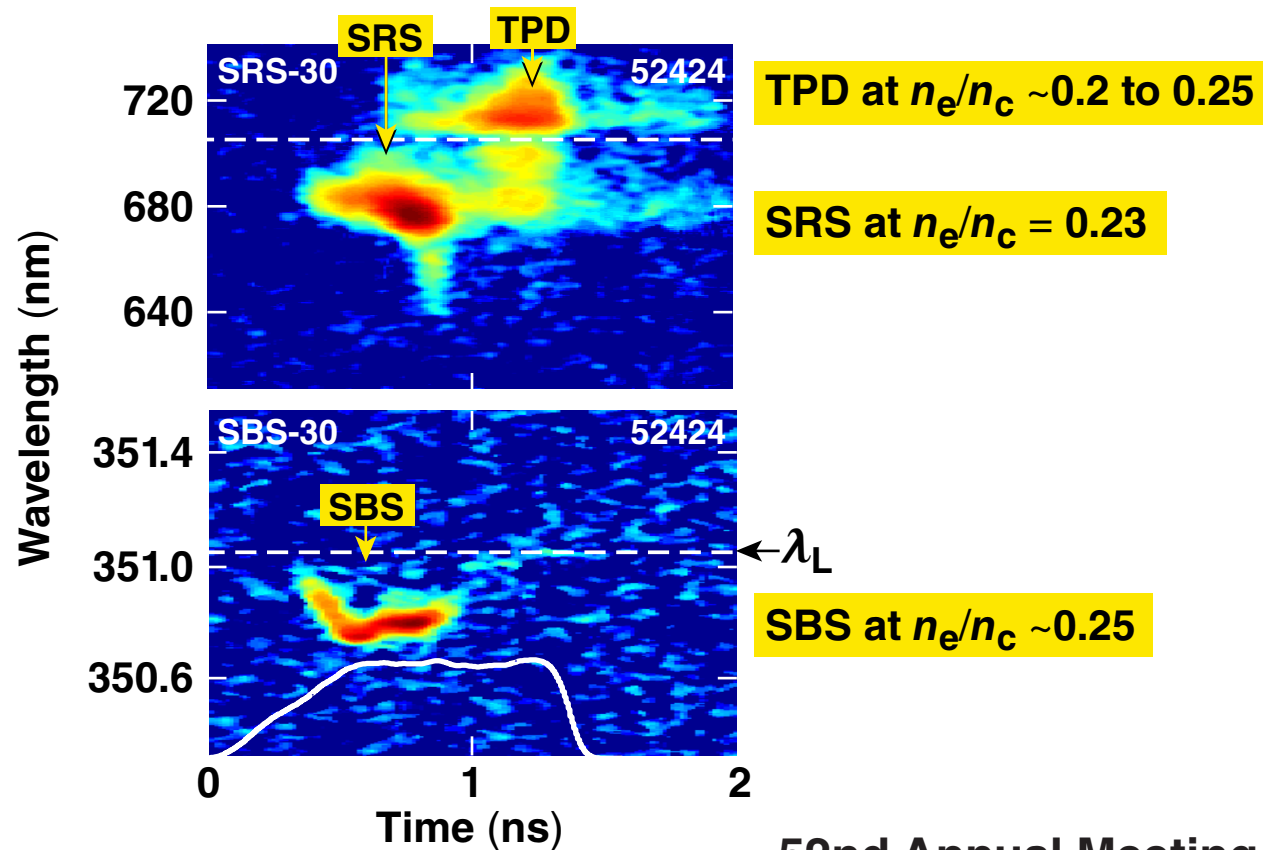


Do SBS and TPD Interact with Each Other in Experiments Relevant to Direct-Drive ICF?



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Summary

SBS near $n_c/4$ appears to influence the two-plasmon-decay instability in long-scale-length plasmas



- In several OMEGA experiments, SBS, SRS, and TPD are observed at nearly the same time in about the same region of space
- 2-D hydrodynamic simulations along with estimates of SBS gain show that SBS is significant at $n_c/4$ while the TPD instability is calculated to be above threshold
- The SRS instability is observed at $n_e/n_c \leq 0.23$ below where SBS occurs

SBS near $n_c/4$ appears to be capable of delaying TPD. Some PIC simulations are now starting to show indications of similar trends.¹

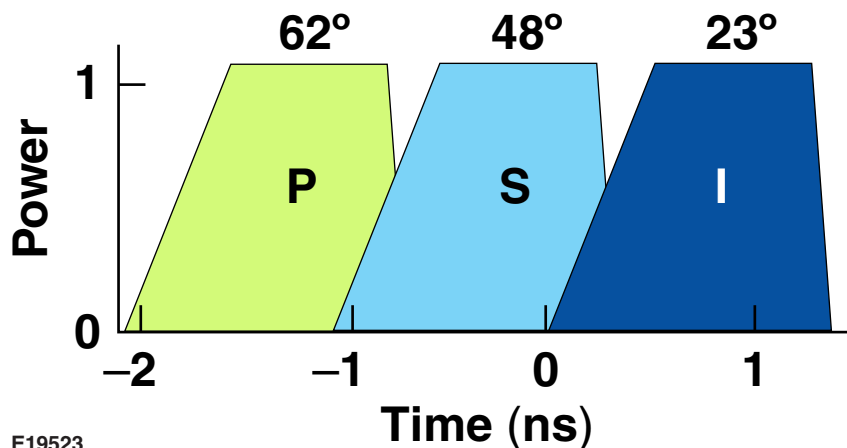
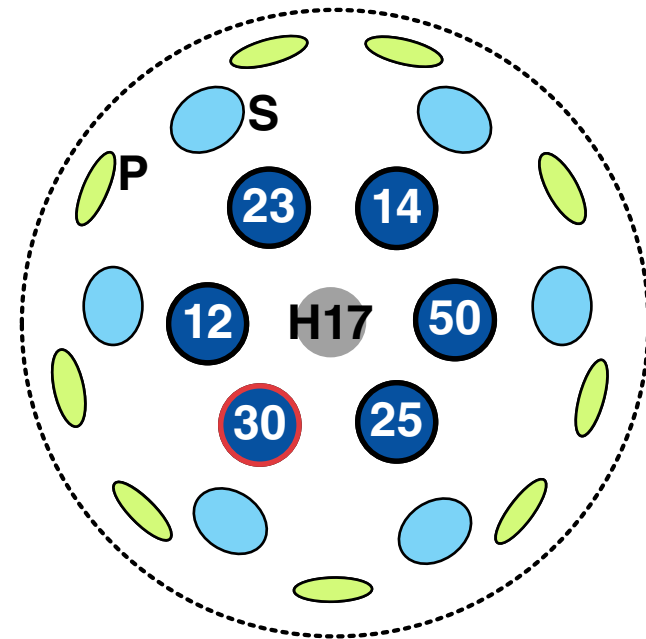
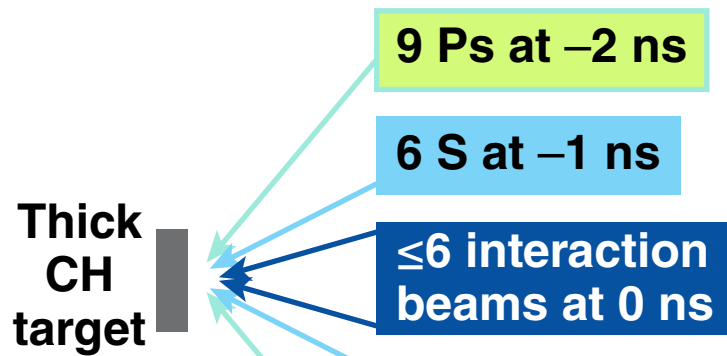
Collaborators



**D. H. Froula, D. H. Edgell, R. E. Bahr, J. F. Myatt, J. A. Delettrez,
R. S. Craxton, S. X. Hu, A. V. Maximov, and R. W. Short**

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Laboratory for Laser Energetics**

Planar-interaction experiments were performed in preformed plasmas using six overlapping interaction beams



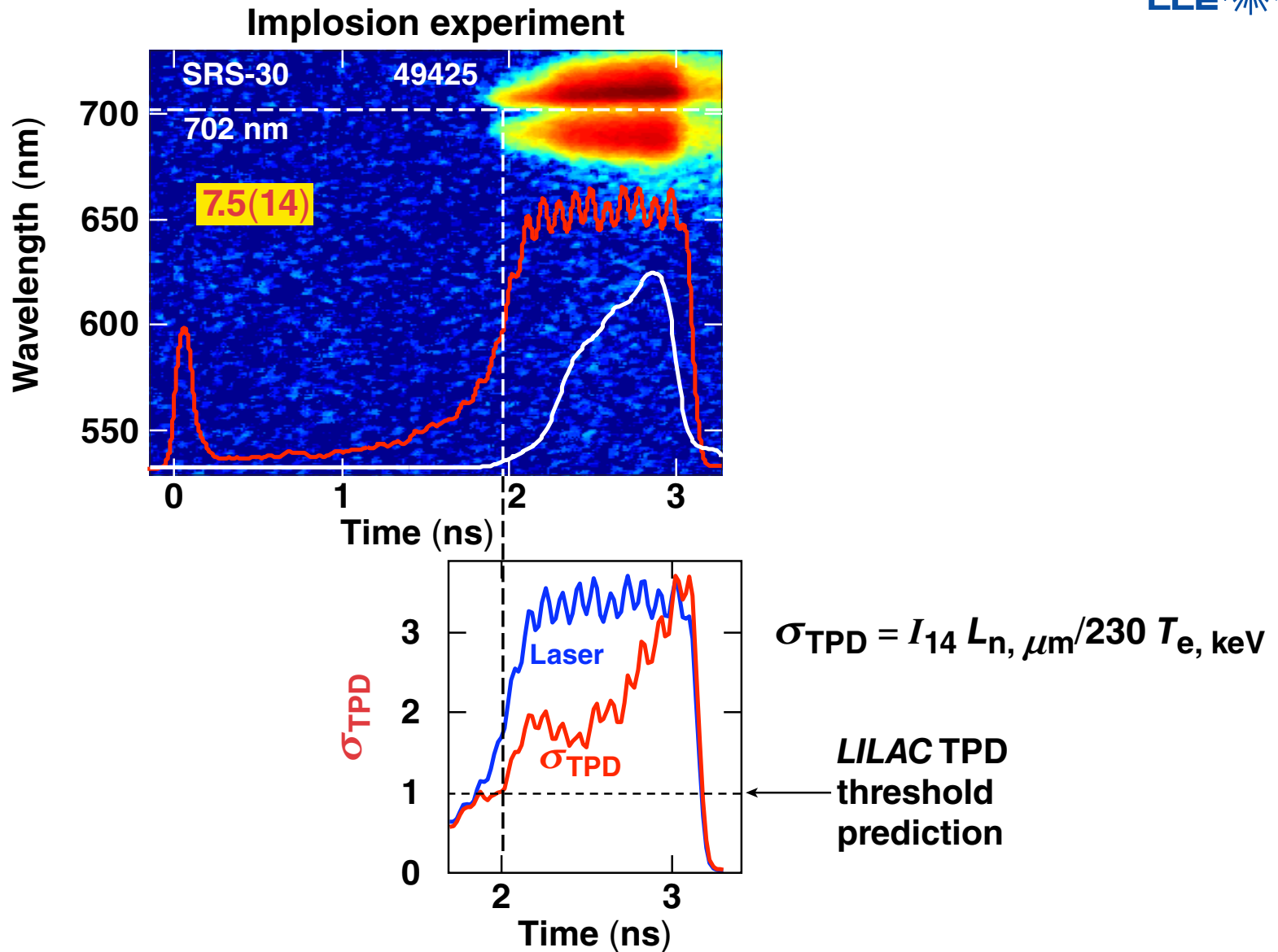
No SSD, SG4 phase plates,
single beam:

$$\sim 1.2 \times 10^{14} \text{ W/cm}^2$$

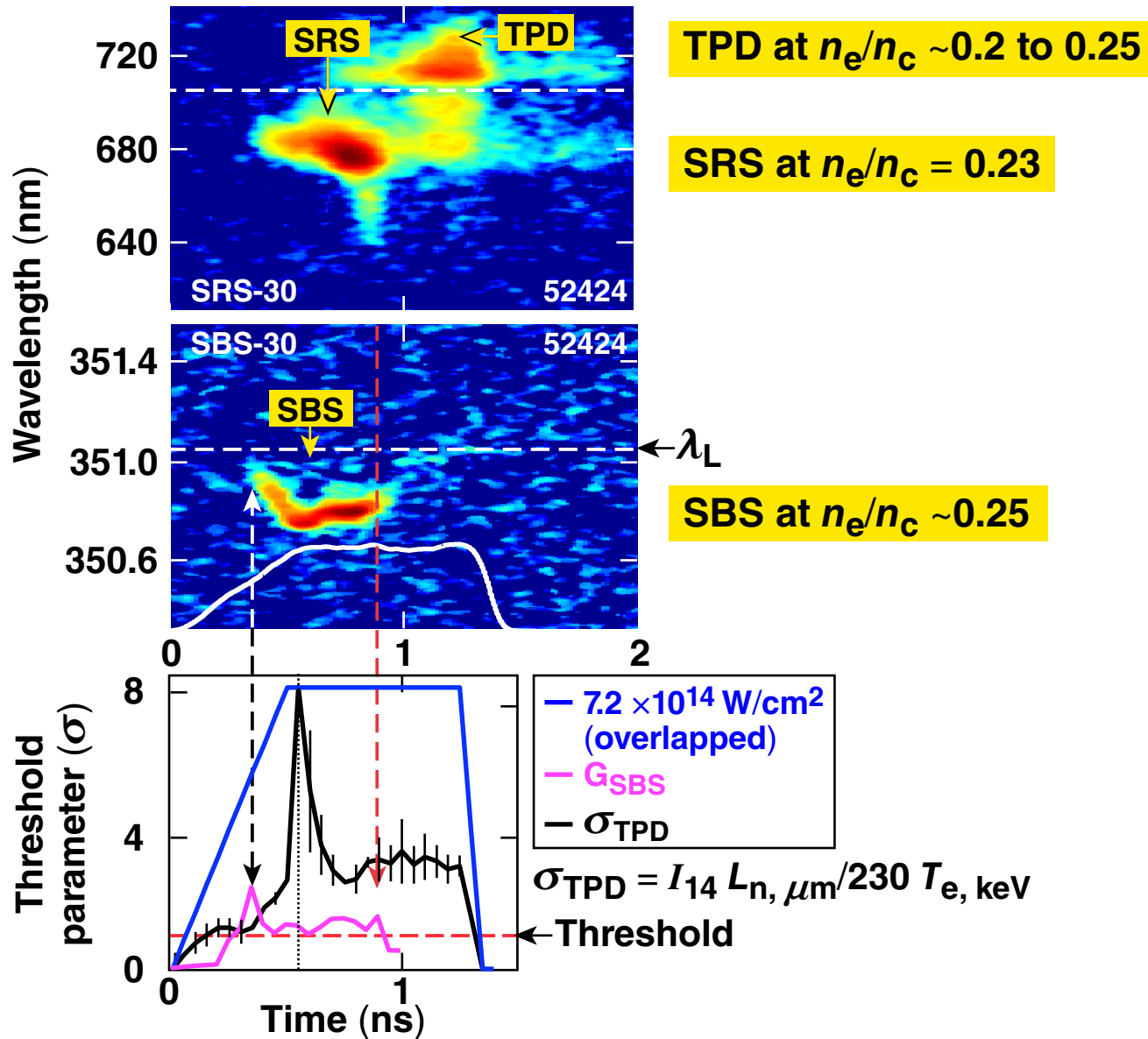
Overlapped:

$$\sim 7 \times 10^{14} \text{ W/cm}^2$$

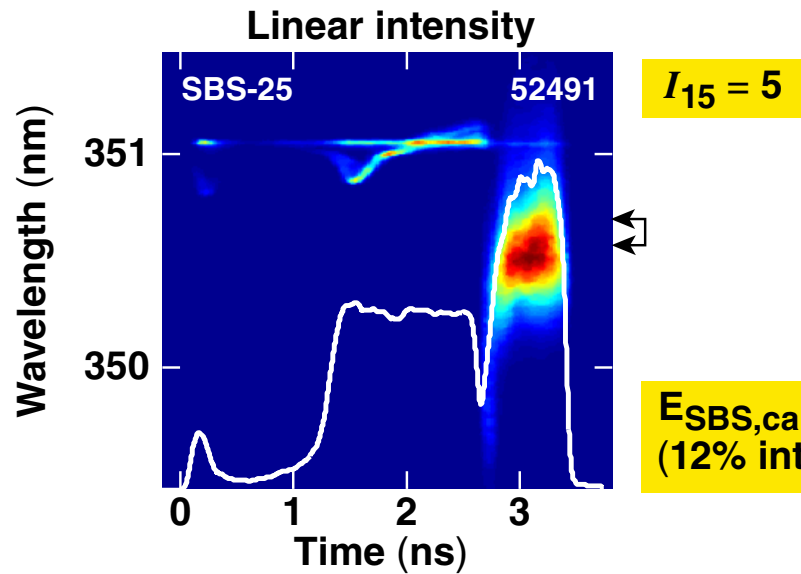
In implosion experiments, the TPD is invariably seen when predicted by linear theory



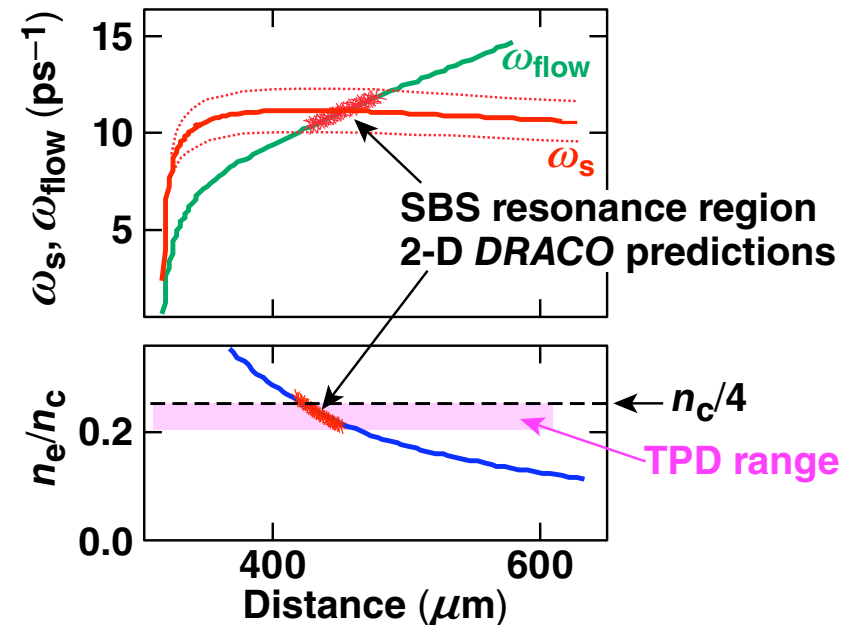
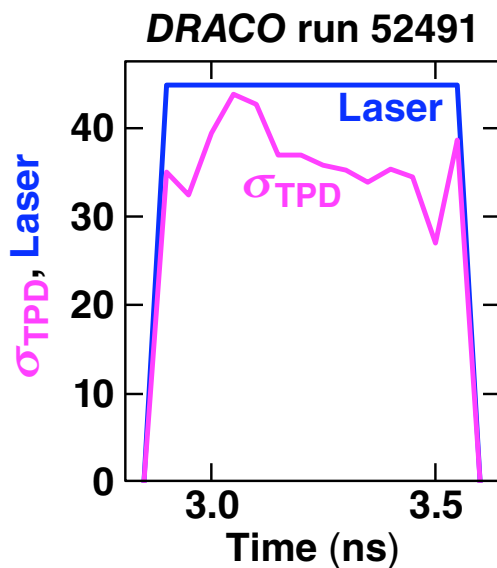
The calculated TPD threshold peaks early but the experimental threshold is delayed until after the SBS near $n_c/4$ turns off



40-beam OMEGA implosion experiments followed by 20 high-intensity beams tested interaction physics $>10^{15}$ W/cm²



- No evidence for TPD ($\omega/2$ or $3\omega/2$)
- Energetic electrons ($T_{\text{hot}} \sim 40 \text{ keV}$) commensurate with SRS ($\geq 24\%$) (\rightarrow inconsistent with TPD)



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