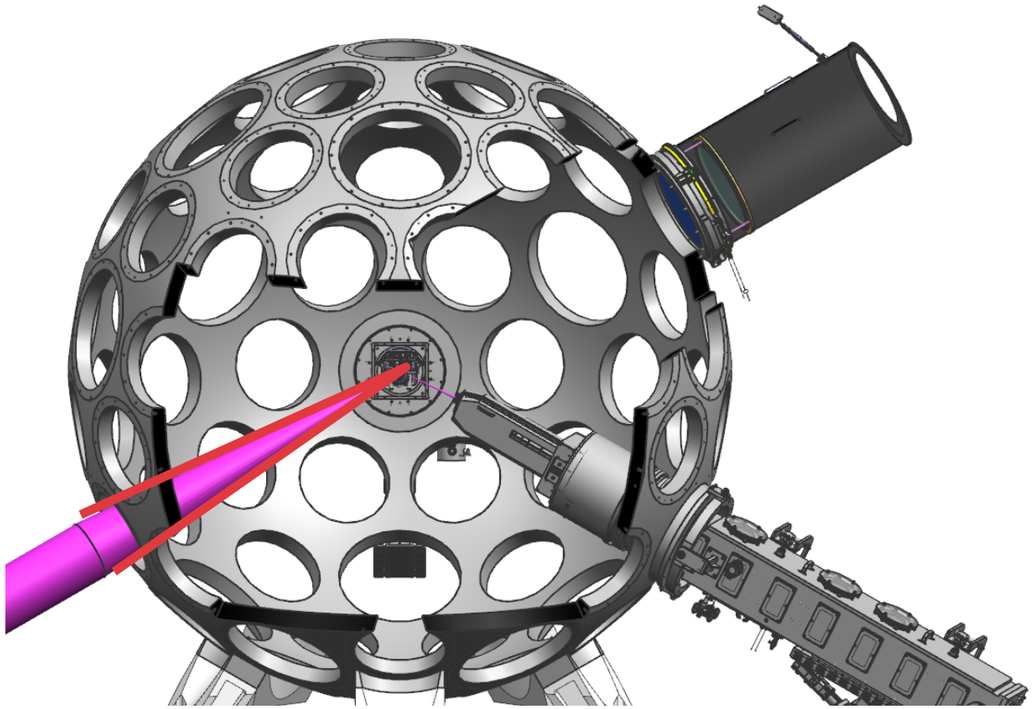
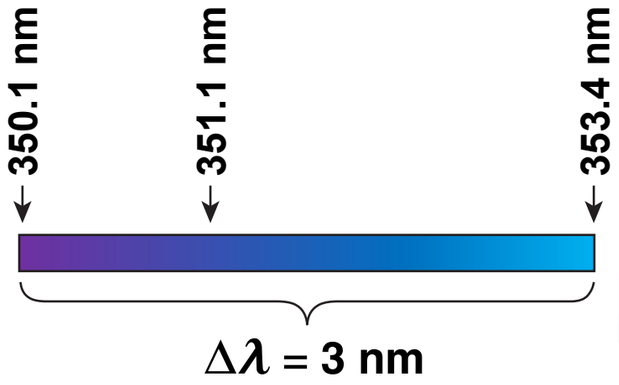




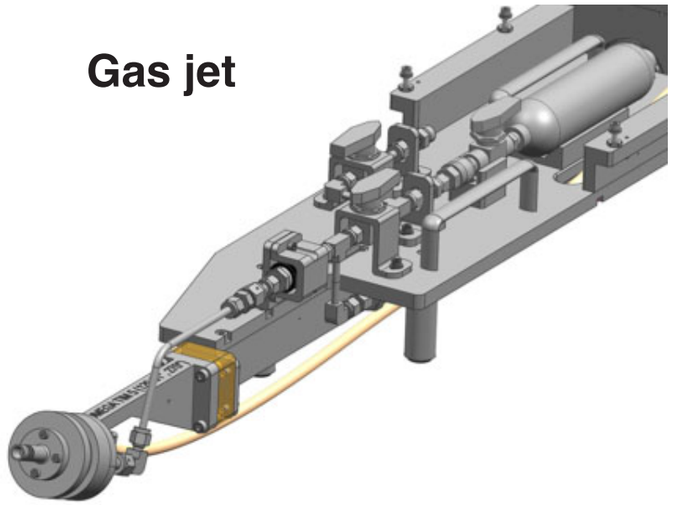


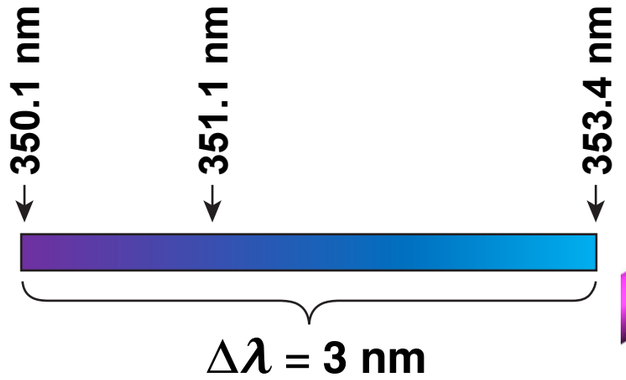


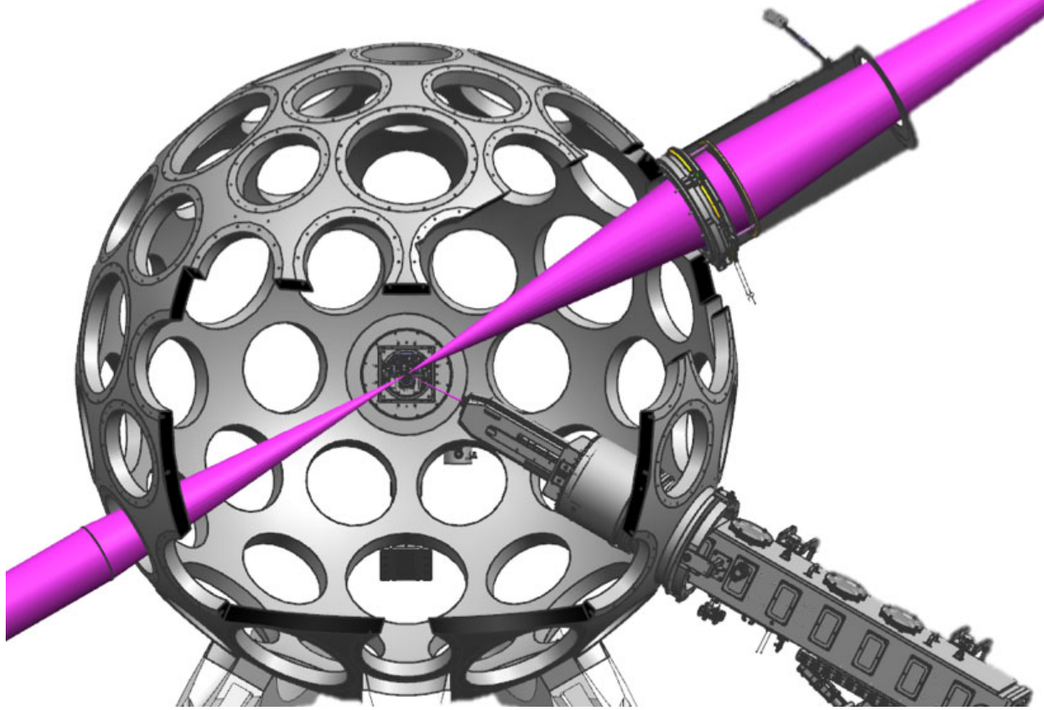
Tunable OMEGA Port 9

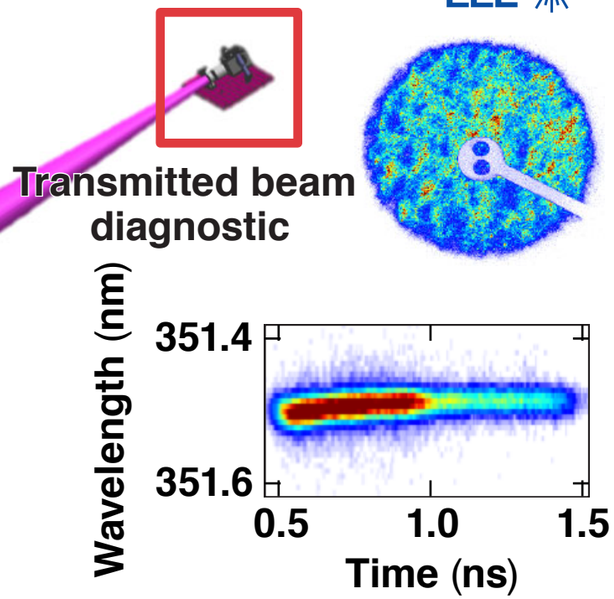
E27947b

The OMEGA LPI platform's diagnostic suite meticulously characterizes beam and plasma conditions





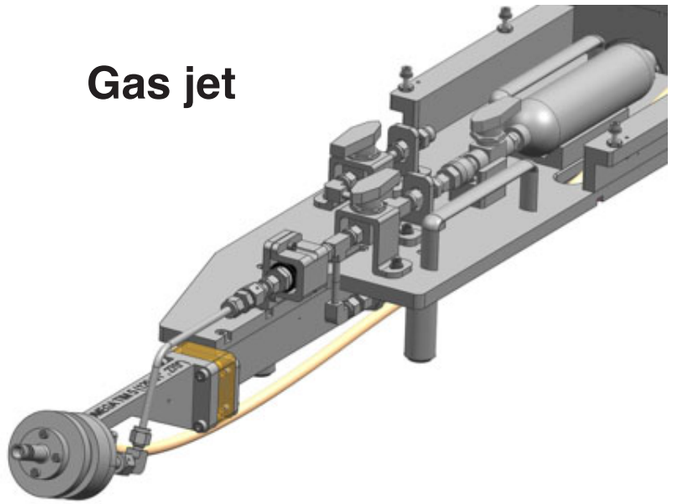


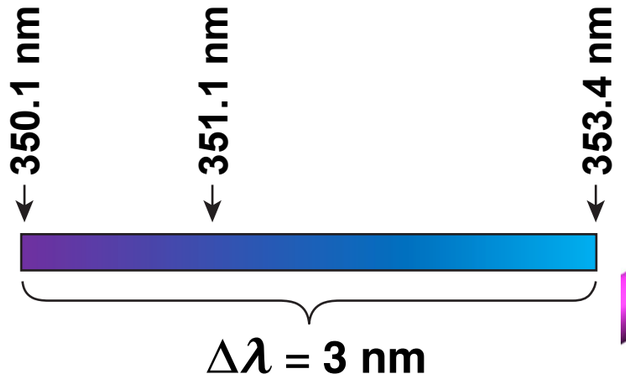


Tunable OMEGA Port 9

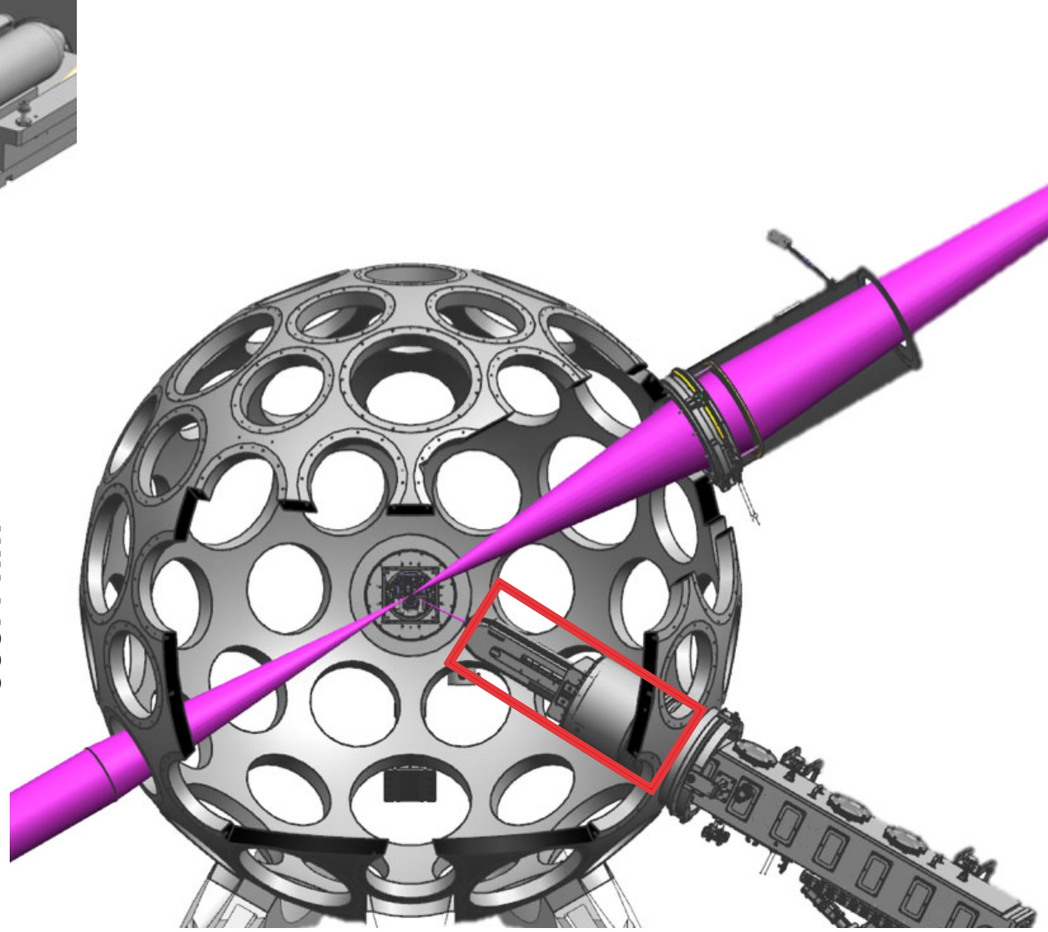
E27947c

The OMEGA LPI platform's diagnostic suite meticulously characterizes beam and plasma conditions

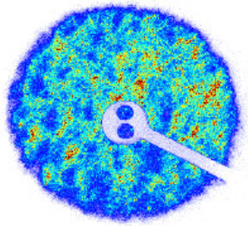


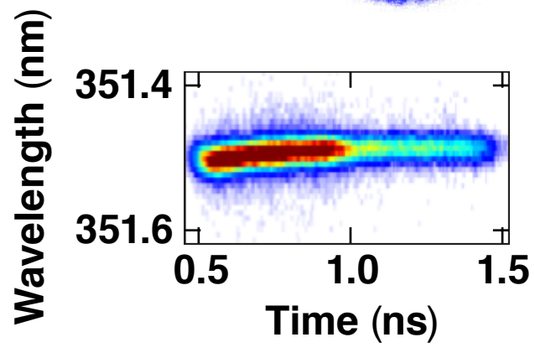


Tunable OMEGA Port 9

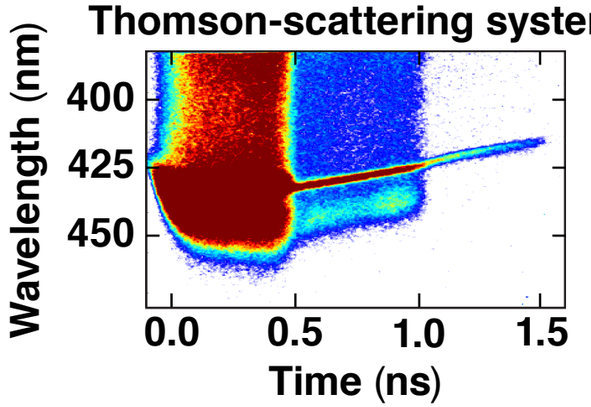


Transmitted beam diagnostic



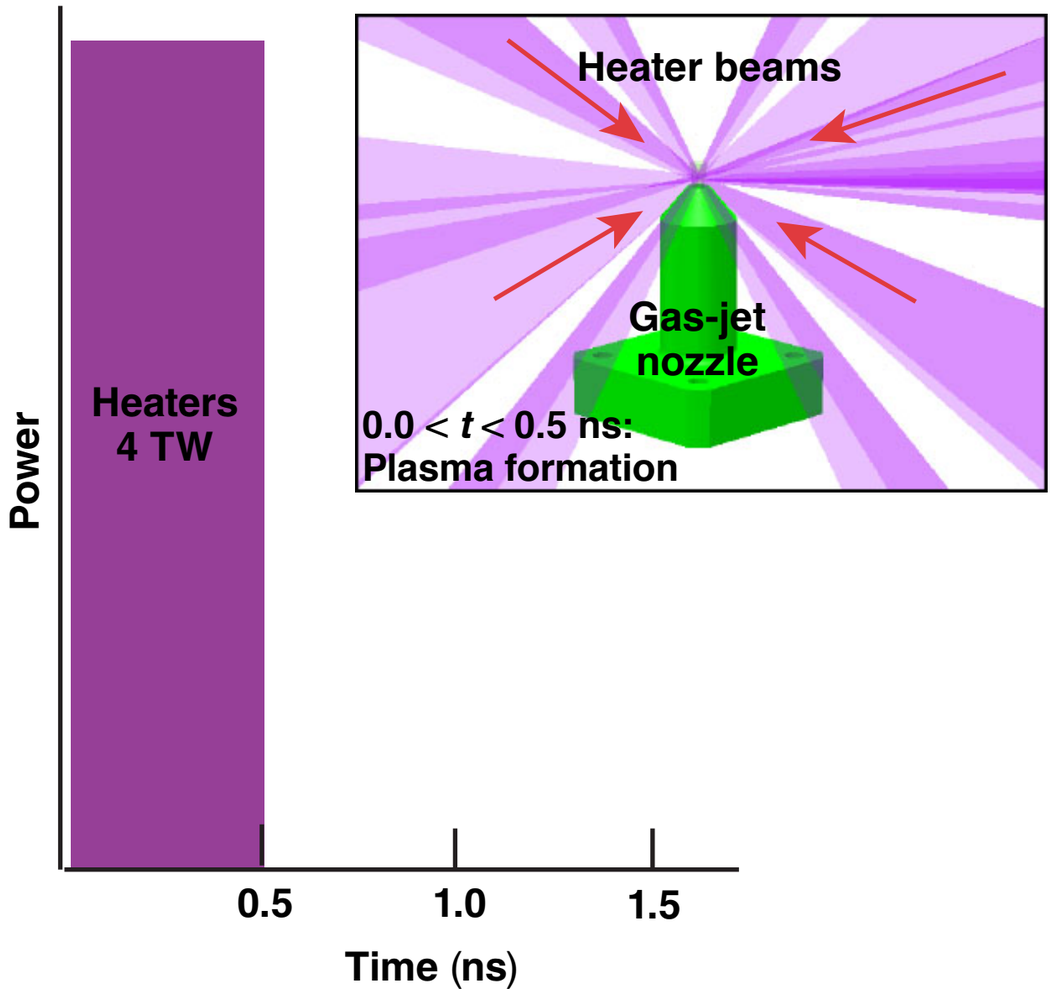


Thomson-scattering system



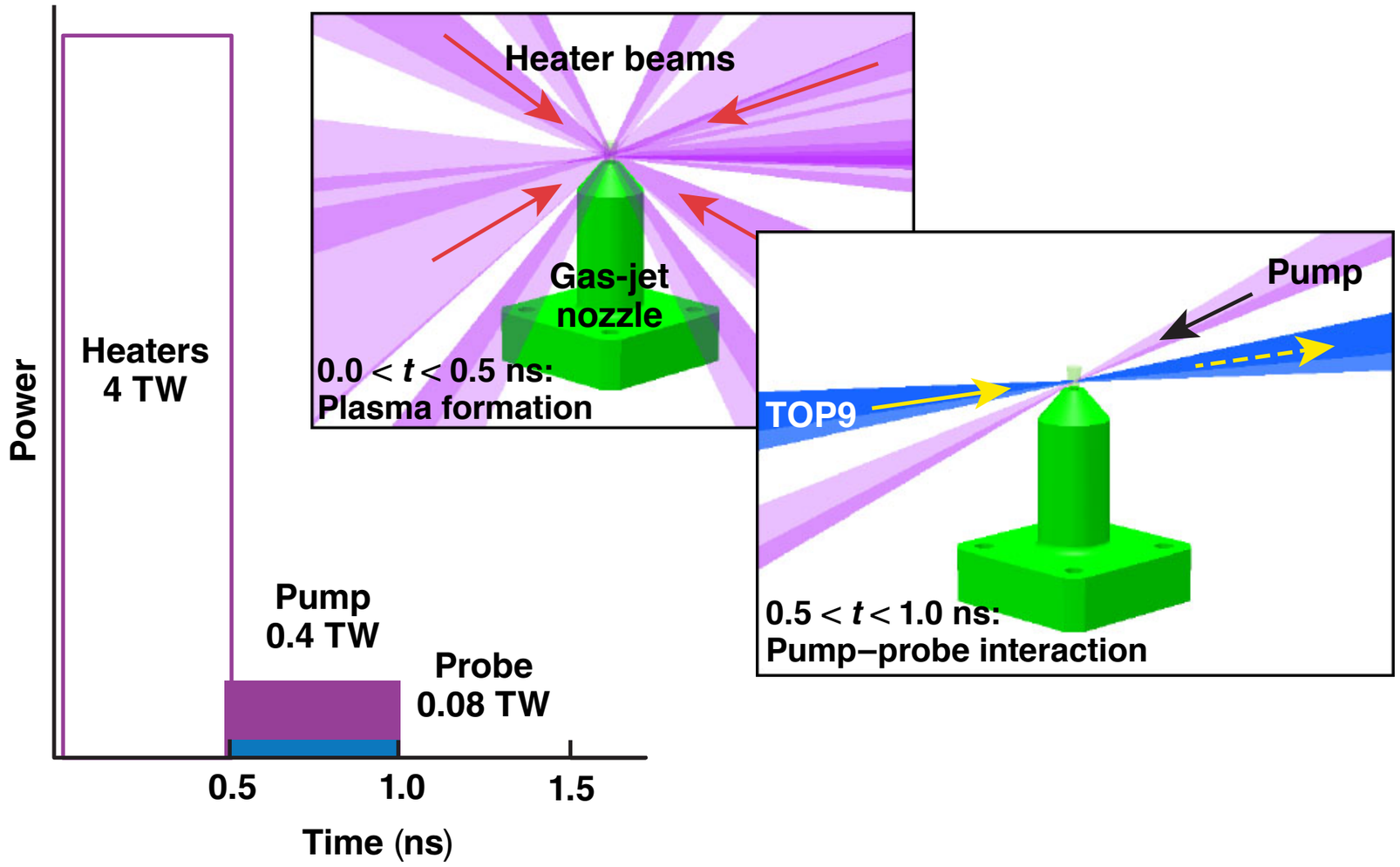
E27947d

The gas-jet system and ten UV heater beams form the plasma before the pump and probe arrive



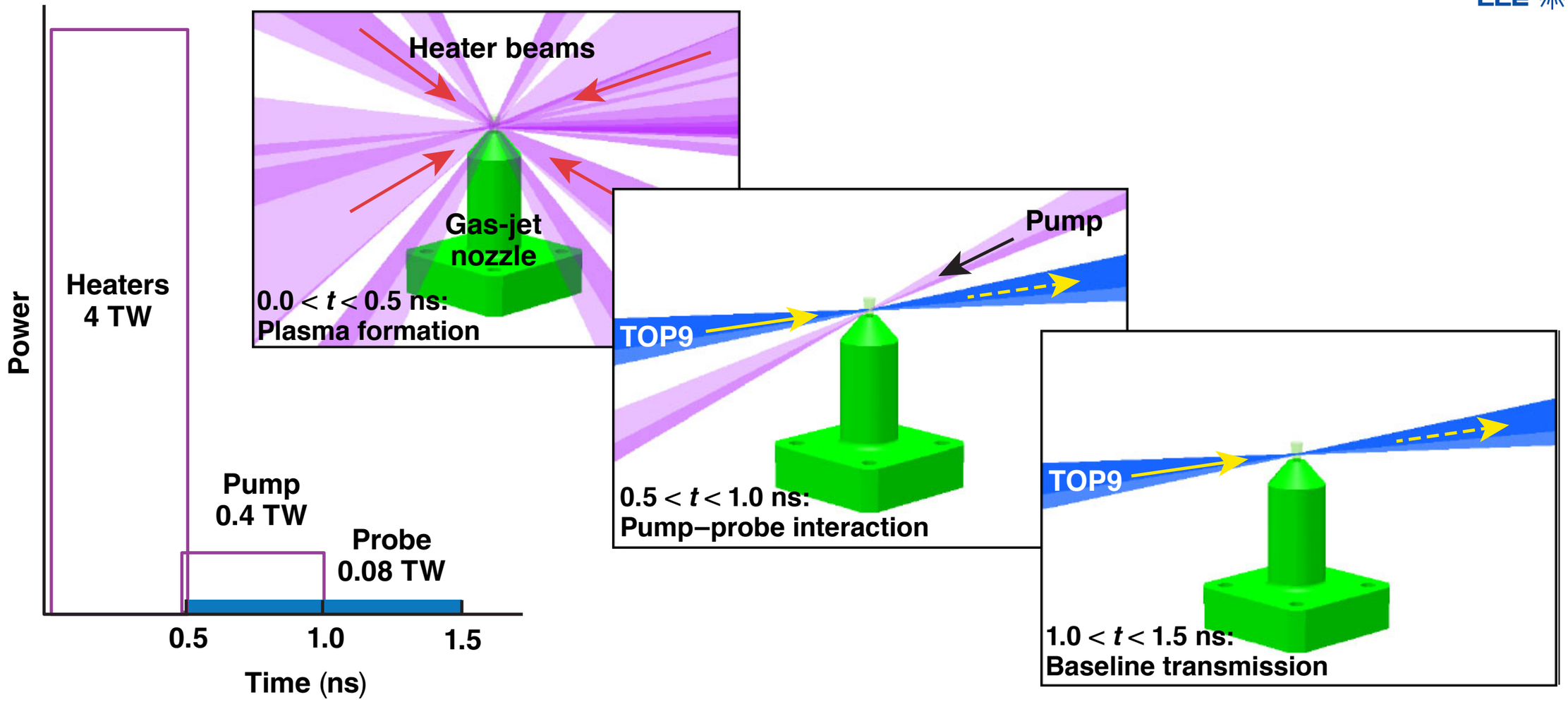
E27948

The gas-jet system and ten UV heater beams form the plasma before the pump and probe arrive



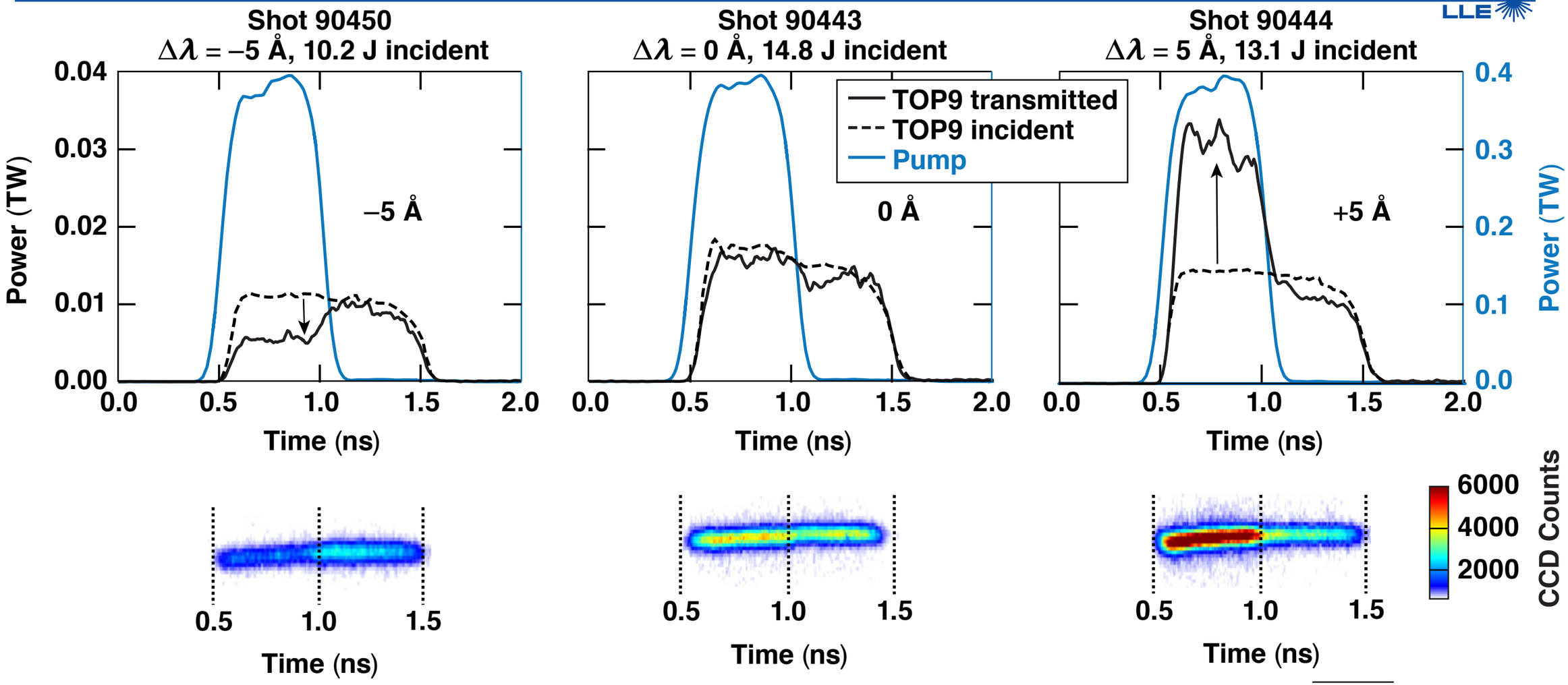
E27948a

The gas-jet system and ten UV heater beams form the plasma before the pump and probe arrive



E27948b

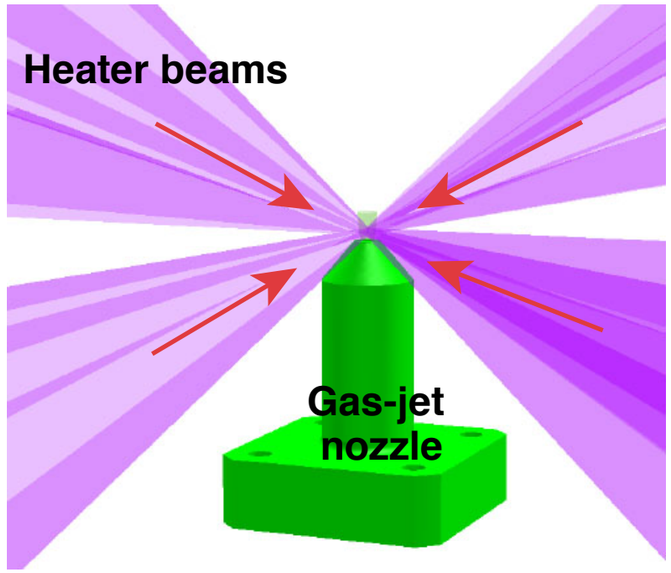
The amount of energy transferred between the pump and probe depends on the TOP9 wavelength shift



E27949

CCD: charge-coupled device

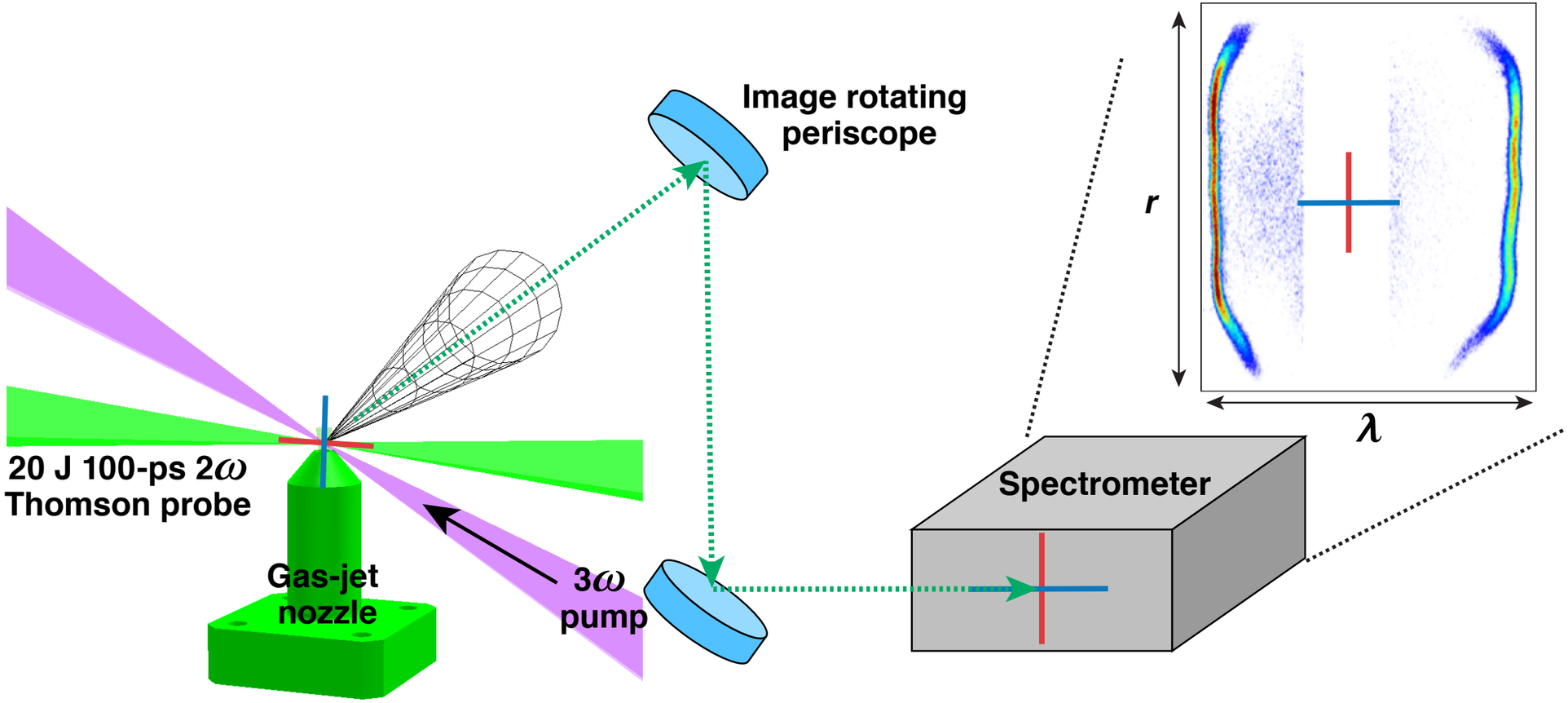
2ω imaged Thomson scattering measures plasma parameters with spatial resolution



0.0 < *t* < 0.5 ns: Plasma formation

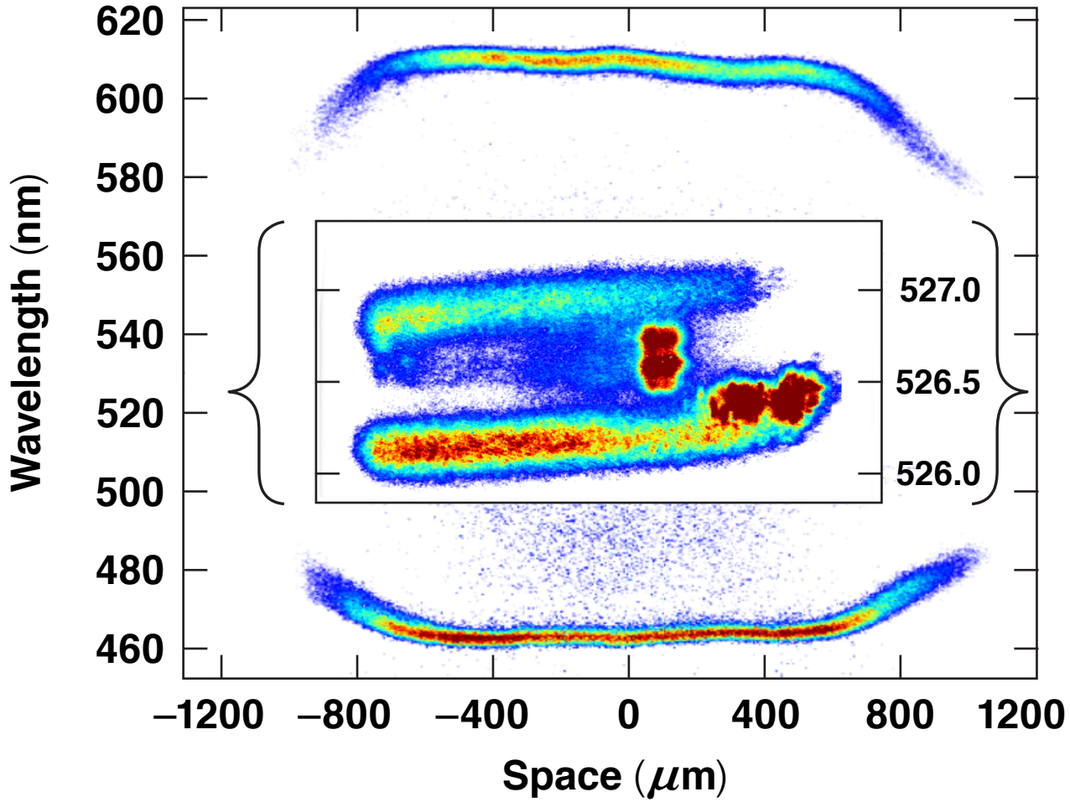
E28093

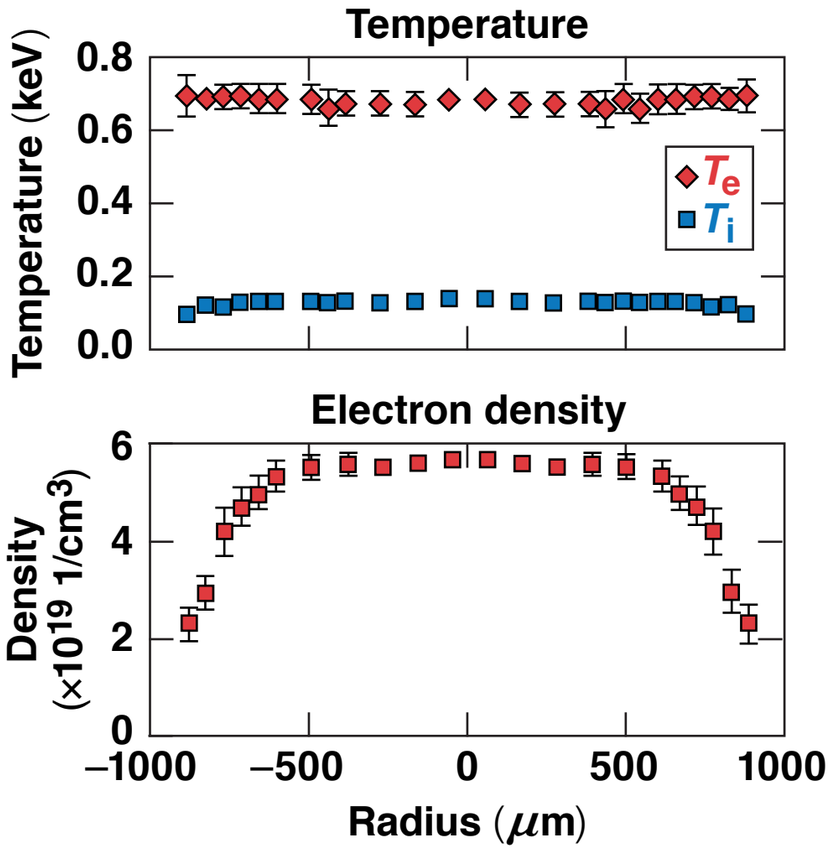
2ω imaged Thomson scattering measures plasma parameters with spatial resolution



E28094

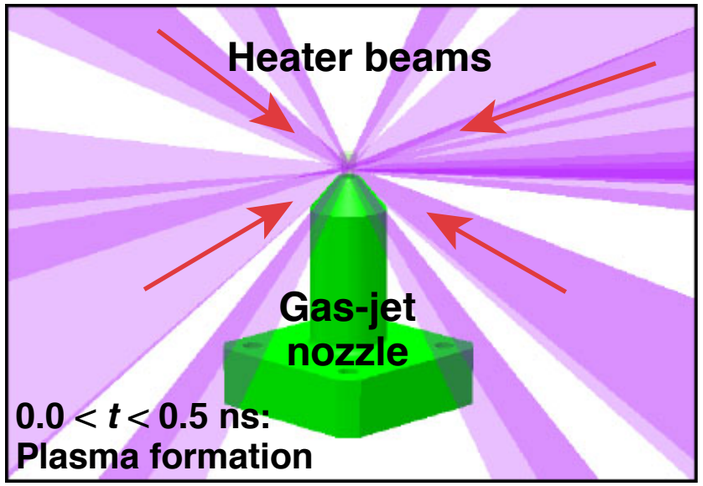
2ω imaged Thomson scattering was used to measure the spatial density and temperature profile of the target plasma





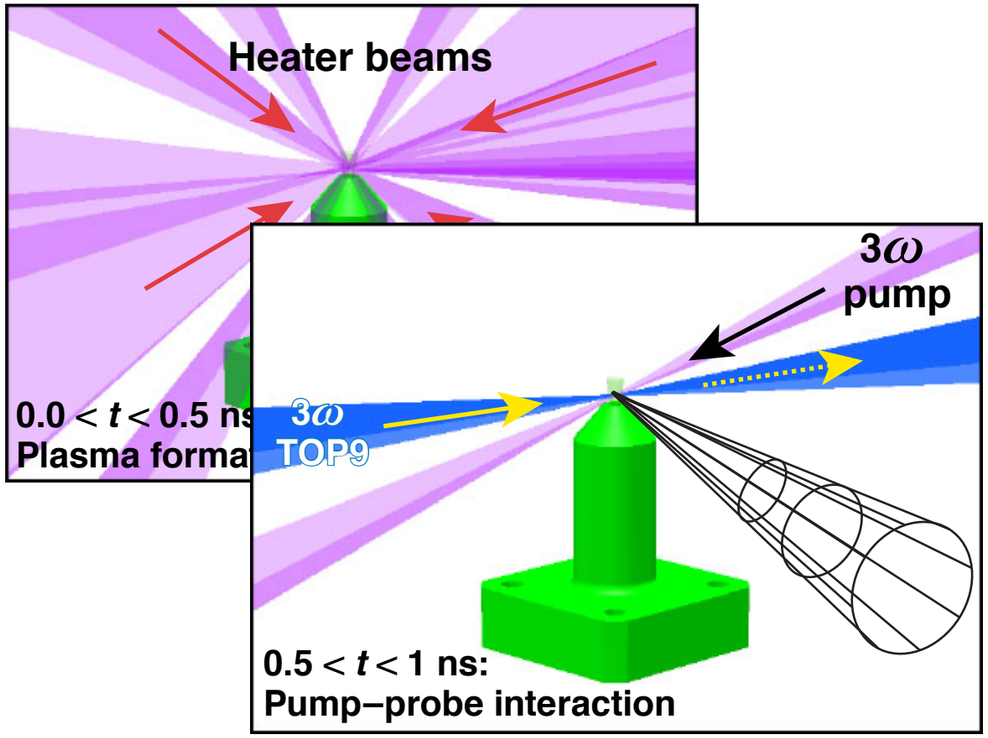
E27951

3ω streaked Thomson scattering measures on-shot plasma parameters with temporal resolution from the center of the plasma



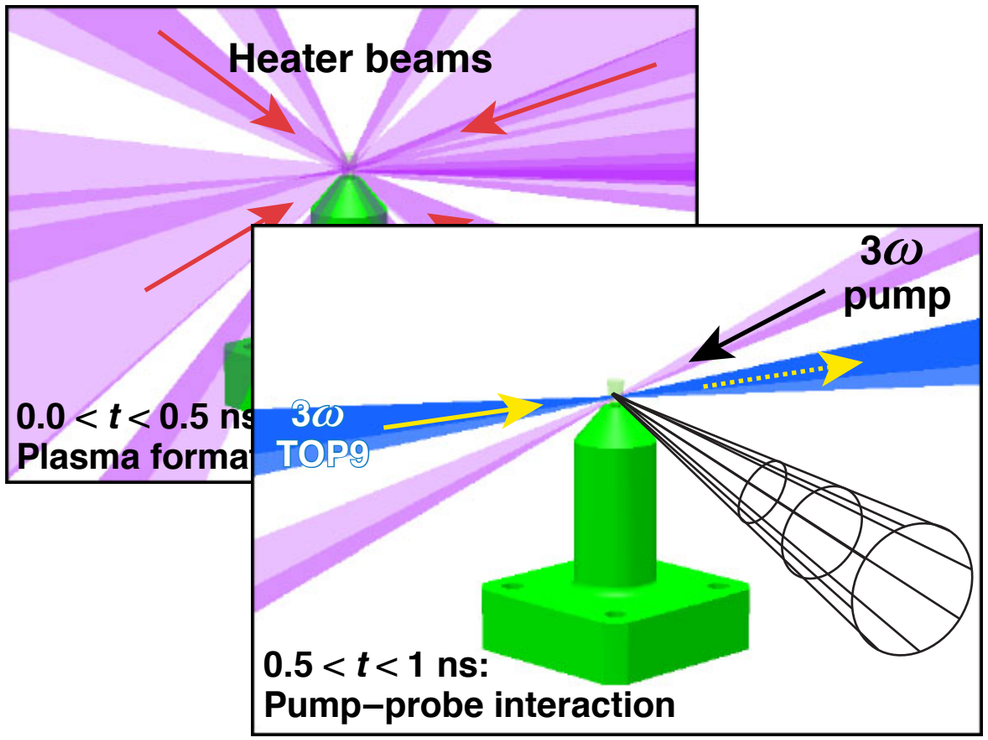
E27950

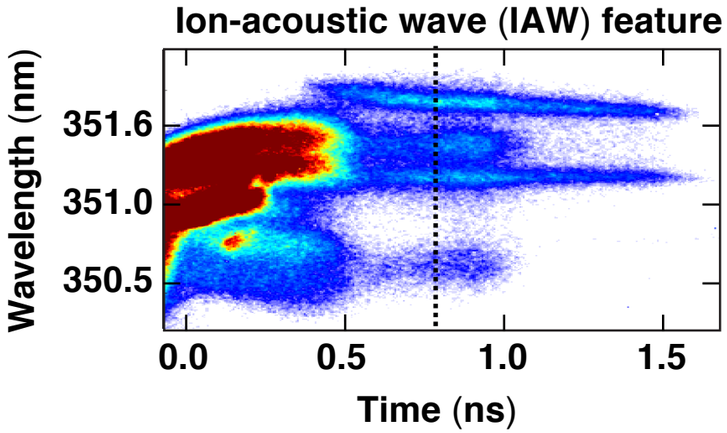
3ω streaked Thomson scattering measures on-shot plasma parameters with temporal resolution from the center of the plasma

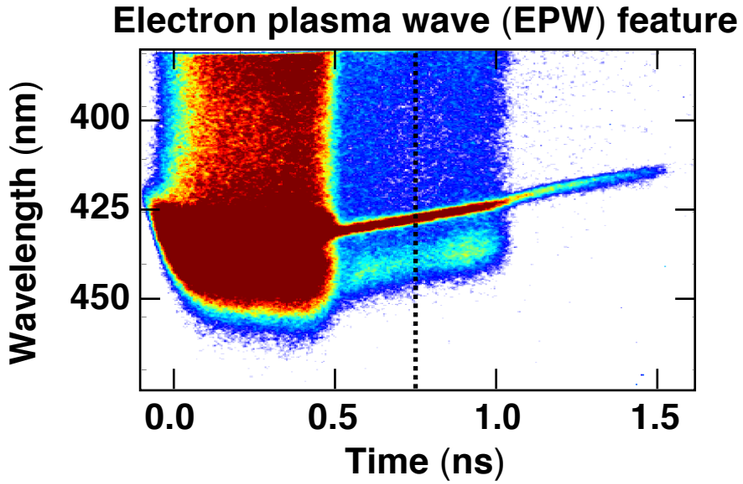


E27950a

3ω streaked Thomson scattering measures on-shot plasma parameters with temporal resolution from the center of the plasma

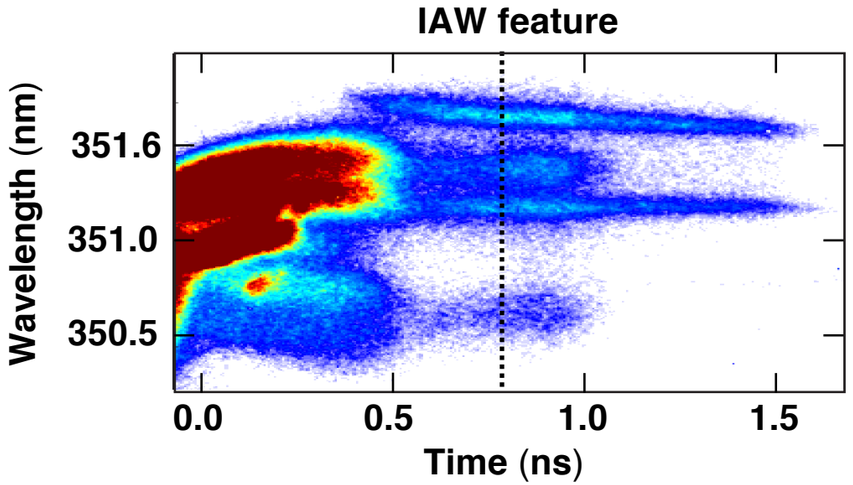


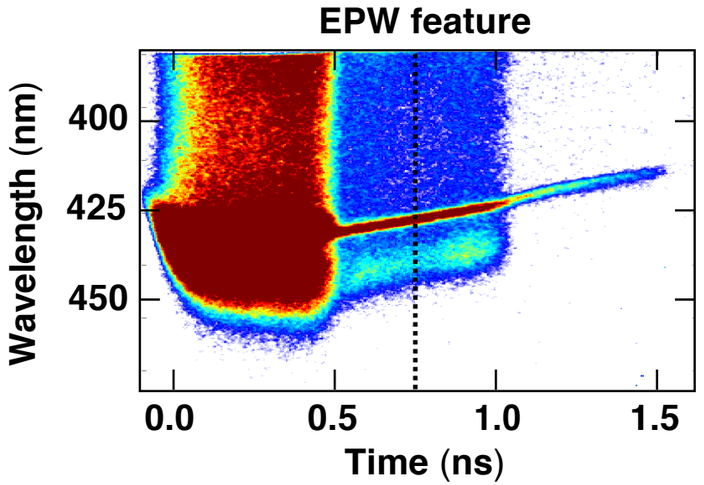


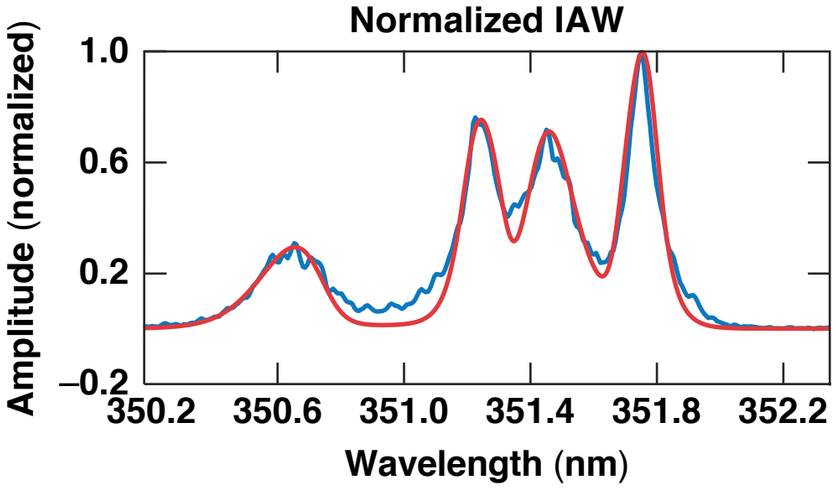


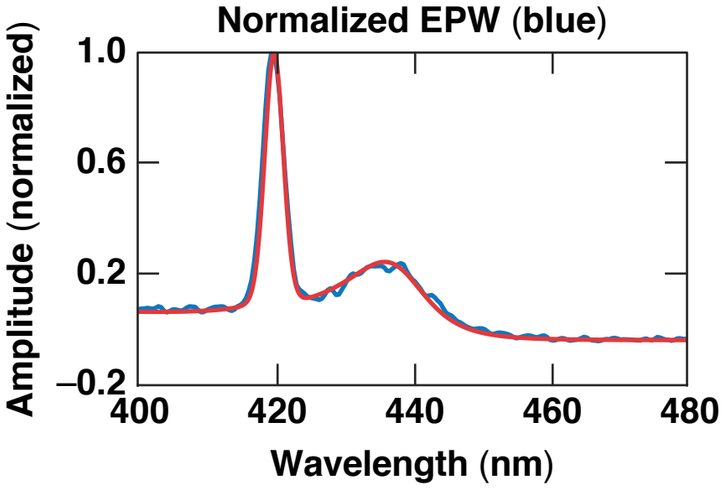
E27950b

3ω Thomson-scattered light is measured on TOP9 shots to measure temporally resolved plasma parameters



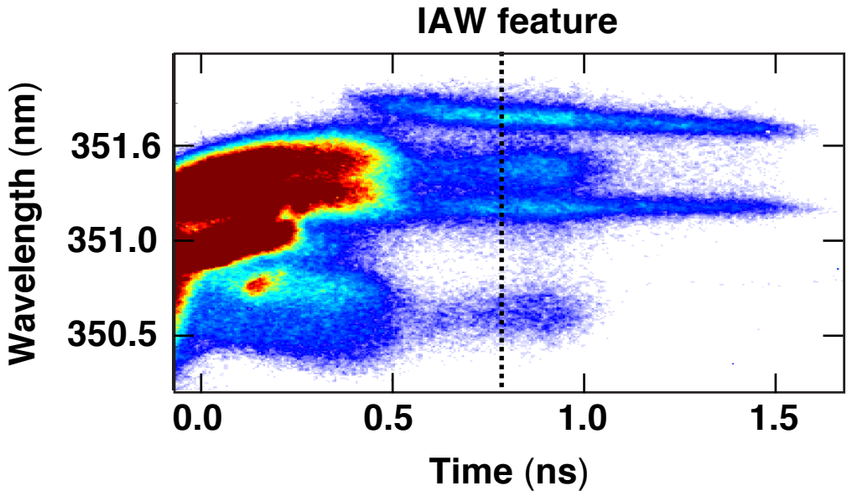


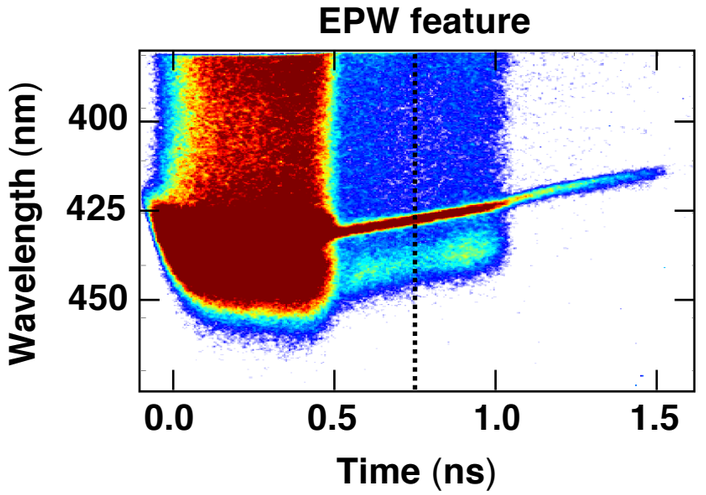


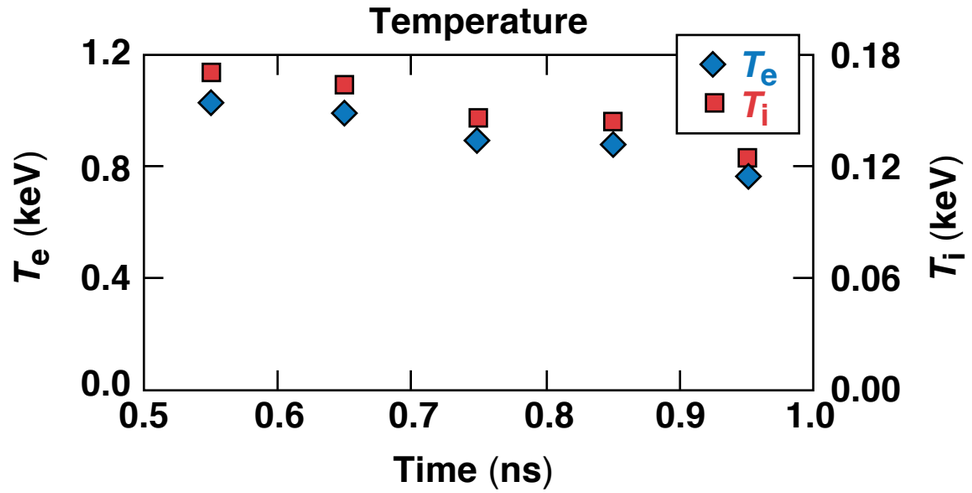


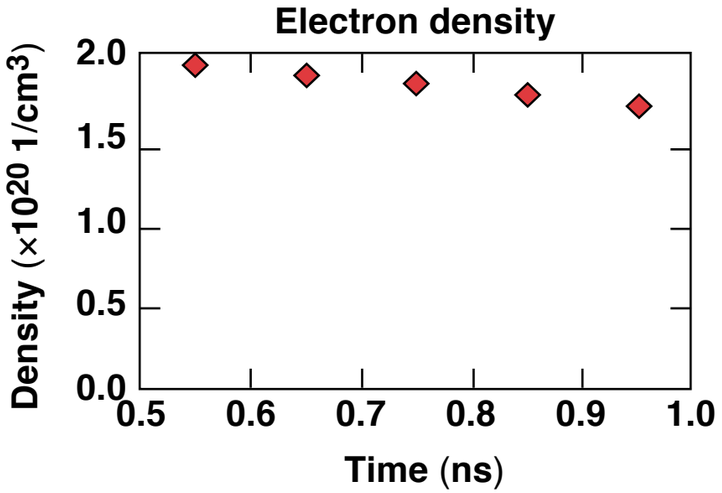
E27952

Plasma parameters vary slowly through the CBET interaction and are measured throughout the TOP9 pulse









E27954

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