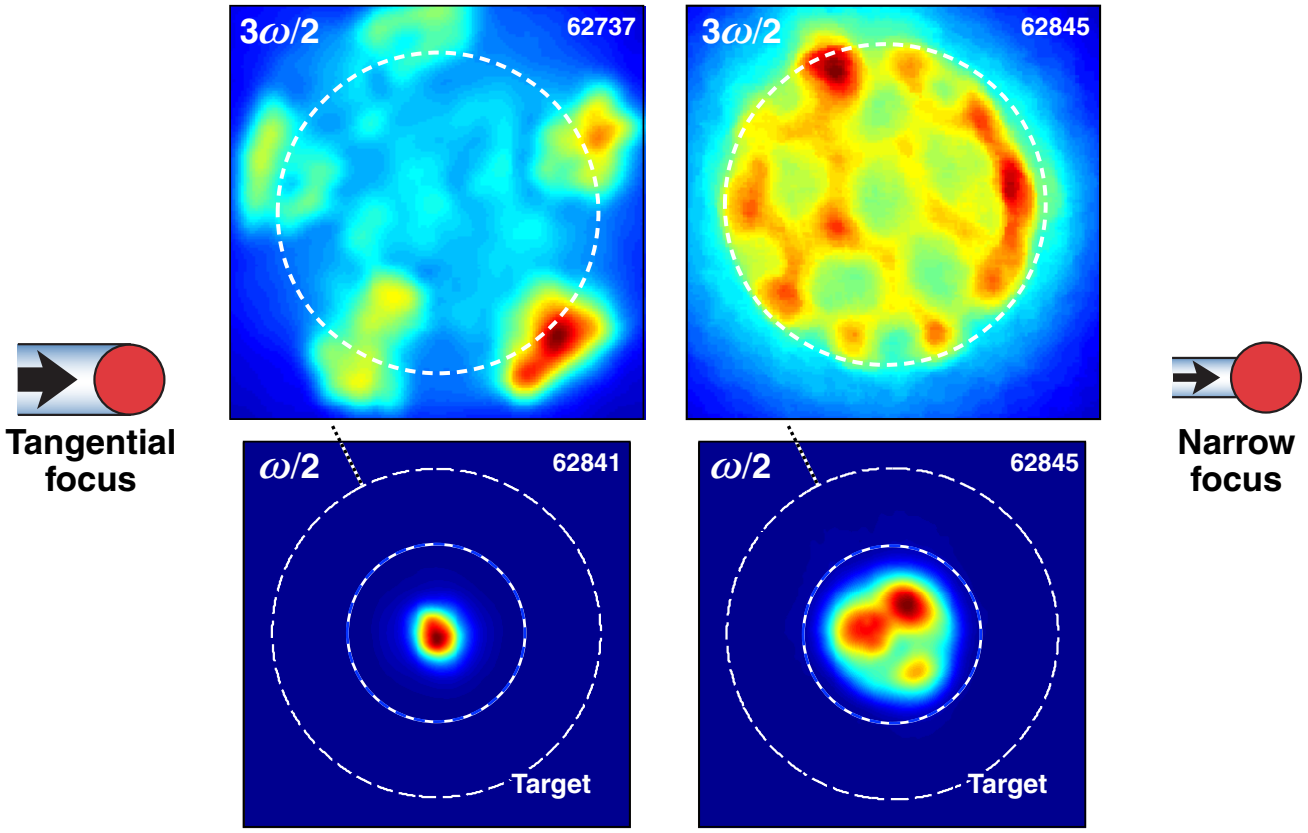
Half-Integer Harmonic Images from Spherical Implosions Point Toward Localized, Multi-Beam Two-Plasmon Decay



Angle-of-incidence–limited irradiation nonuniformity in HEX and PENT locations are evident in $3\omega/2$ and $\omega/2$ images

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Division of Plasma Physics
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Summary

Images of the $3\omega/2$ and $\omega/2$ emission from implosion experiments identify details of the two-plasmon-decay (TPD) processes

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- $3\omega/2$ and $\omega/2$ images are consistent with driving common waves in HEX and PENT ports on OMEGA
- Comparison of on-target laser-light nonuniformity and $3\omega/2$ and $\omega/2$ images allows for inferences on TPD driven in localized areas
- $3\omega/2$ emission can potentially be used to explain observed discrepancies between scattered-light measurements and *LILAC* predictions

Collaborators

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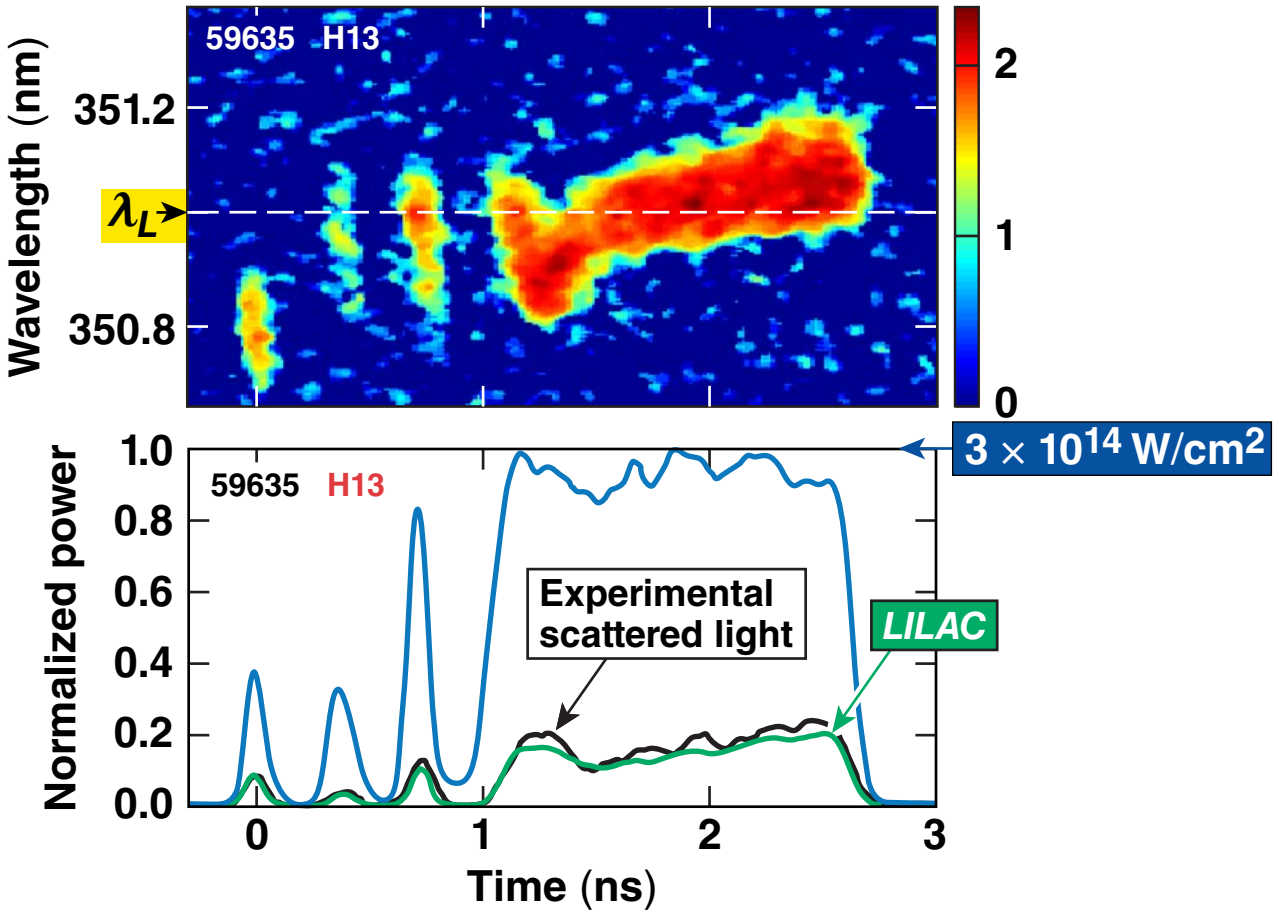
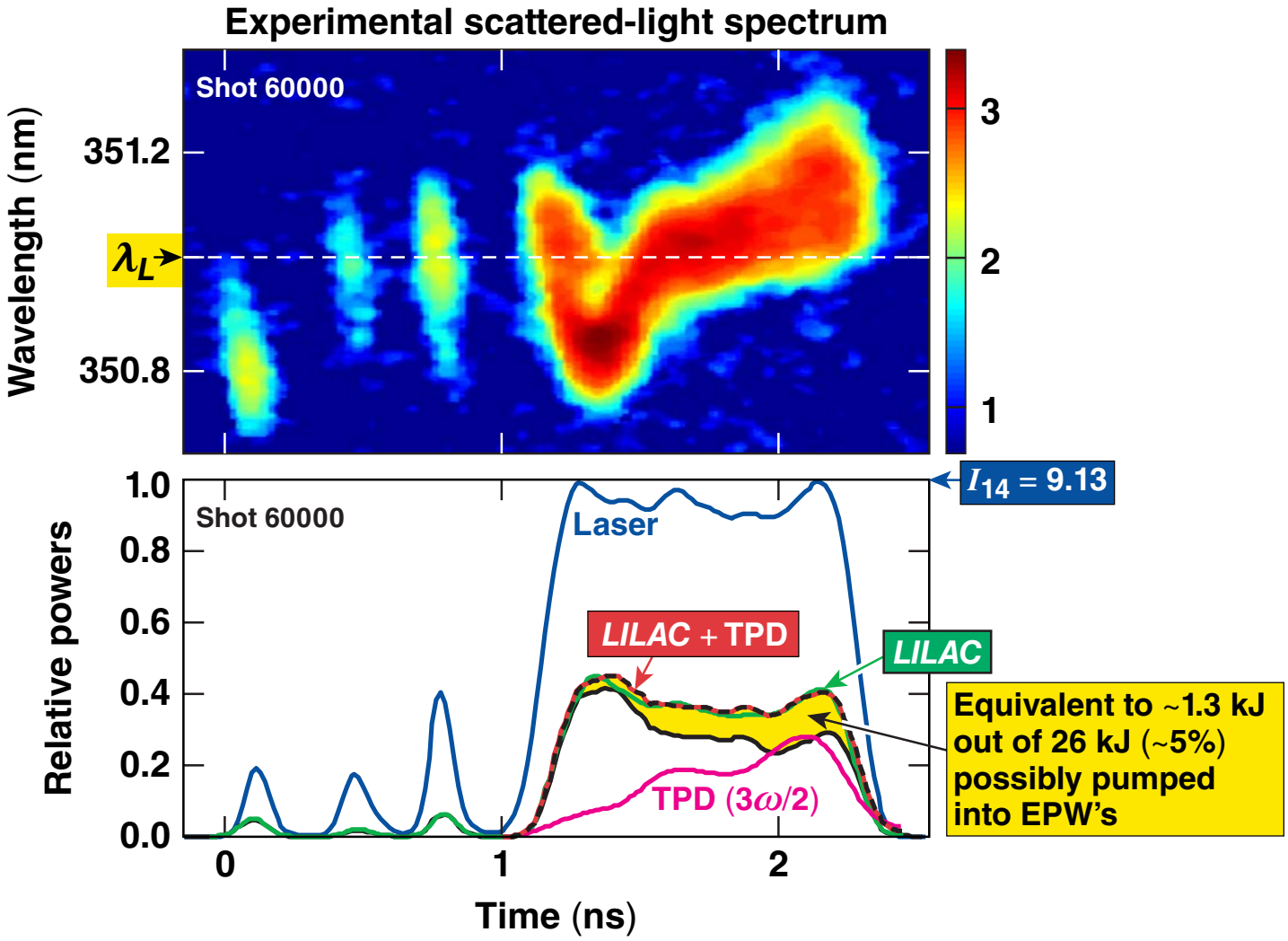
At overlapped intensities of <4 × 10^{14} W/cm^2 the *LILAC* predictions for scattered light are within 2% of the time-integrated measurements



No measureable TPD (3ω/2)
No HXRD signals

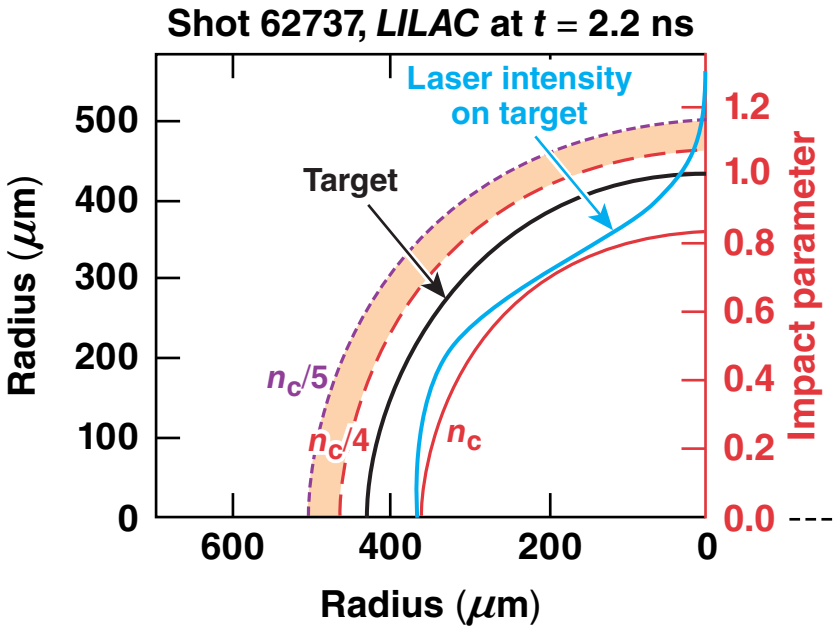
E19947a

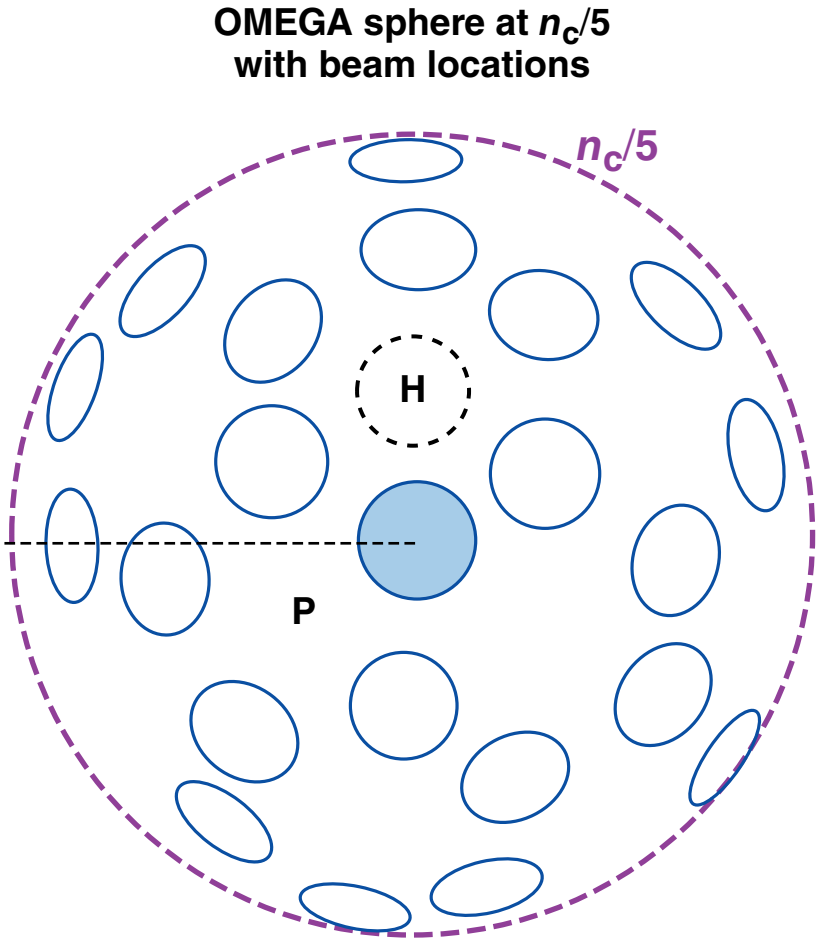
Time-resolved scattered-light spectra for high-intensity implosions are consistent with significant energy loss to TPD plasmons



E19911b

Multibeam TPD interaction imposes symmetry restrictions and favors HEX and PENT locations on OMEGA

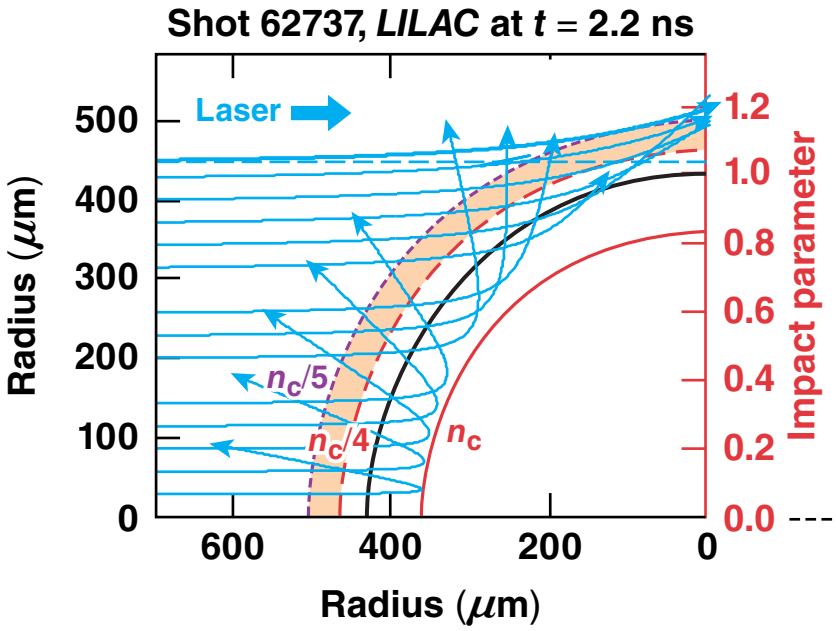


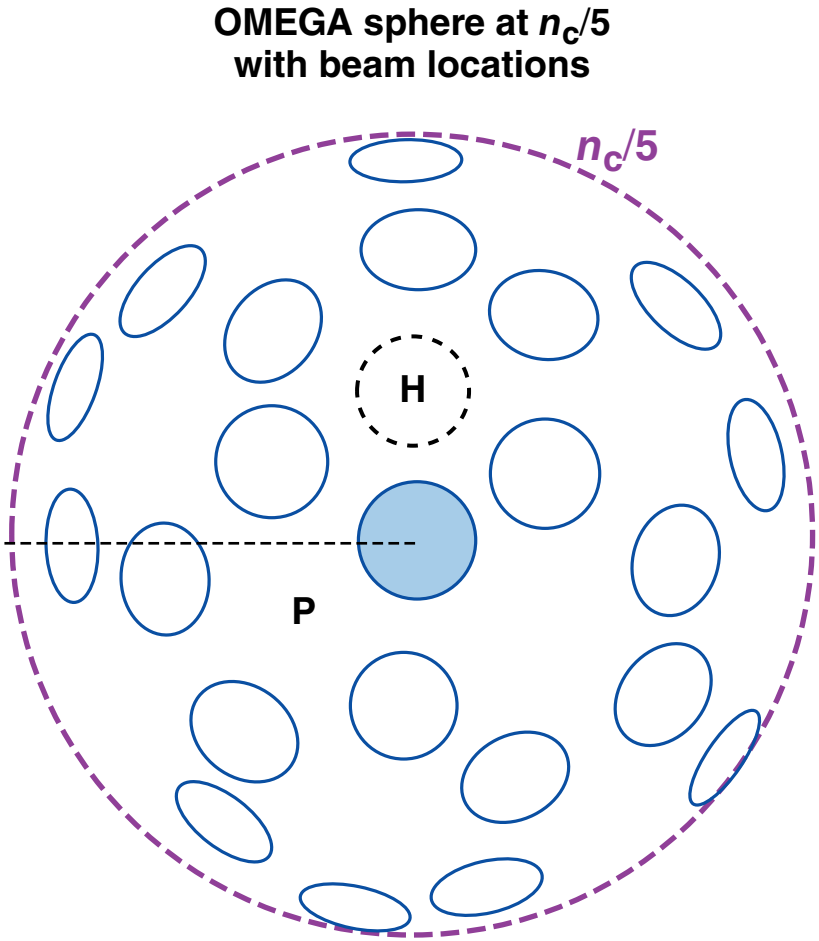


DDP = SG4

E20440

Assuming multibeam TPD, ray tracing with realistic plasma conditions is used to find TPD locations

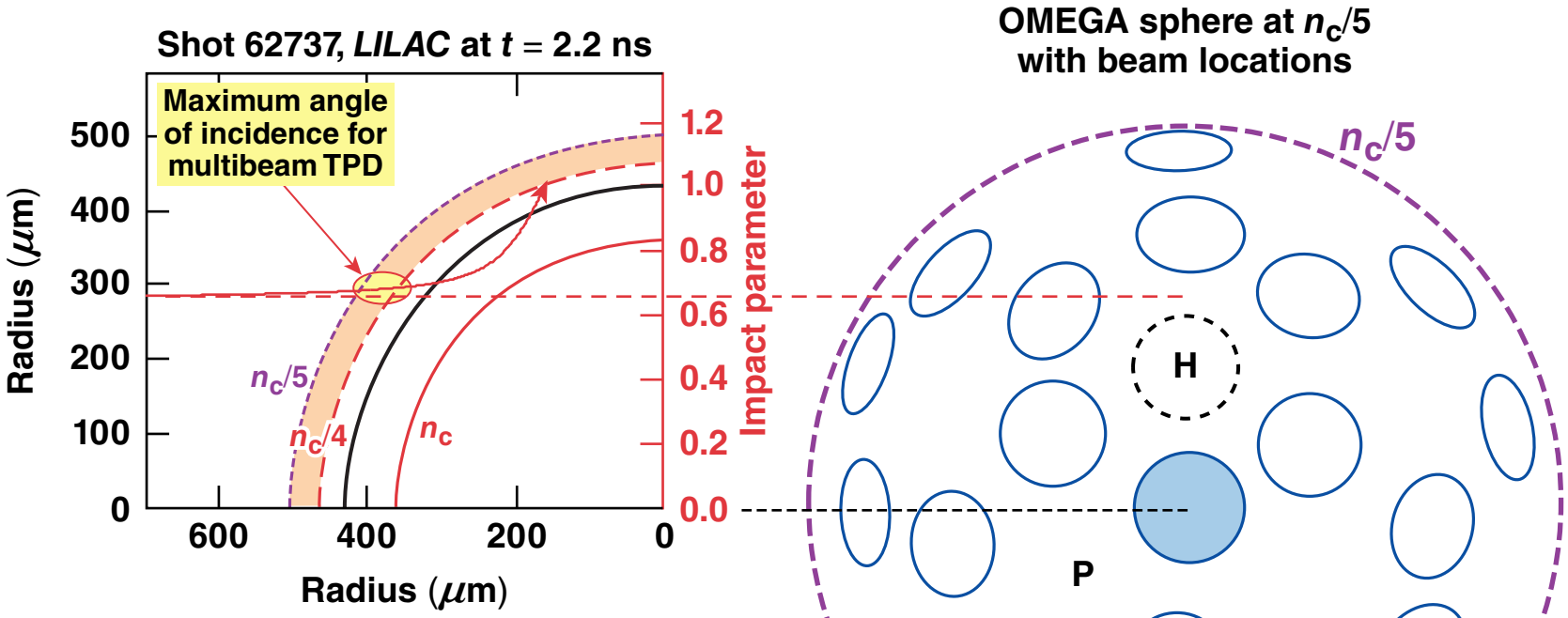




DDP = SG4

E20440a

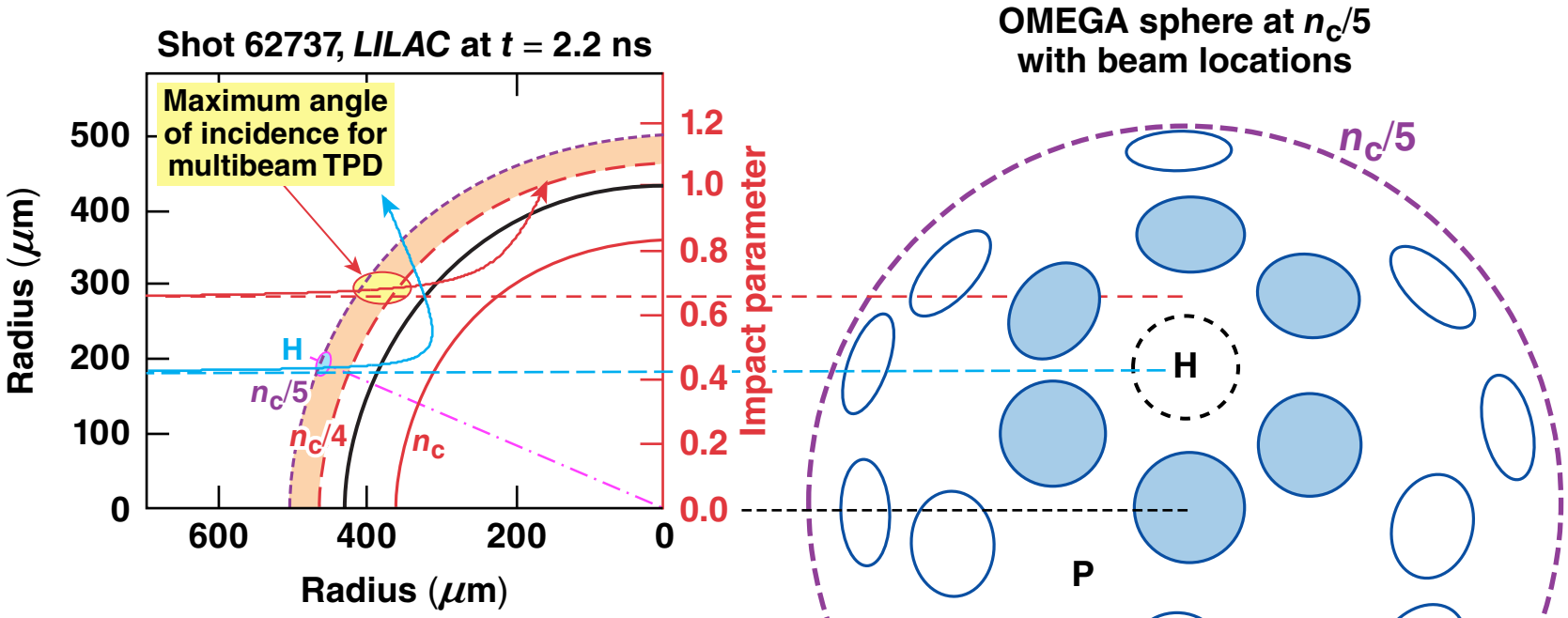
Theory limits multibeam TPD growth to a beam angle of ≤40°



DDP = SG4

E20440b

HEX and PENT locations on OMEGA are naturally favored for multibeam TPD interaction

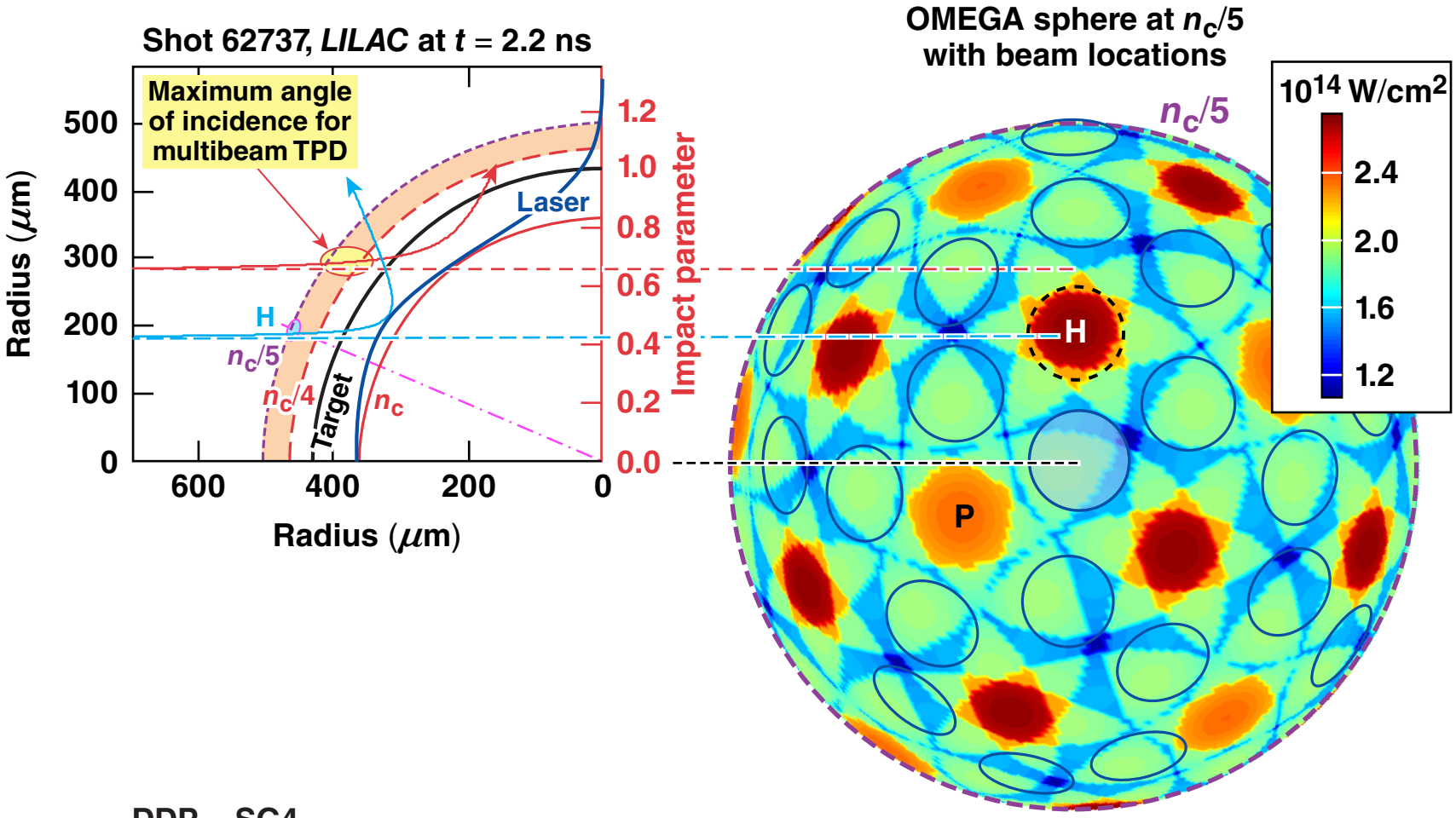


DDP = SG4

E20440c

Limiting local beam angles to <35° reveals the irradiation nonuniformity for otherwise optimum illumination uniformity

Overall drive (illumination) nonuniformity ~0.3%

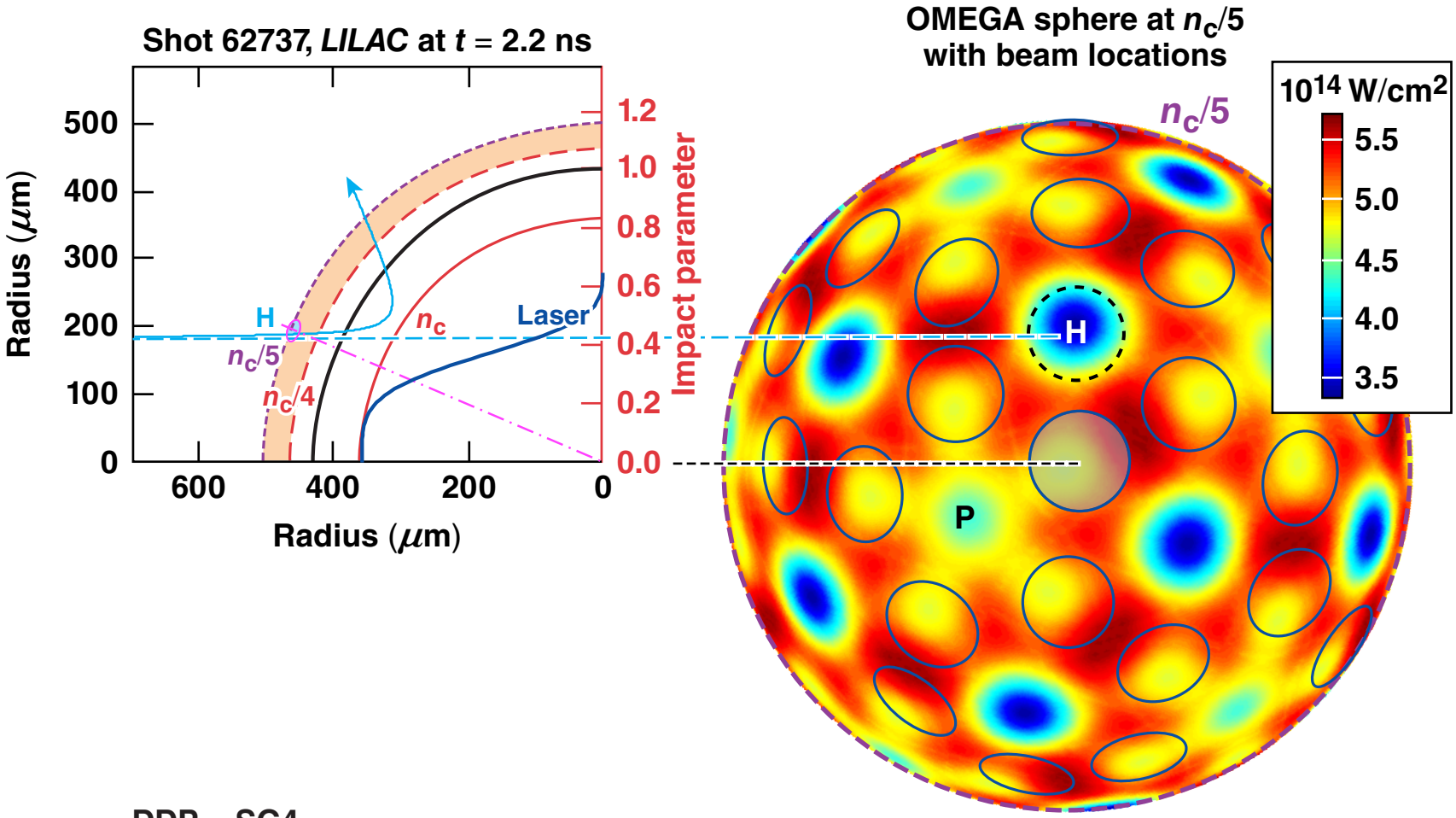


DDP = SG4

E20440d

Changing the target illumination can significantly change the location of likely TPD

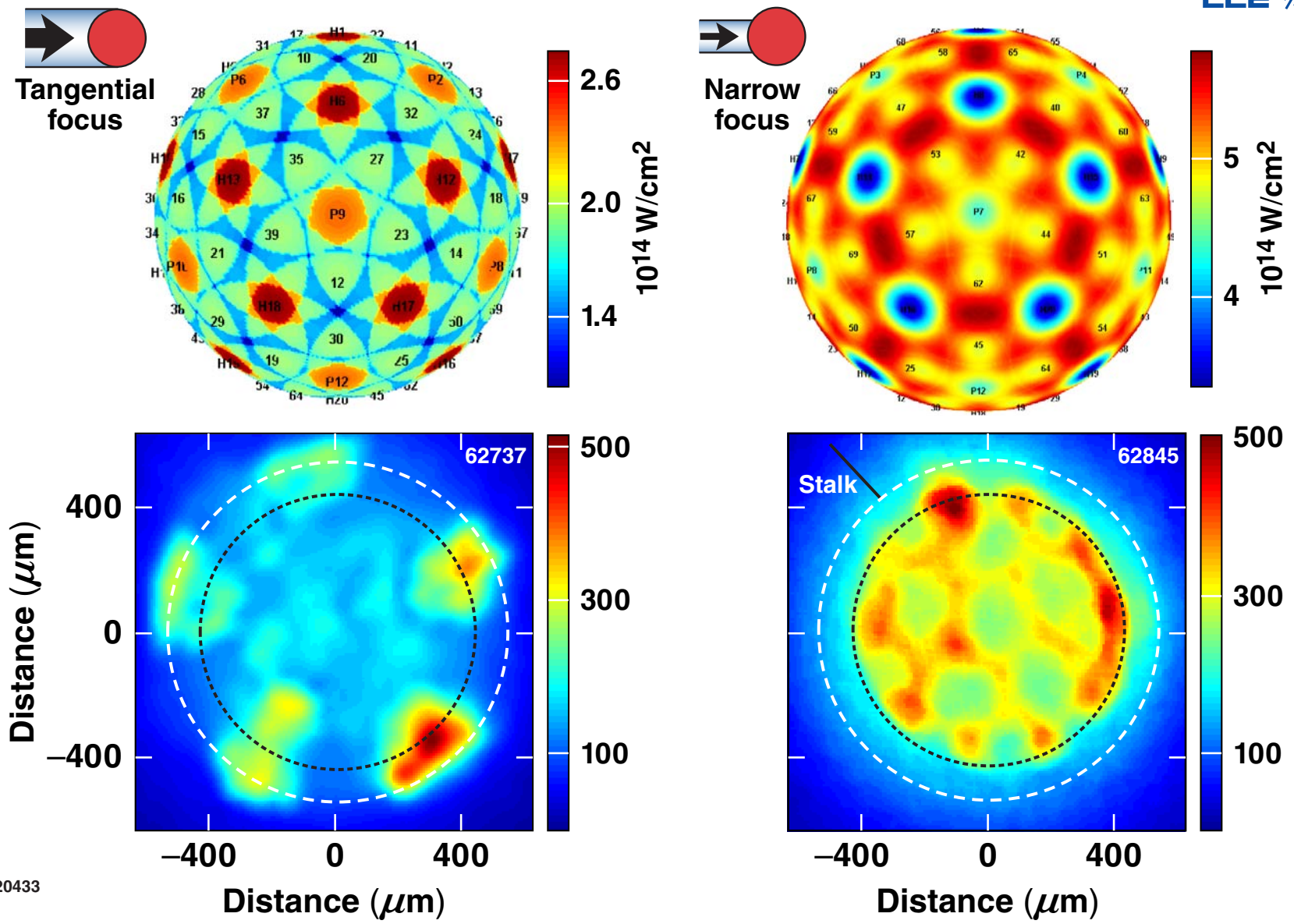
Overall drive (illumination) nonuniformity degraded to 10%



DDP = SG4

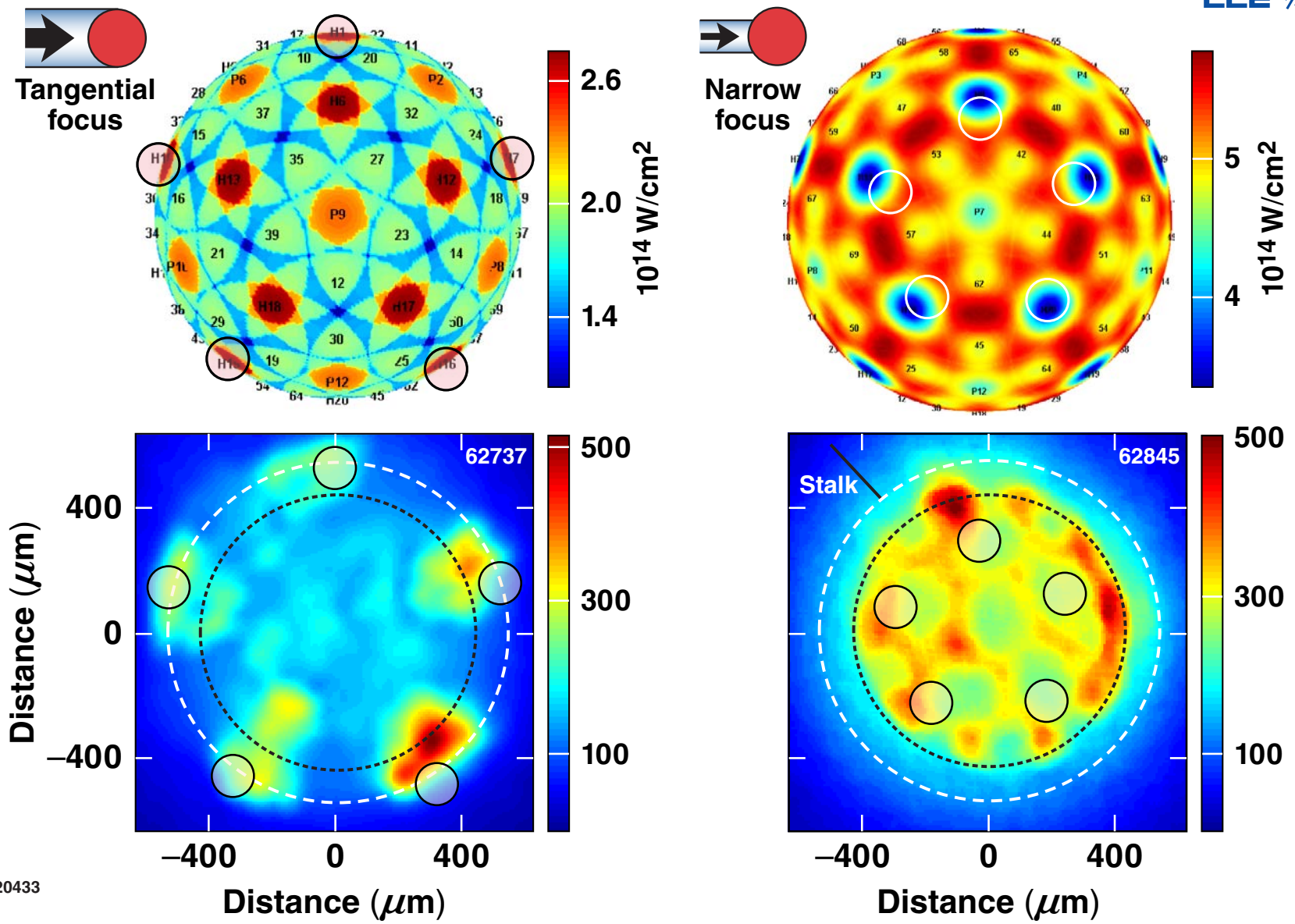
E20440e

The structure observed in 3ω/2 images is consistent with TPD operating in well-localized regions



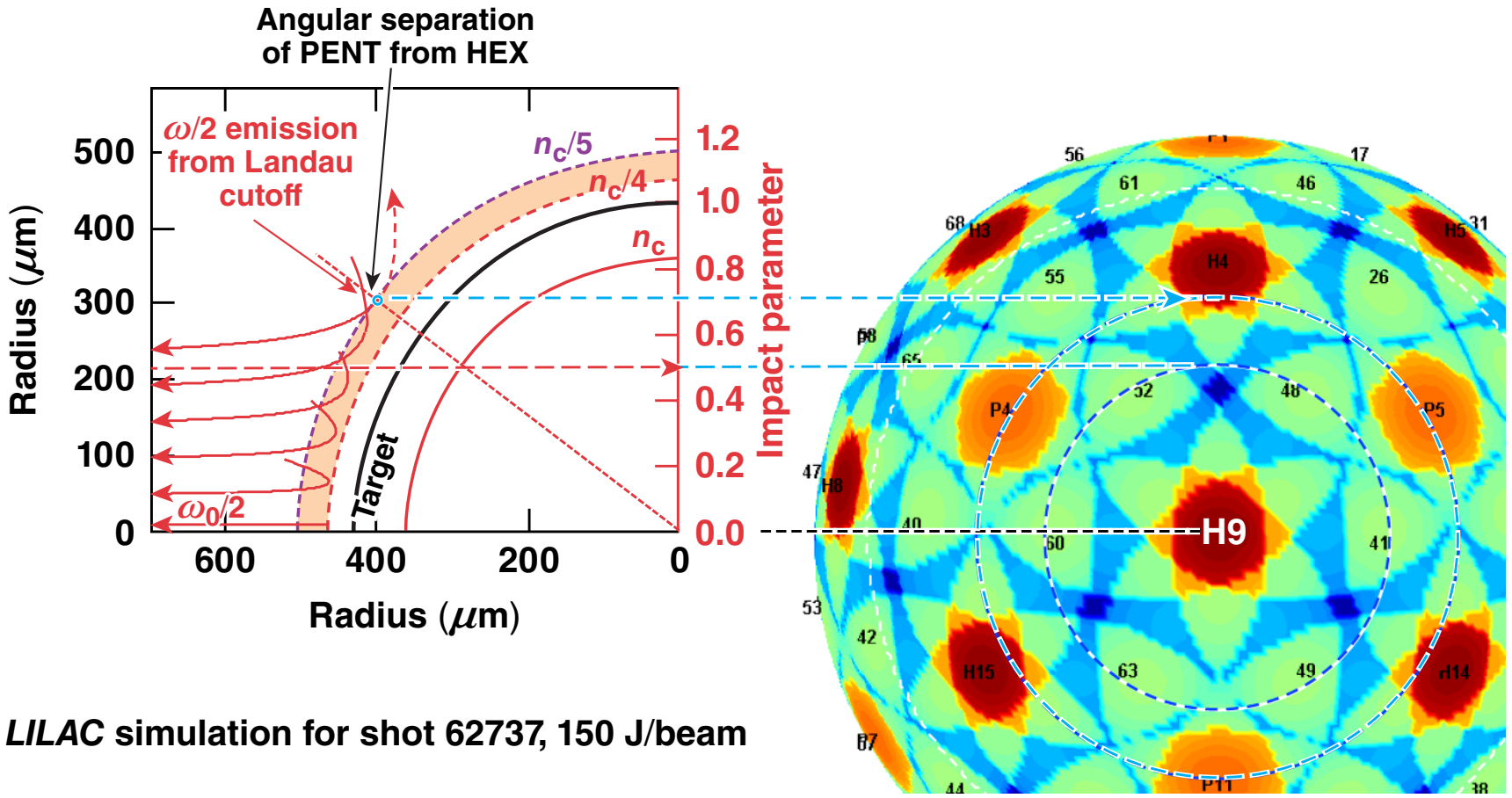
E20433

The structure observed in 3ω/2 images is consistent with TPD operating in well-localized regions



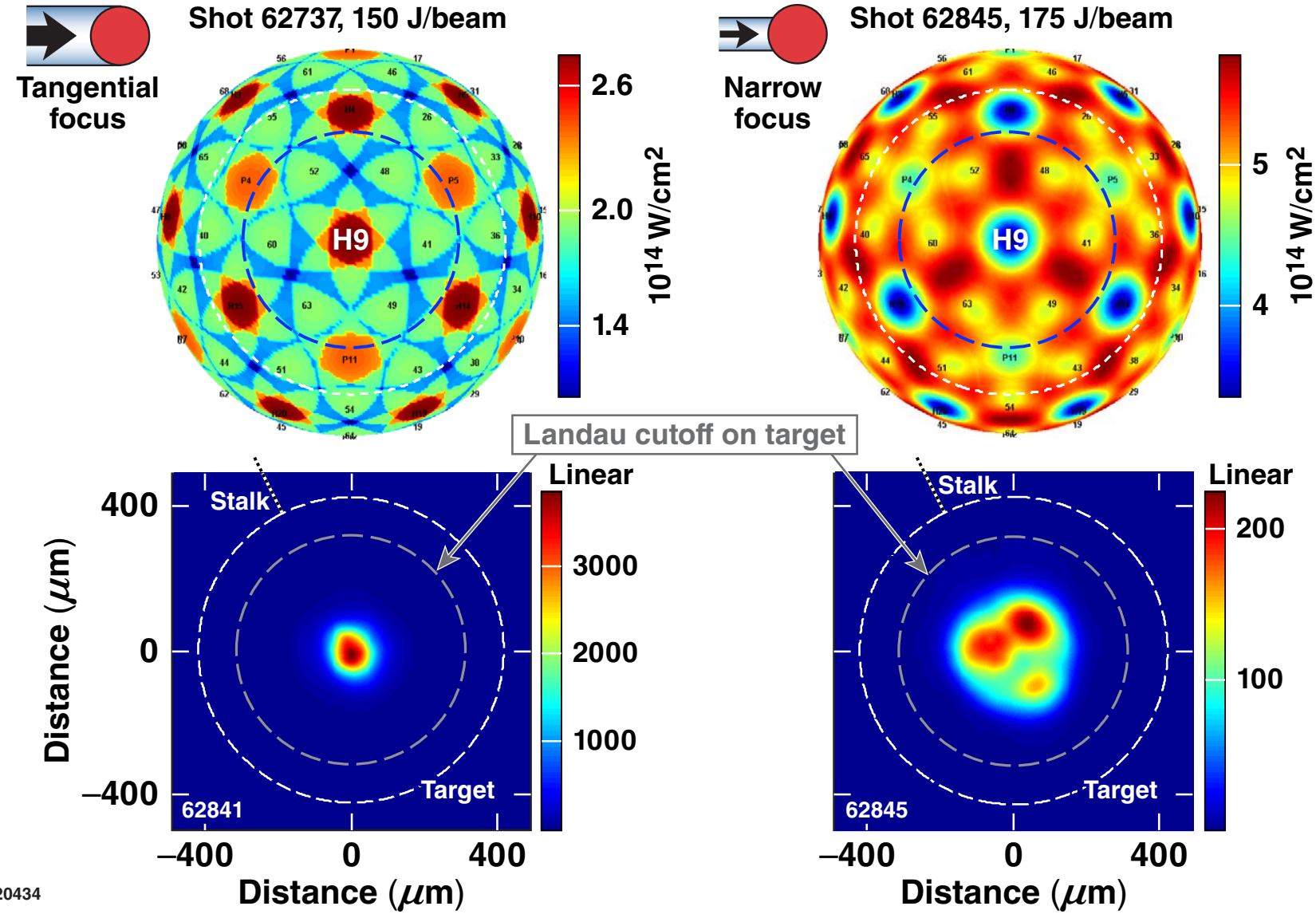
E20433

$\omega/2$ images are dominated by refraction and can be understood using ray tracing



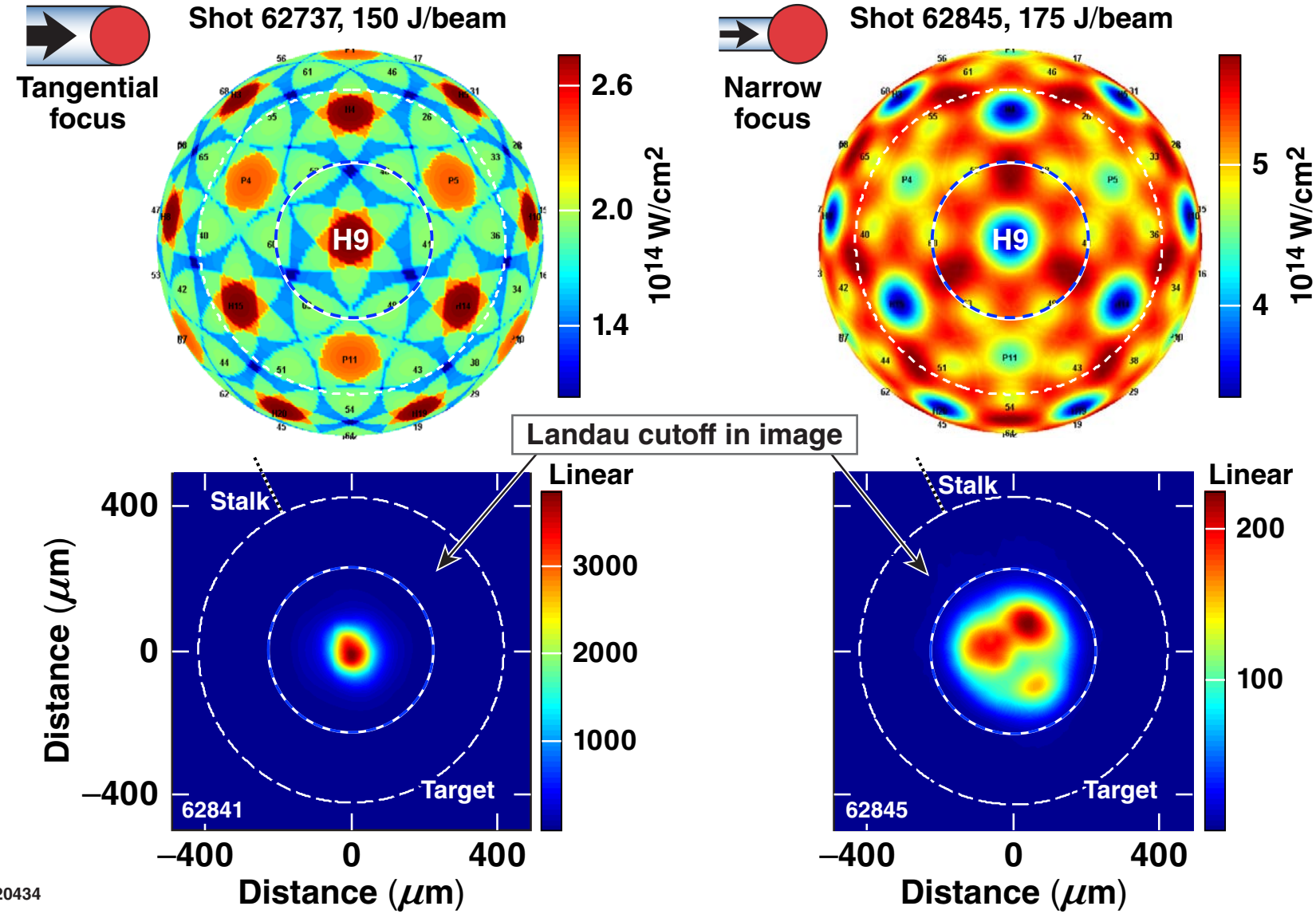
LILAC simulation for shot 62737, 150 J/beam

Different illumination conditions lead to distinct changes in $\omega/2$ images



E20434

Different illumination conditions lead to distinct changes in $\omega/2$ images



E20434

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