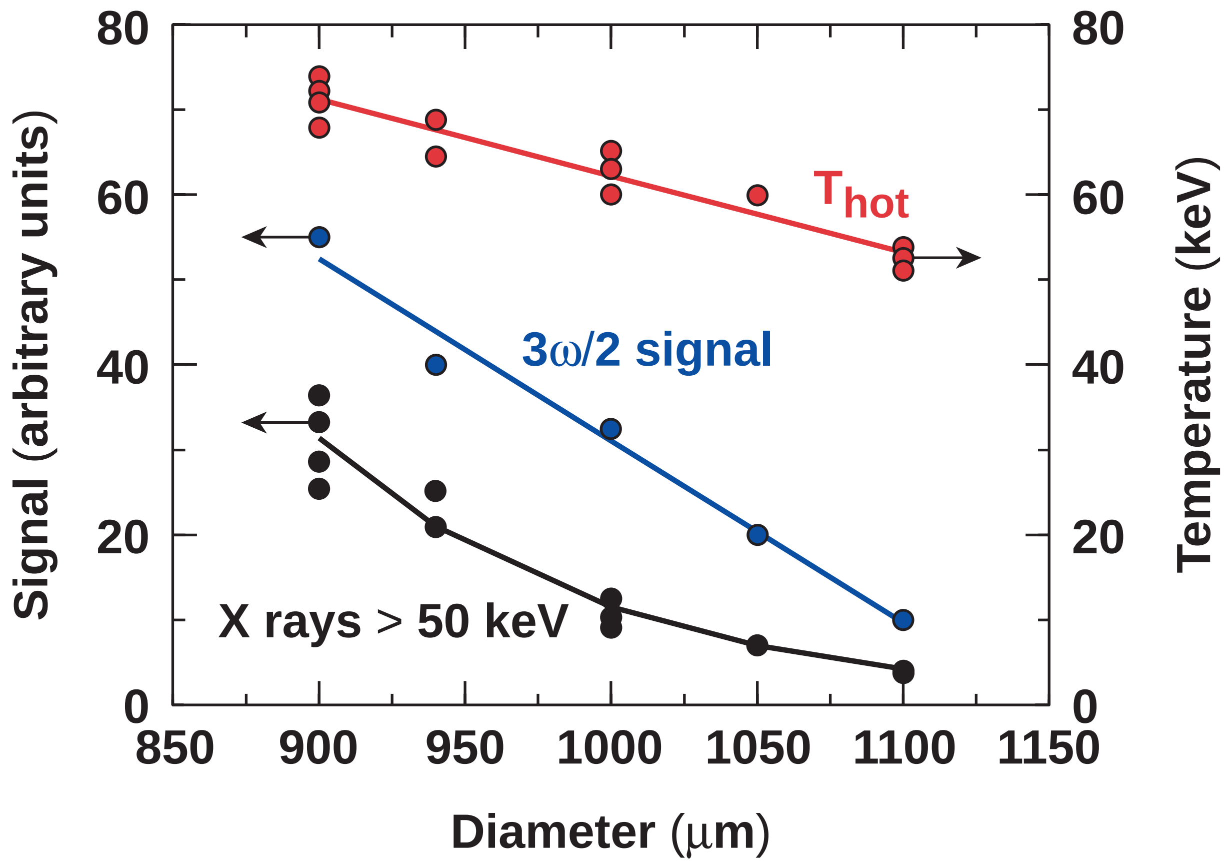
Measurements of the Two-Plasmon-Decay Instability on OMEGA



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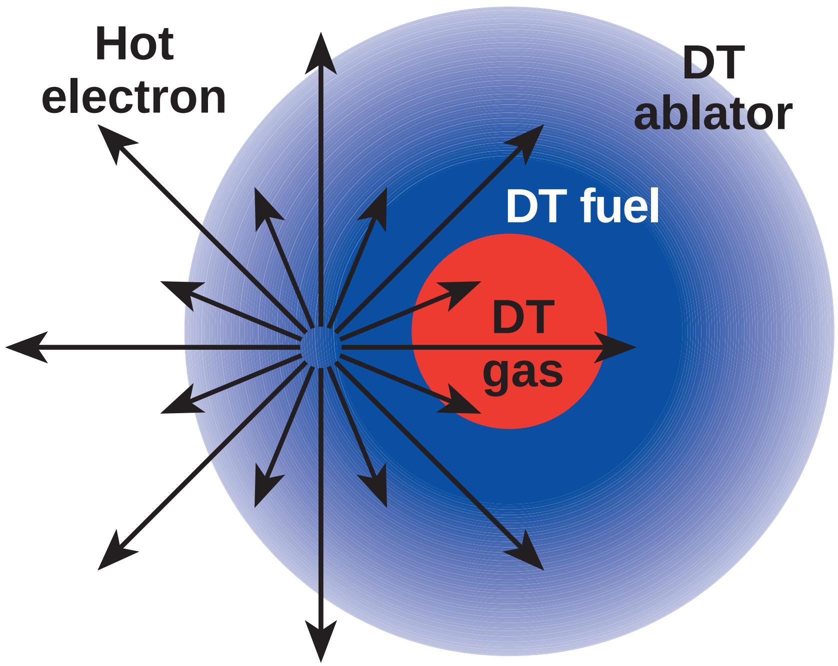
Summary

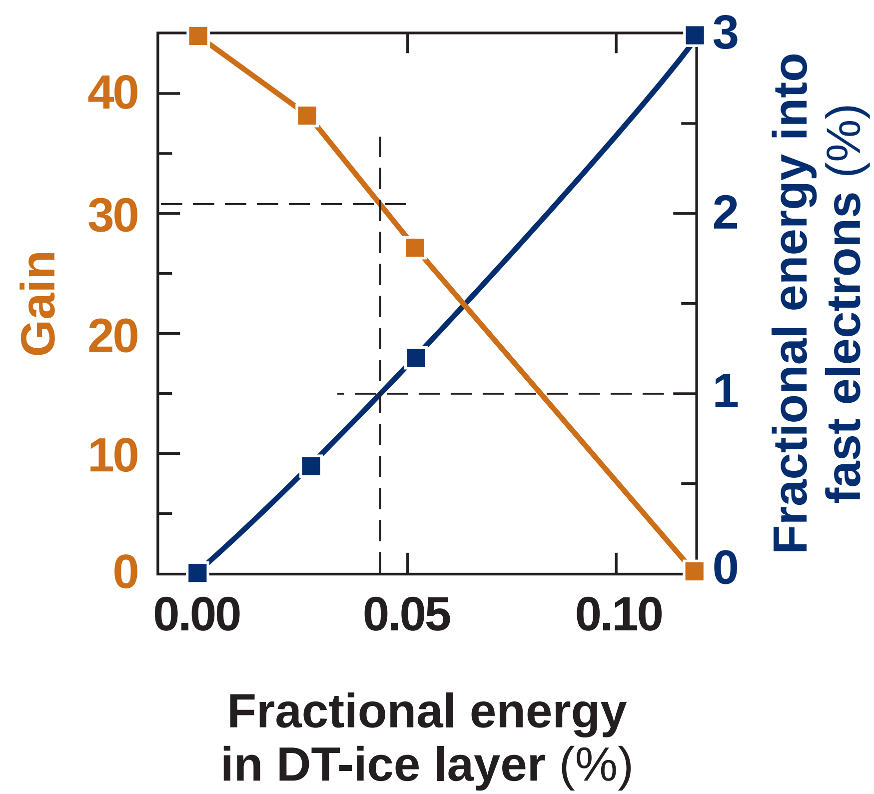
Two-plasmon-decay instability is the primary source of hot electrons in both planar and spherical experiments

- The 3ω/2 signature of the two-plasmon-decay instability correlates very well with the hard x-ray emission in both planar and spherical geometries.
- Smoothing by spectral dispersion (SSD) enhances the hard x-ray emission in spherical and long-scale-length planar experiments.
- Polarization smoothing (PS) using birefringent wedges lowers the hard x-ray emission.
- Experiments using targets of different diameters indicate that the overlapped intensity dominates the scaling of the hard x-ray emission and the 3ω/2 signature of the two-plasmon-decay instability.

Hot electrons can significantly reduce the target gain

- **The effect of an 80-keV hot-electron tail was simulated using the fast-electron package in *LILAC*.**
- **About 4% of the energy absorbed into fast electrons couples into the DT-ice fuel layer.**





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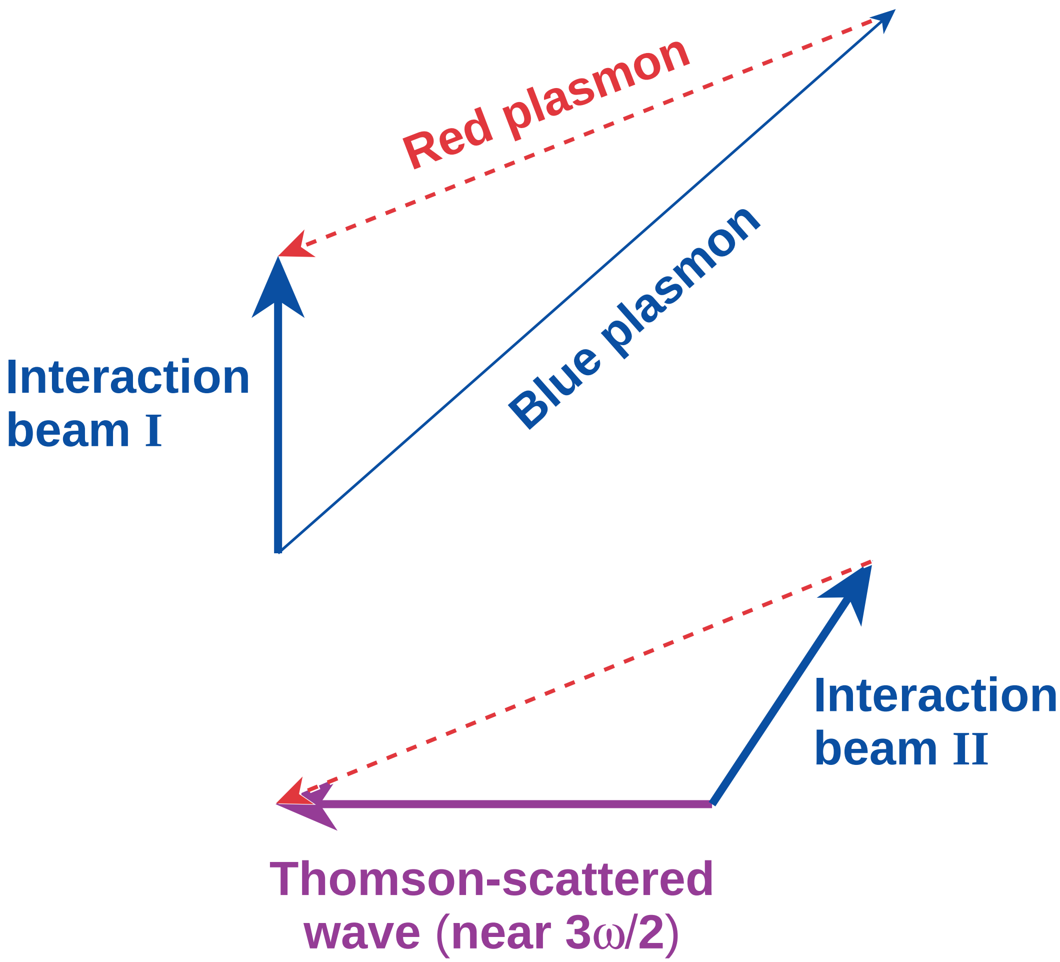
The 3ω/2 signature of the two-plasmon-decay instability is produced by Thomson scattering

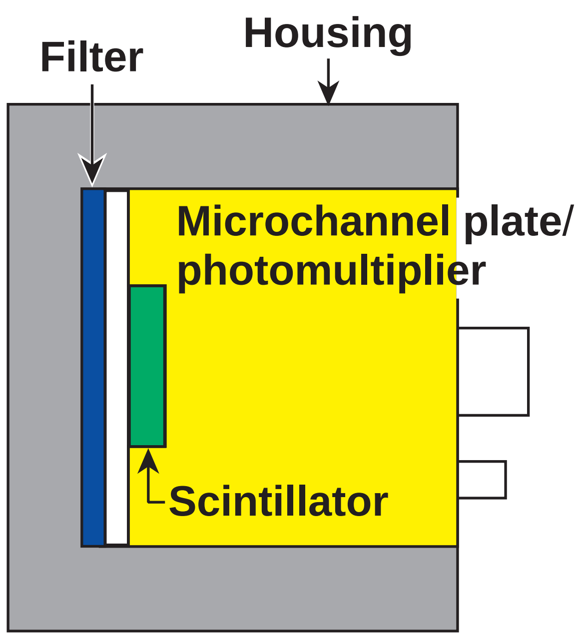


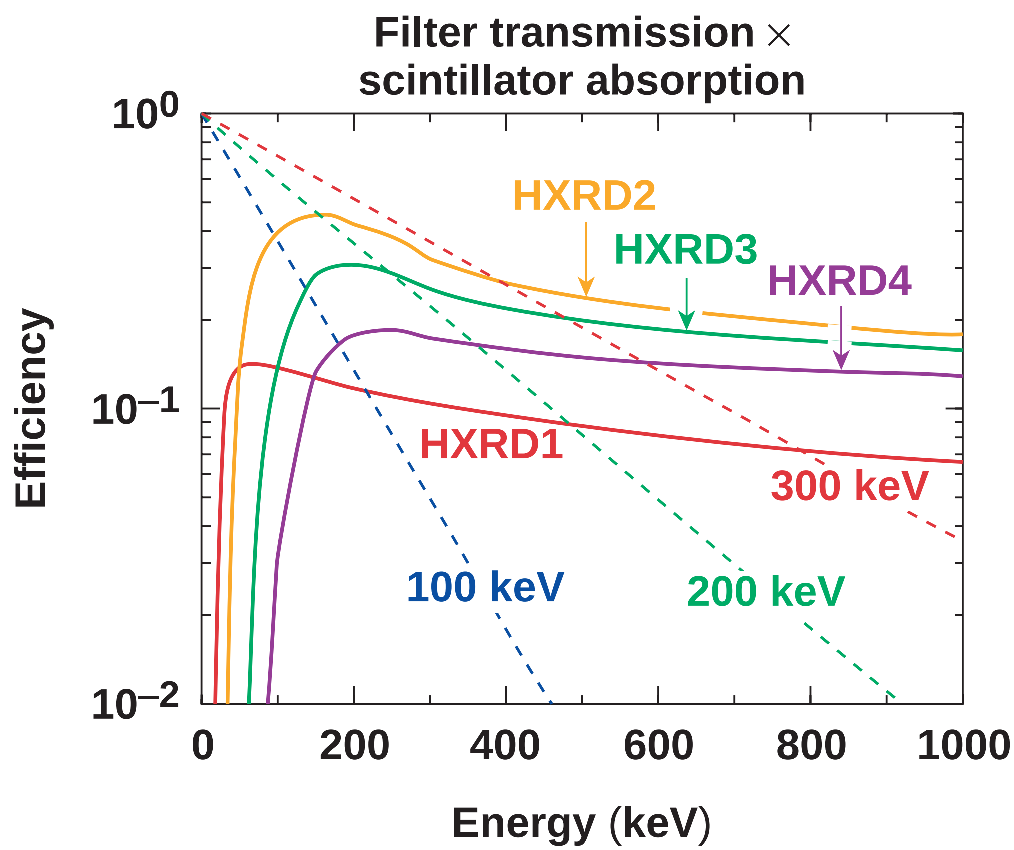
Two-plasmon decay (primary decay process)

Self-Thomson scattering (secondary scattering process)

E6414a

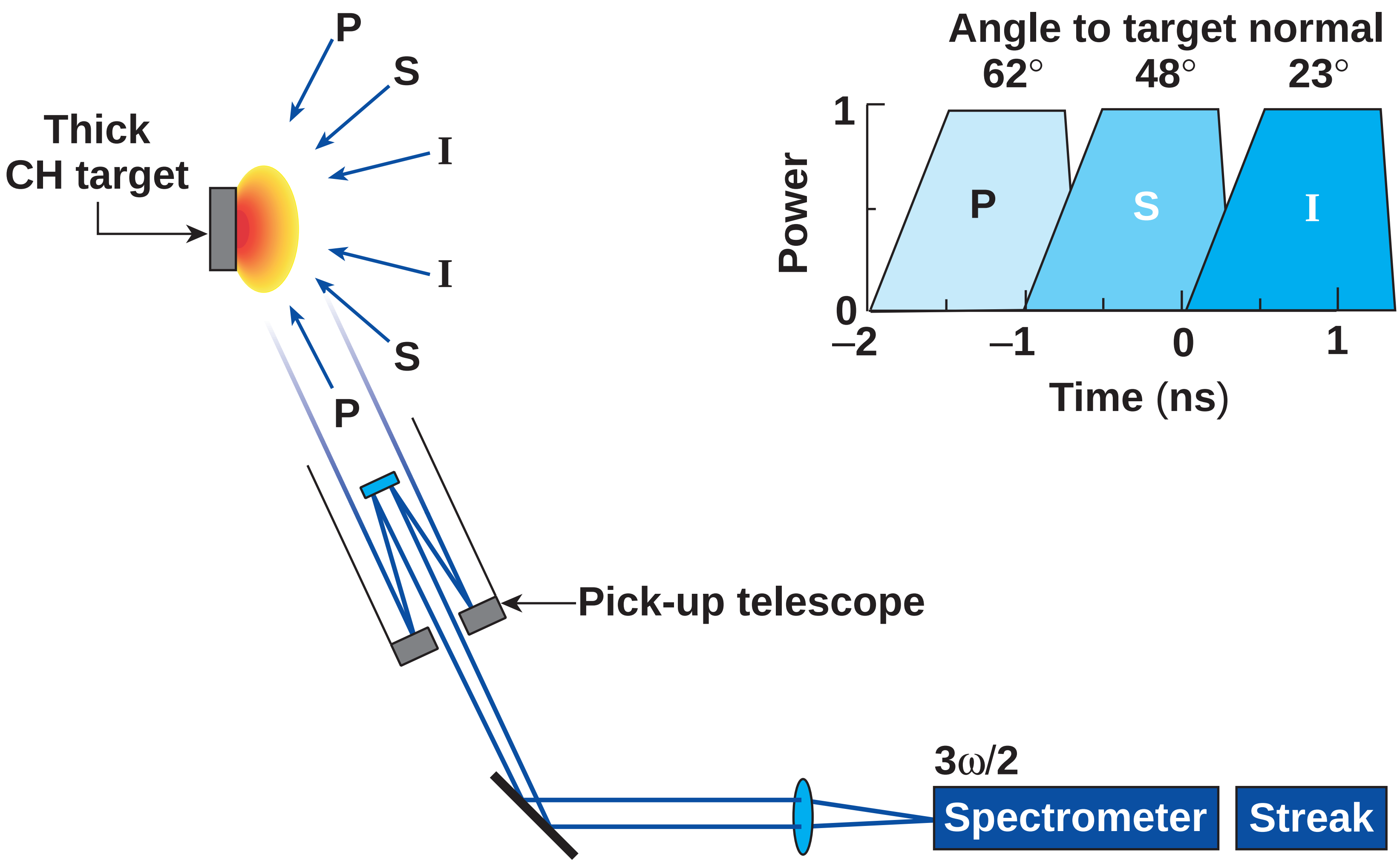
Four hard x-ray detectors using single-edge-type filters are used to measure the hot-electron temperature





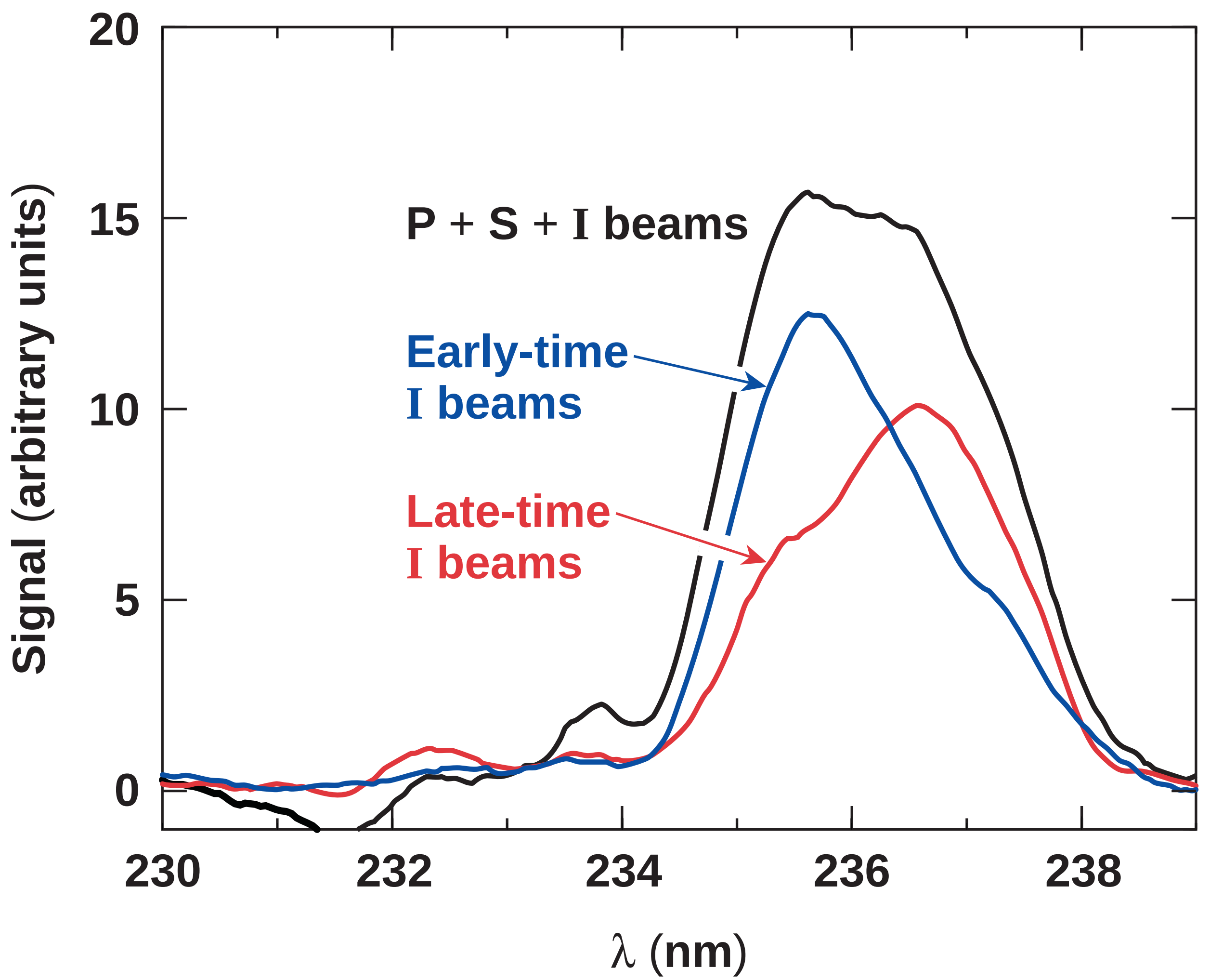
E10921

Planar-foil experiments use three sets of delayed beams, six of which are interaction beams



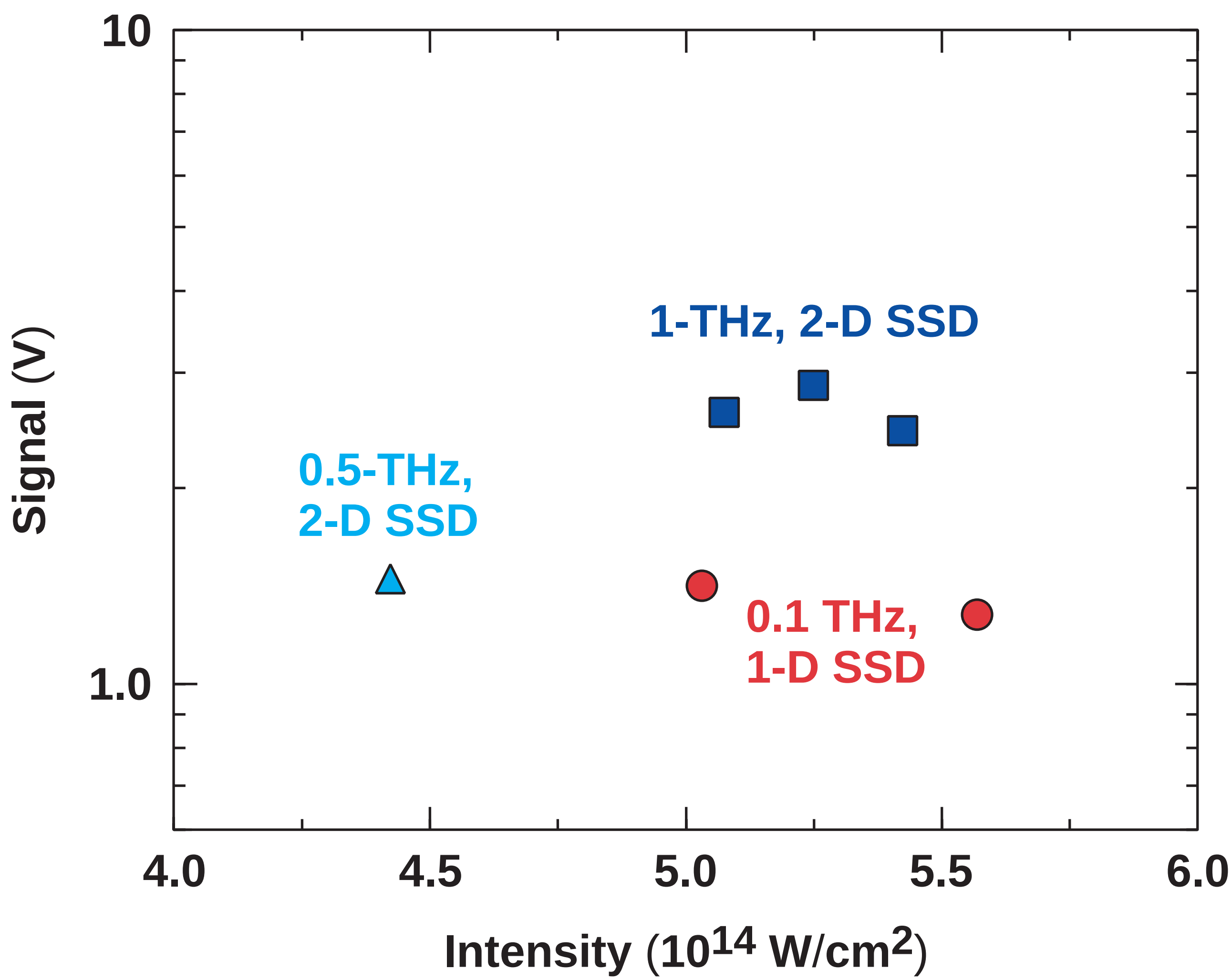
E10941

The blue shifted peak is missing in the 3ω/2 spectrum in planar experiments



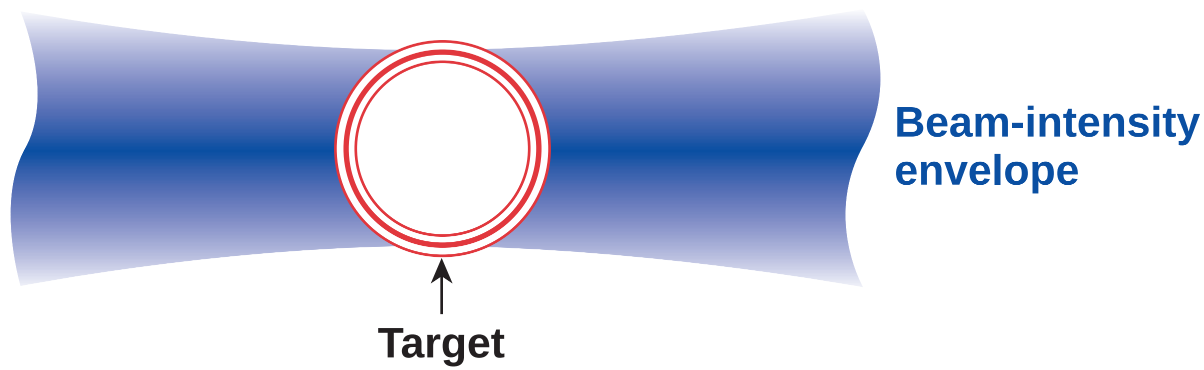
E10942

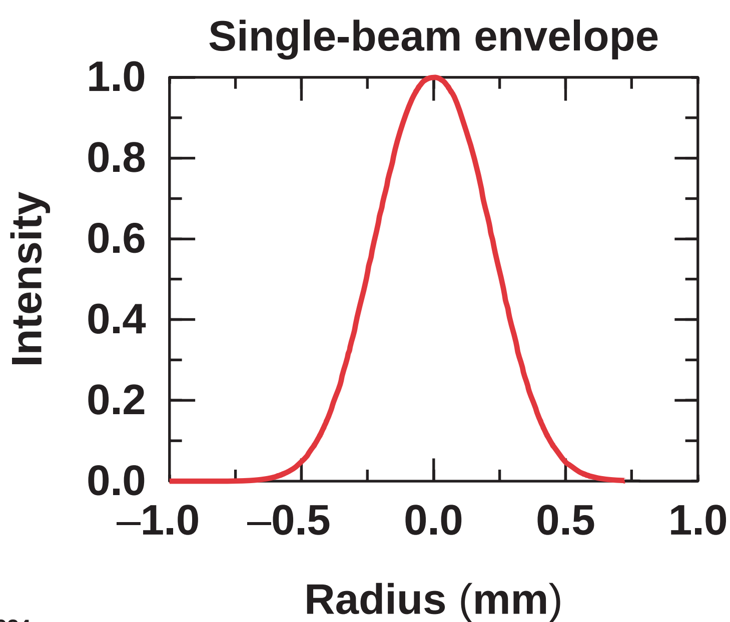
The hard x-ray signals from the planar experiments show a trend of increased signal with SSD

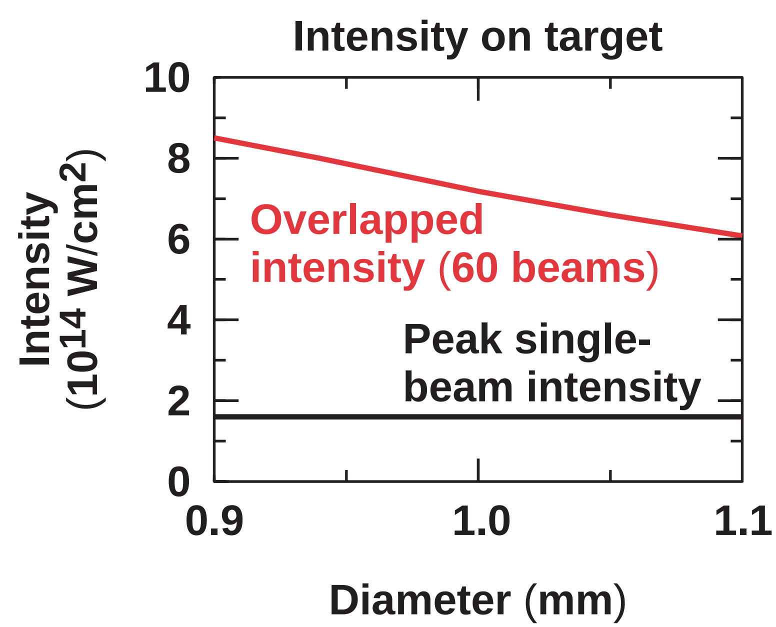


E10925

In spherical geometry, the overlapped intensity on target depends on the target diameter



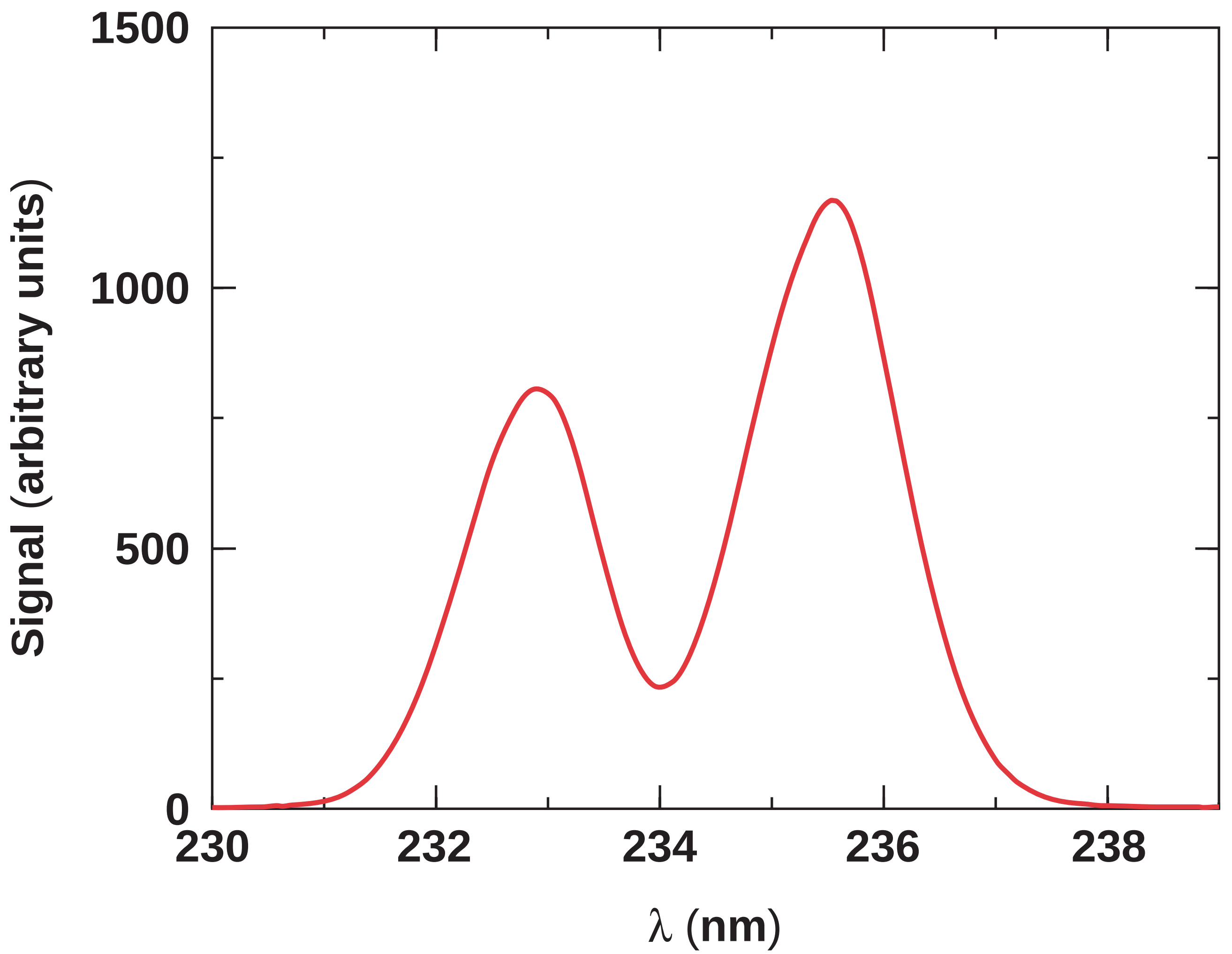




E10924

The 3ω/2 signal from spherical experiments shows the typical two-peak structure

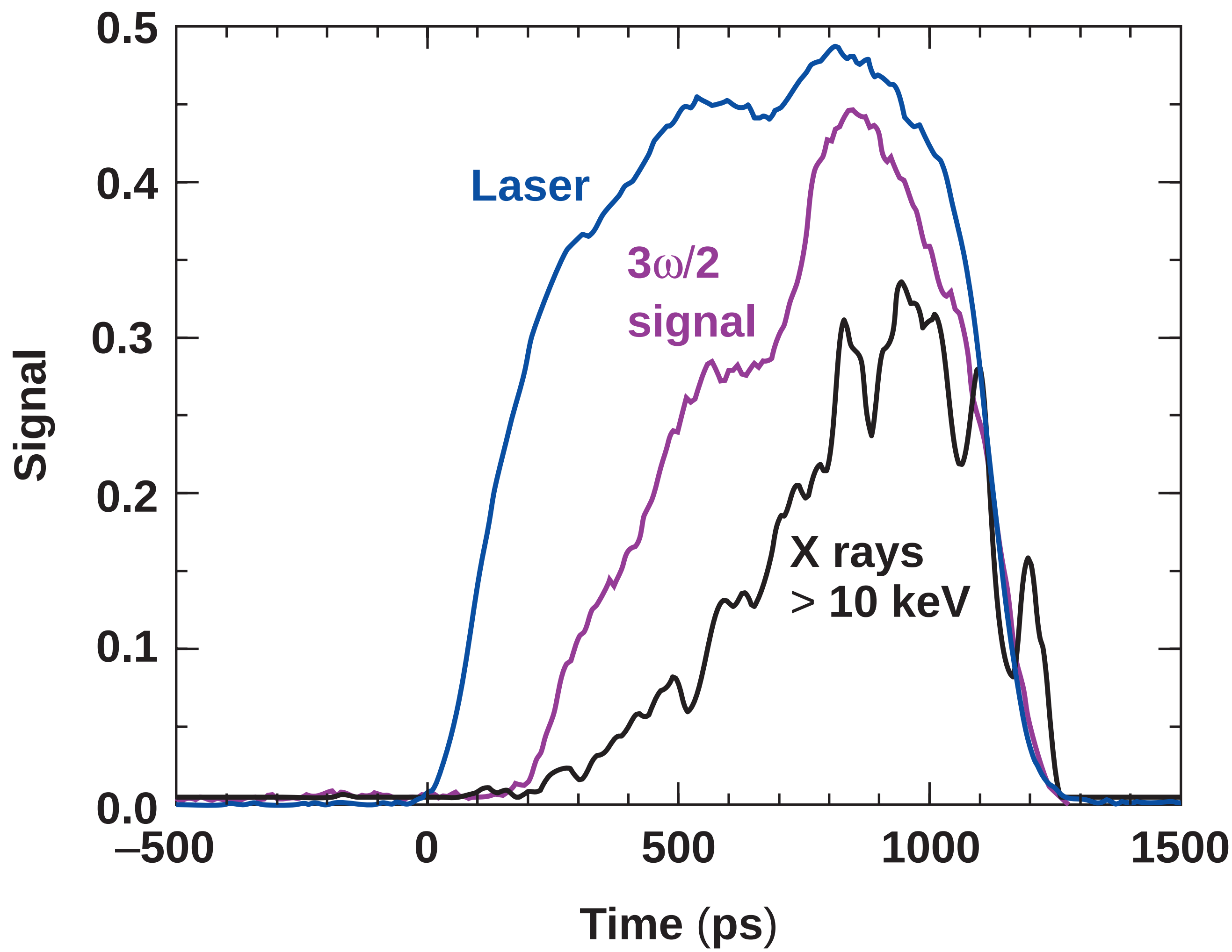
- CH shell, 950-μm diam., 8×10^{14} W/cm^2 overlapped, 1-ns square



E10940

3ω/2 light correlates with hard x rays for square pulse

- CH shell, 950-μm diam., 8×10^{14} W/cm^2 overlapped, 1-ns square



E10109

Improvements in the single-beam nonuniformity by SSD or PS affect the hard x-ray emission for spherical targets

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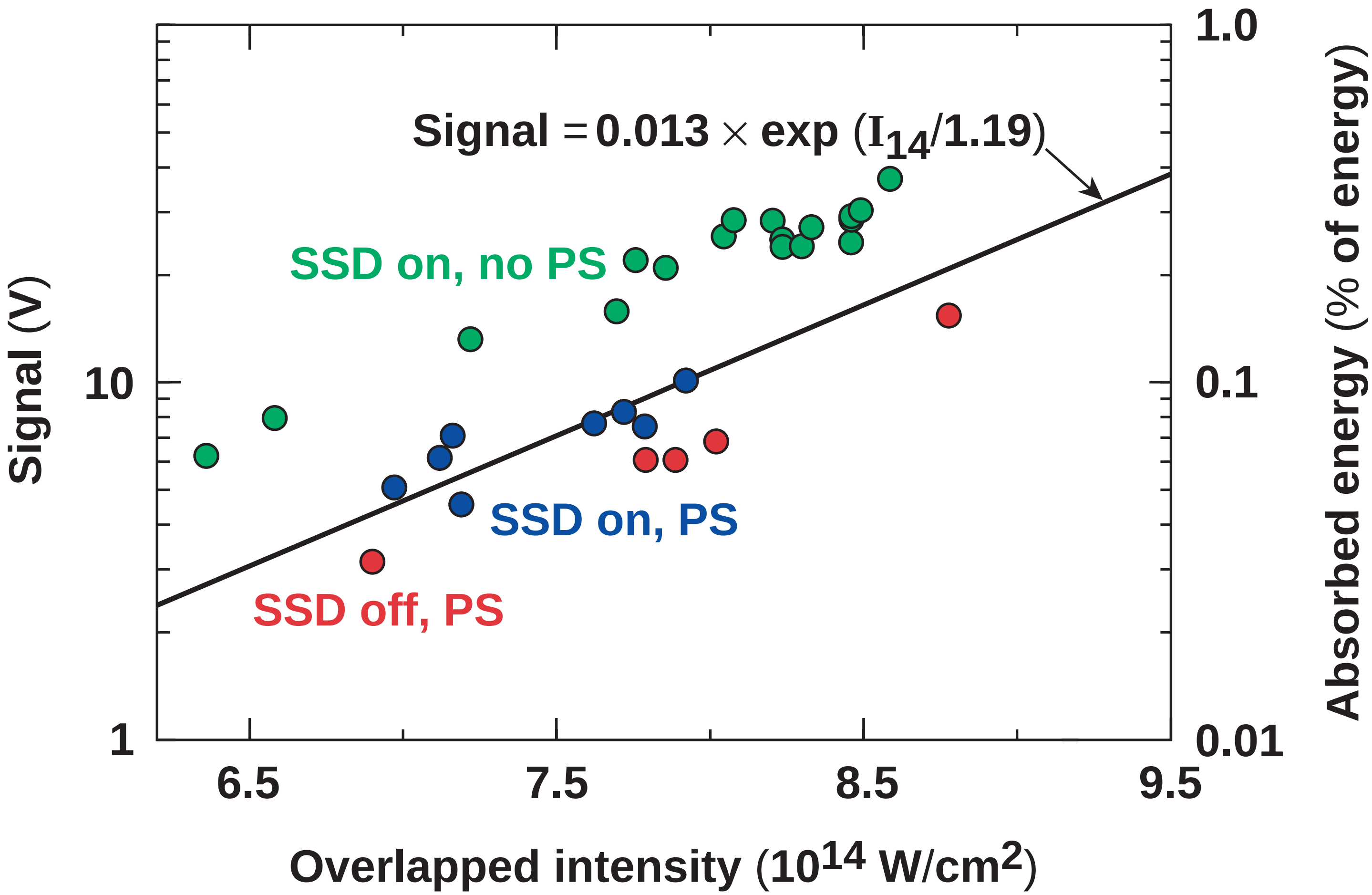
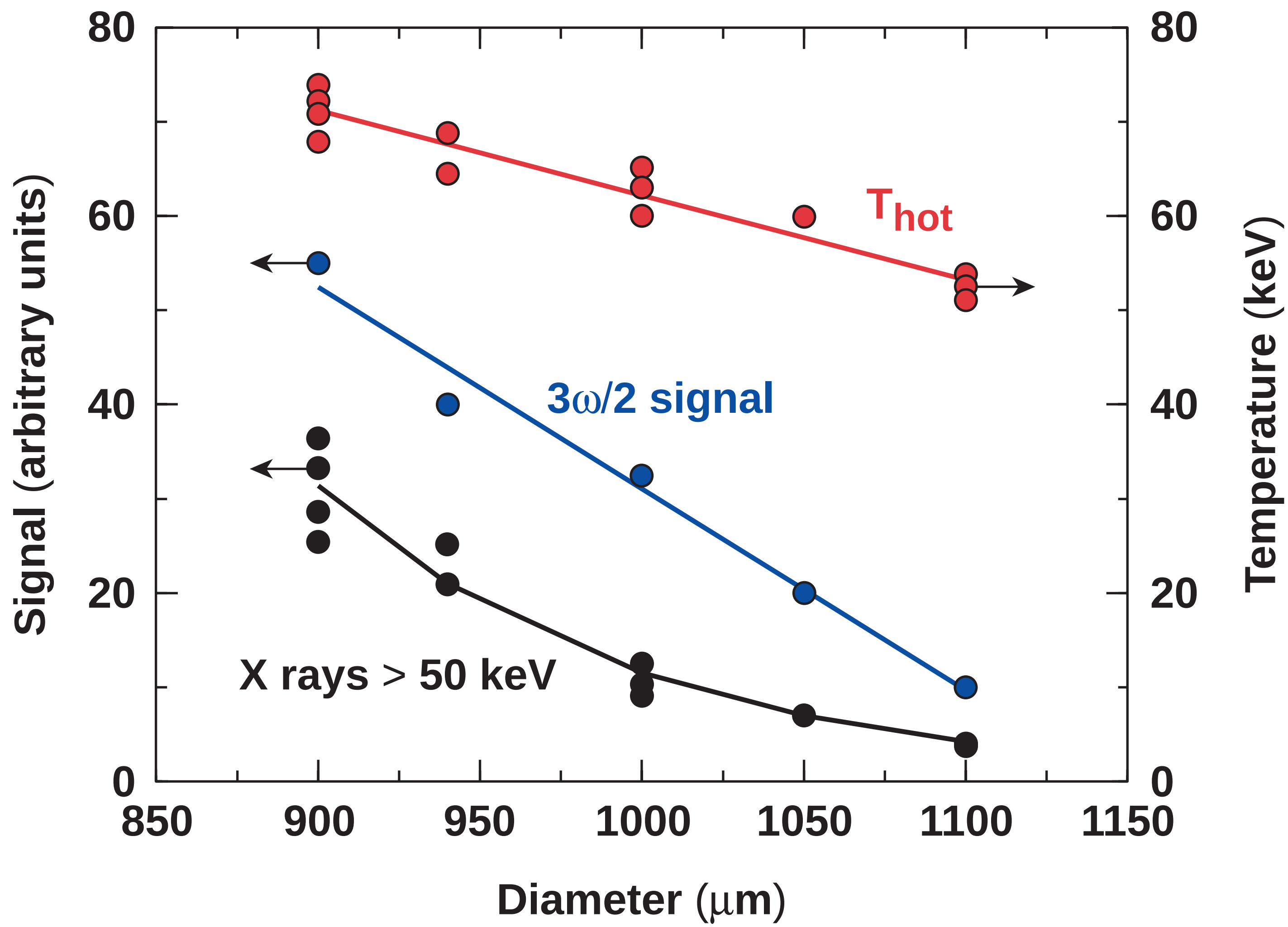
- CH shell, 950-μm diam., 1-ns square, varying single-beam intensity



E10922

The hard x-ray signal, temperature, and 3ω/2 signal correlate very well with the target radius for spherical targets

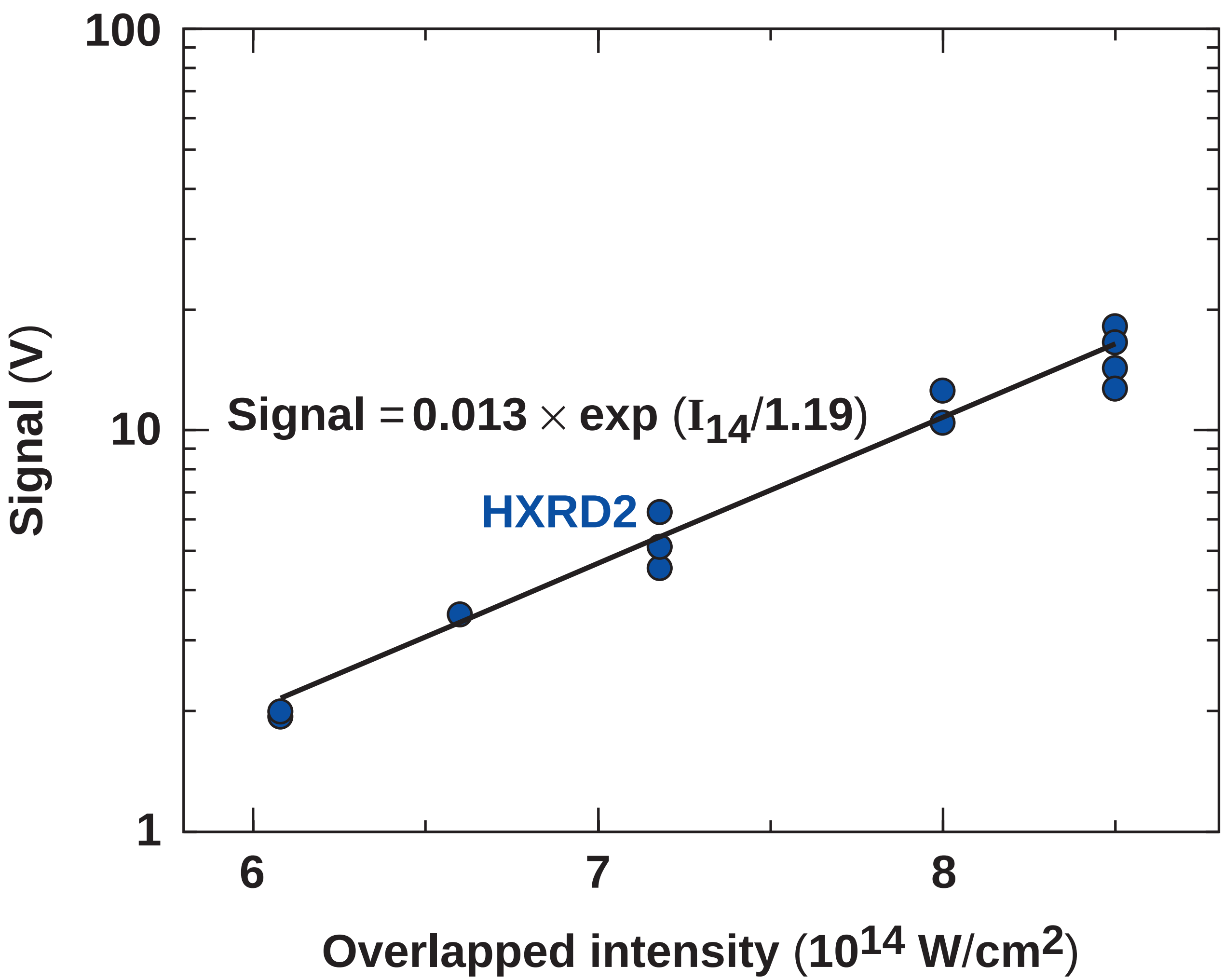
- CH shell, 1.8 × 10^{14} W/cm^2 single beam, 1-ns square



E10923

Changing the target diameter is equivalent to changing the laser power for spherical targets

- CH shell, 1.8×10^{14} W/cm^2 single beam, 1-ns square



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Summary/Conclusion

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