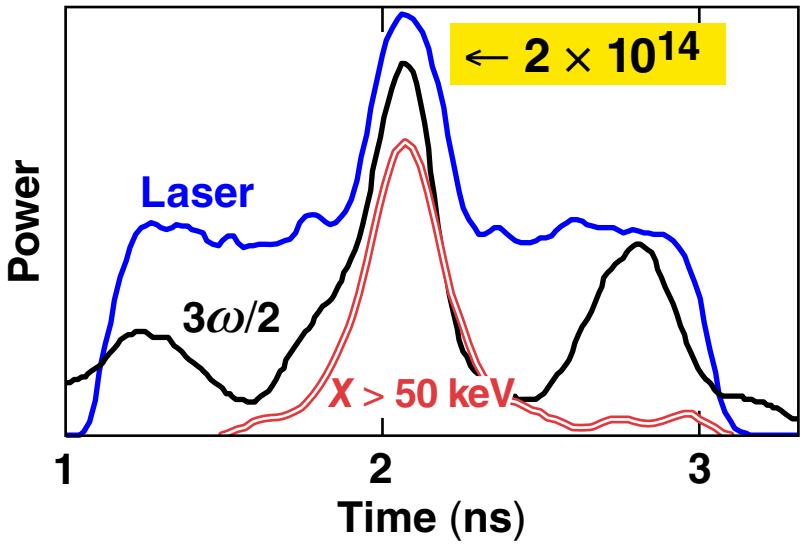
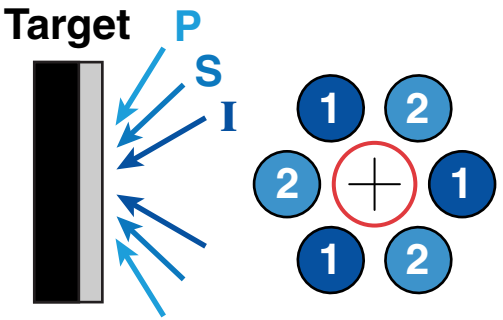
Two-Plasmon-Decay Instability in Direct-Drive Experiments





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Summary

The $3\omega/2$ and hard x-ray emission and the TPD threshold parameter are well correlated in planar target experiments

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- $3\omega/2$ emission and hard x-ray emission track each other well unless a deliberate Thomson-scattering configuration is present
- The TPD threshold parameter based on linear theory holds over a wide range of experiments
- The onset of the TPD instability is usually dominated by the hydrodynamic evolution of the plasma, which was avoided in the present experiments
- Delays of ≤100 ps are within the present experimental errors and may be exploitable for TPD mitigation in the future*

*J. F. Myatt (JO5.00013).

Collaborators

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Motivation

Theoretical work suggests a delay between TPD onset and fast-electron generation that may be used for preheat mitigation

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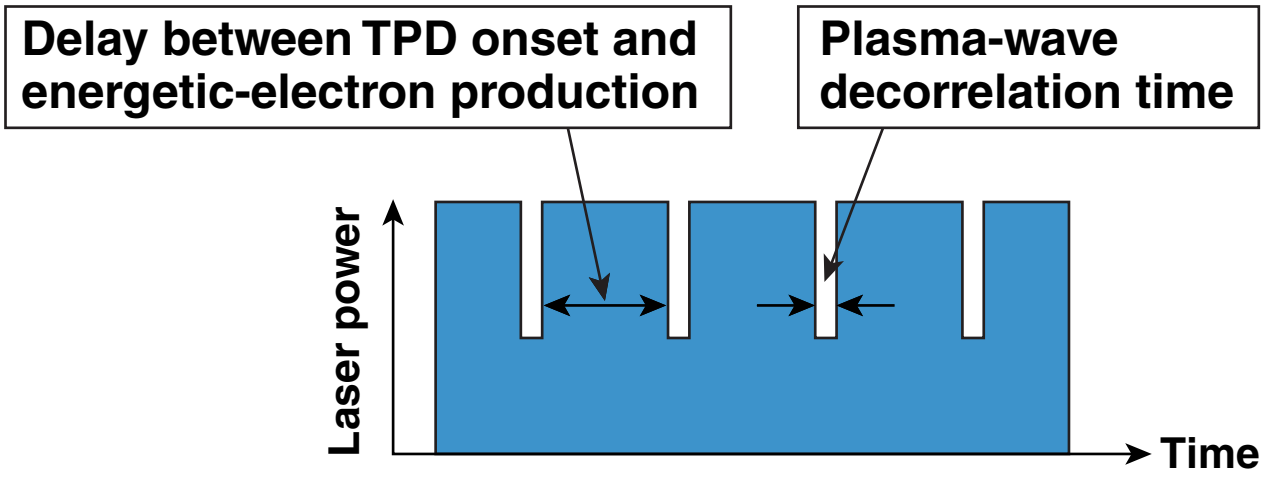
- Boundary conditions for fast-electron recirculation around $n_c/4$ may introduce 50- to 100-ps delays between the onset of the TPD instability and energetic-electron production.
- ICF pulse shapes with appropriate gaps could mitigate the detrimental effects of the TPD instability.



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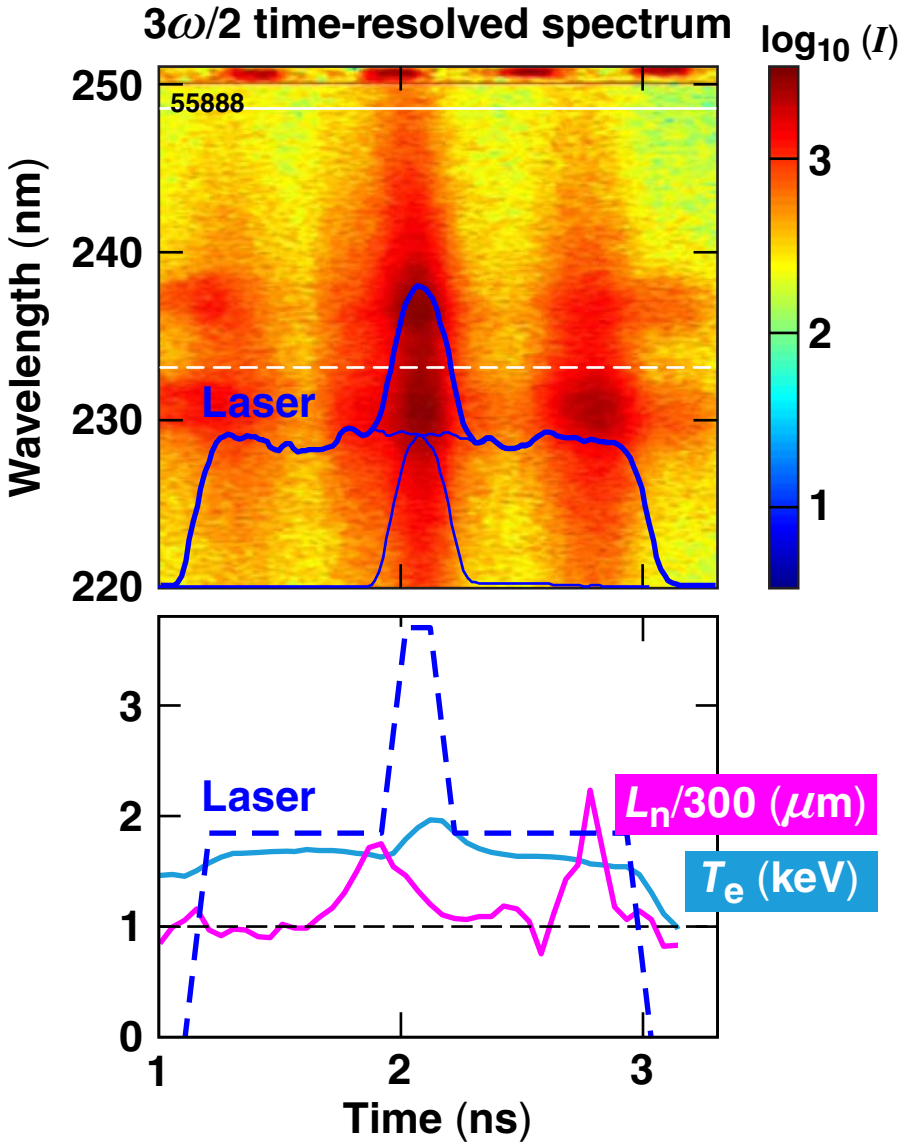
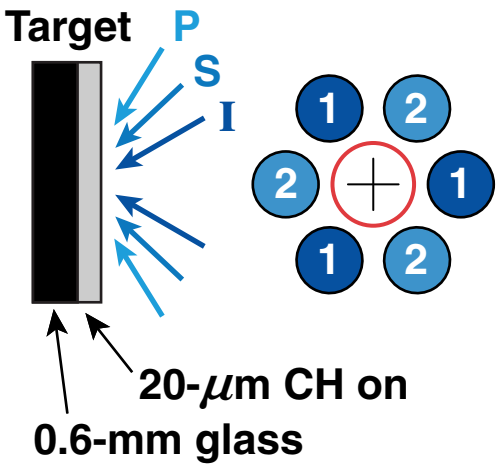
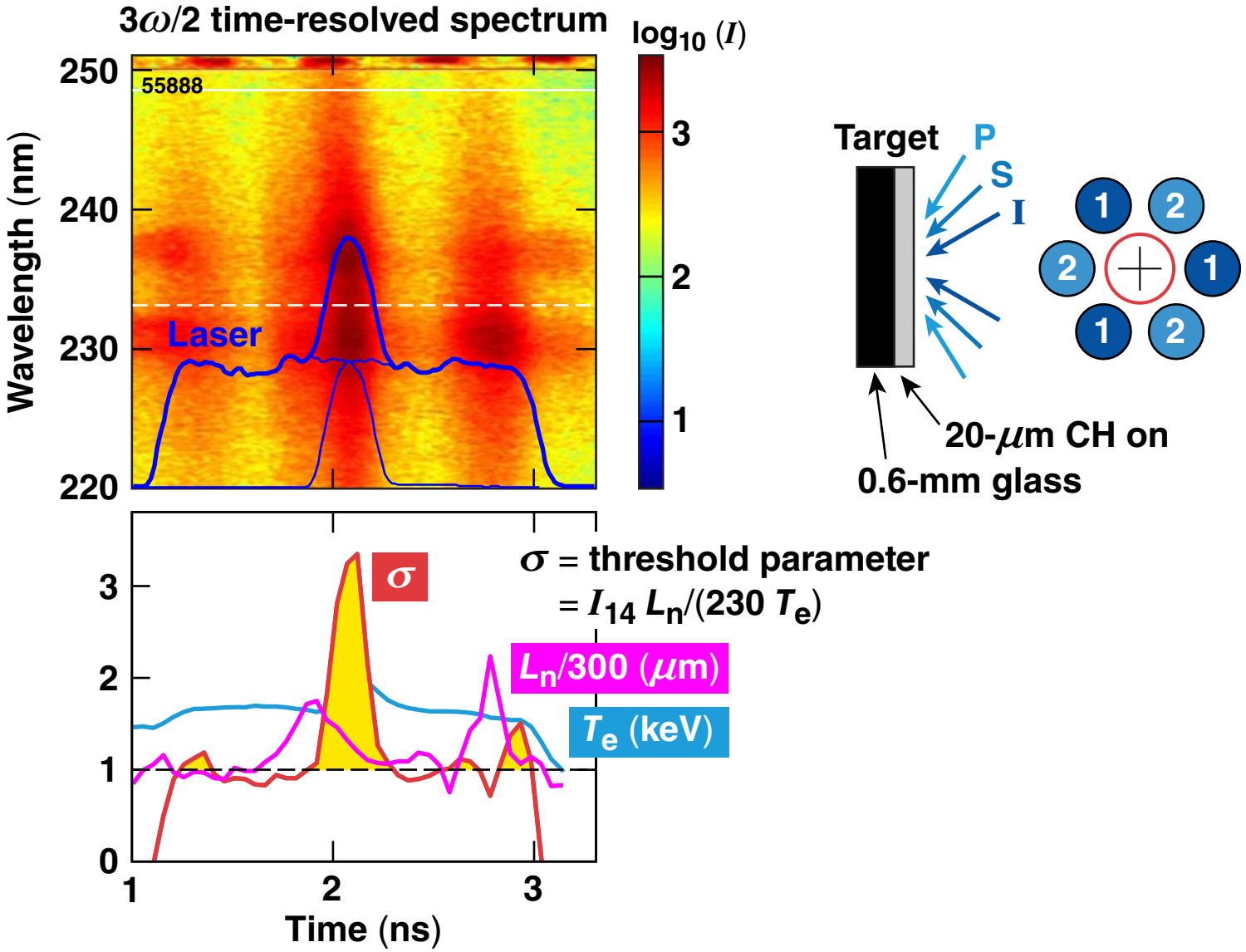
Planar TPD experiments are set up for minimal hydrodynamic response during the interaction time





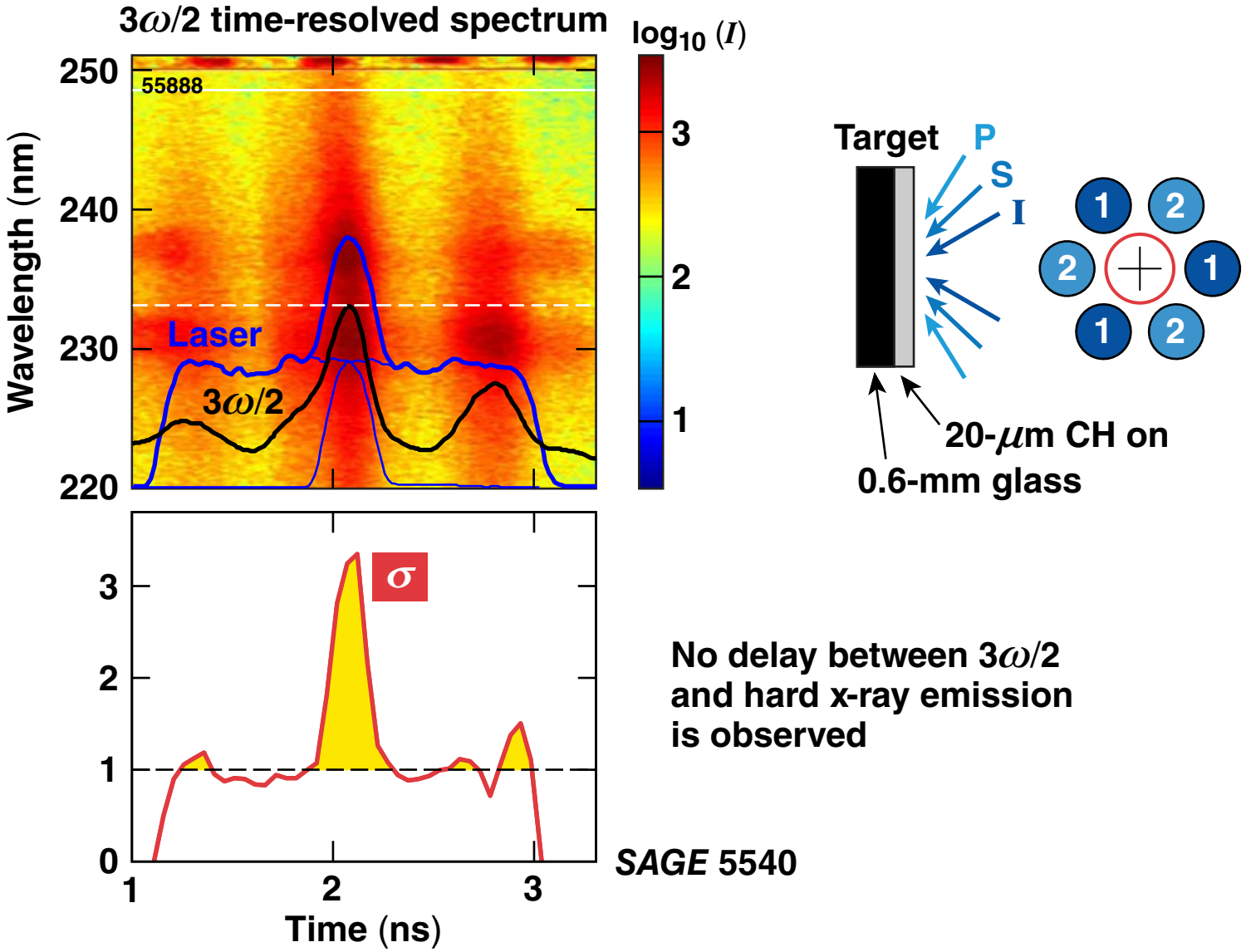
E18438a

Planar TPD experiments are set up for minimal hydrodynamic response during the interaction time



E18438b

The 3ω/2, hard x-ray emission and TPD threshold parameter track each other very well



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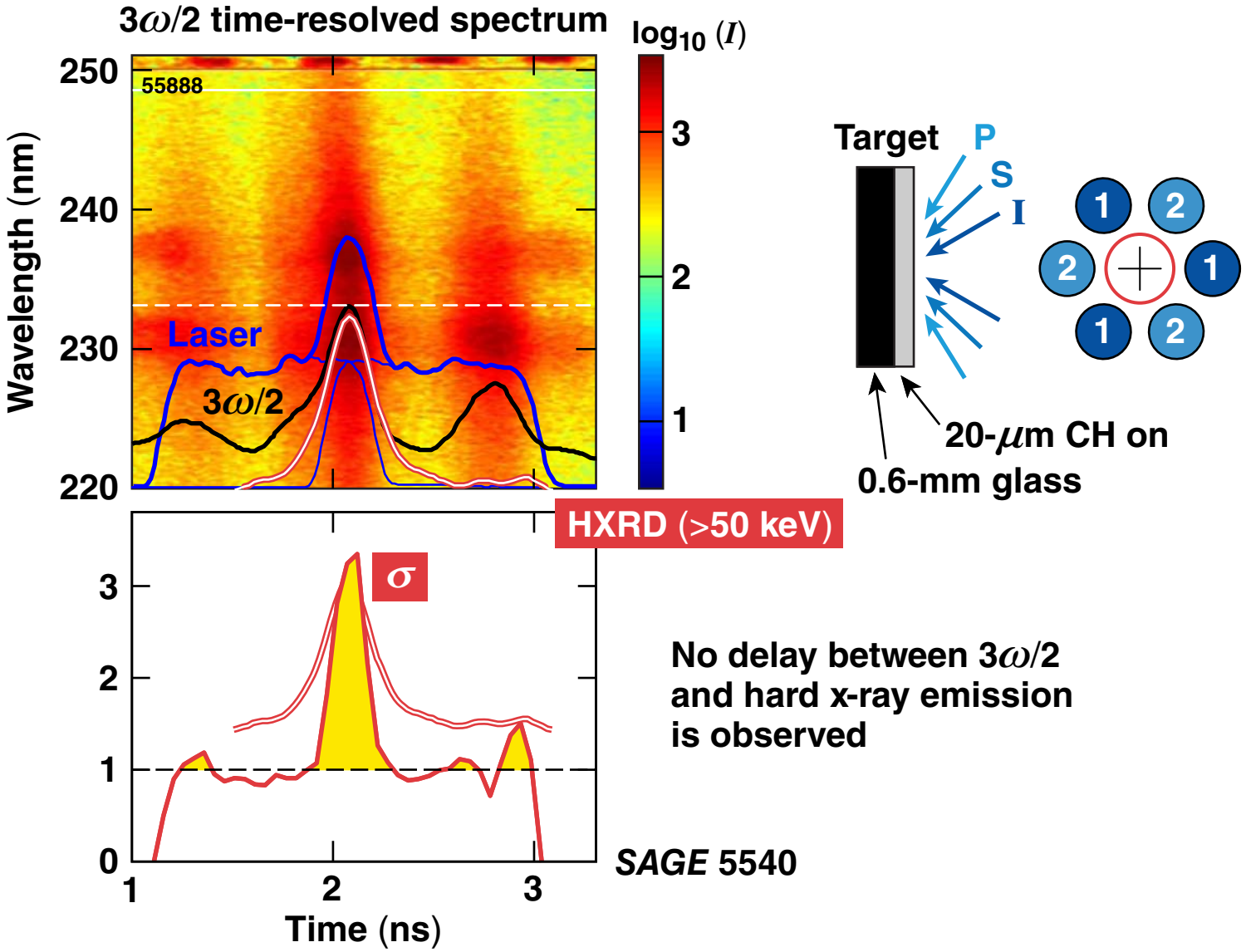
The 3ω/2, hard x-ray emission and TPD threshold parameter track each other very well



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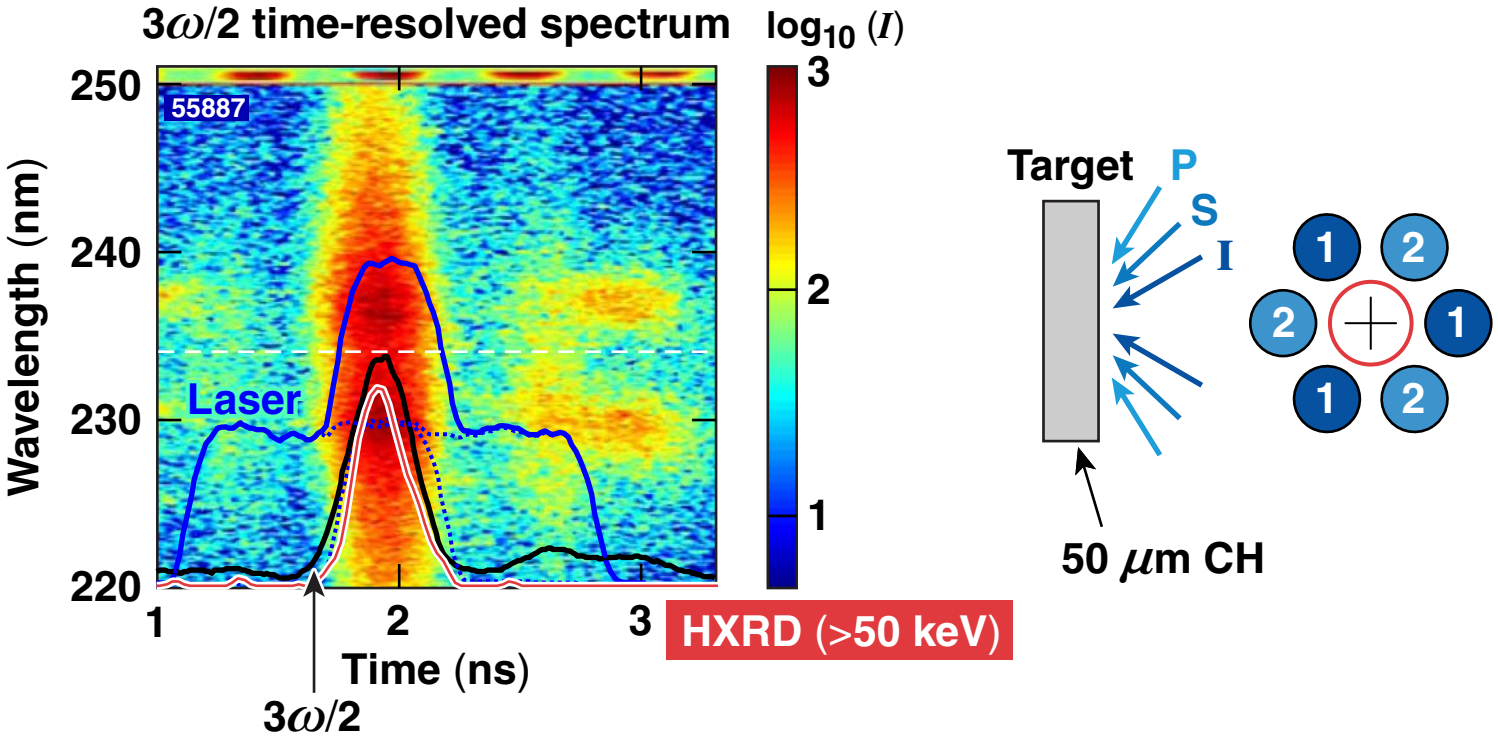
A delay between 3ω/2 and hard x-ray emission might be expected for thin plastic targets since the electrons are not absorbed in a single pass



- No delay is observed
- Hard x-ray yield decreased by >10× for 50-μm plastic targets compared to 20-μm plastic on 600-μm glass
  - indication that electrons escaped (no reflux)

Summary/Conclusions

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E18436

*J. F. Myatt (JO5.00013).