

On-Shot Focal-Spot Characterization in the OMEGA Target Chamber

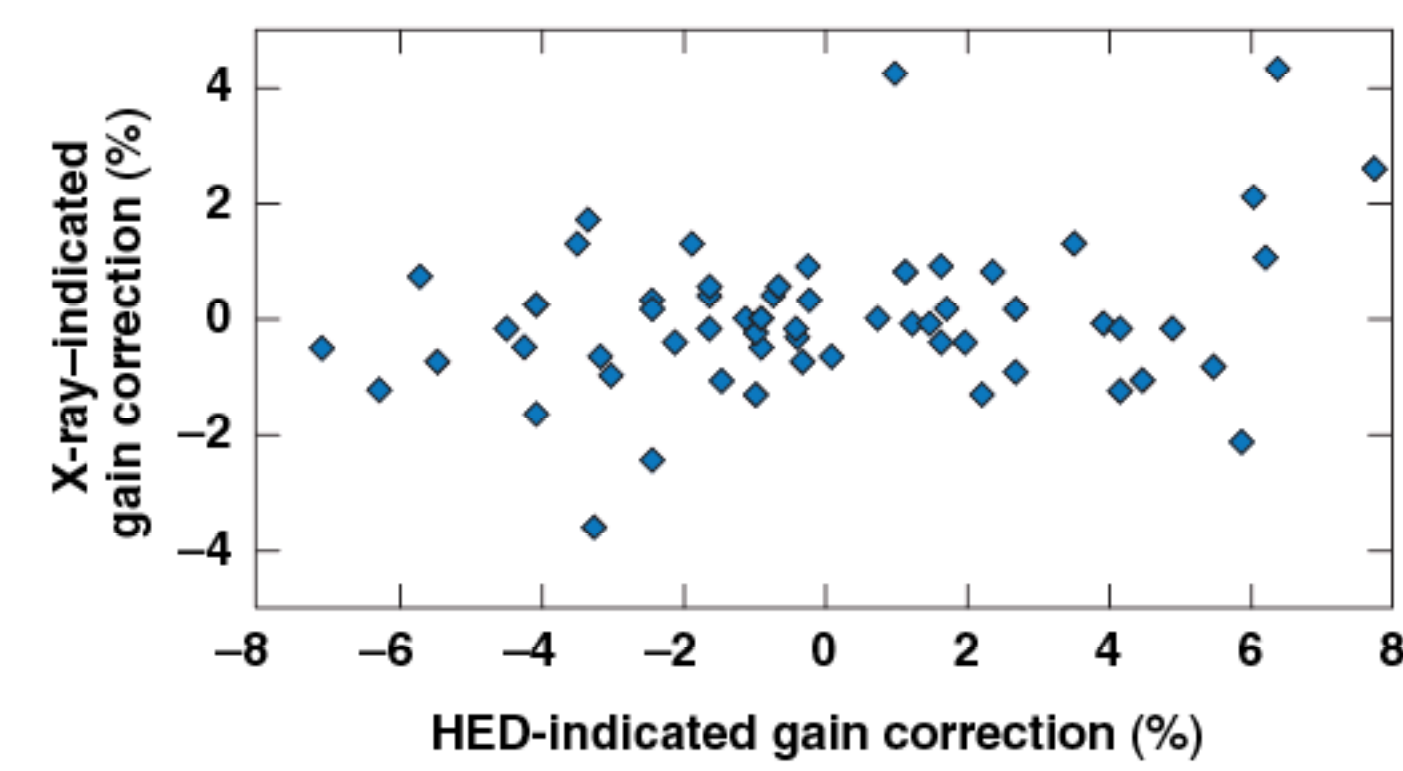


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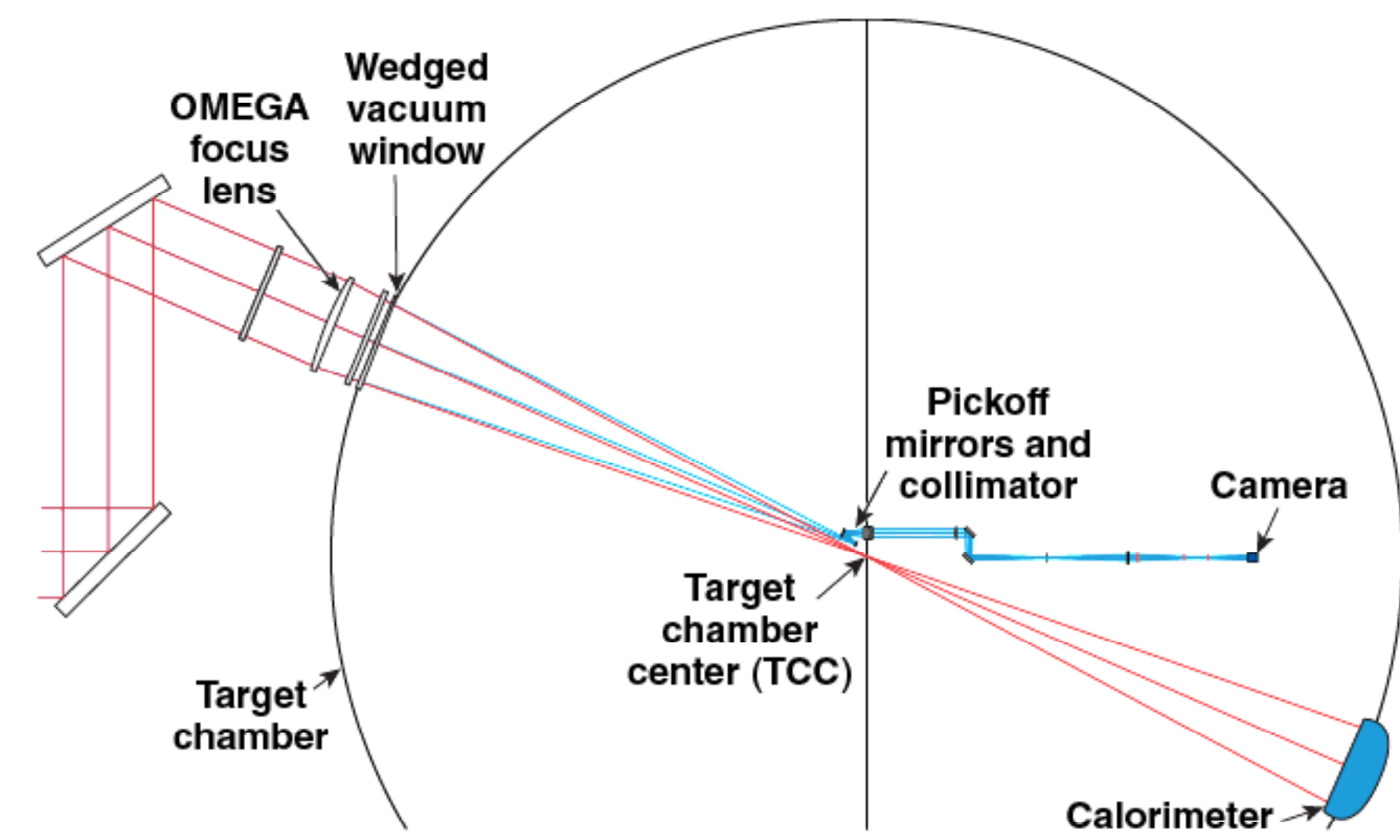
There are significant discrepancies among various estimates of OMEGA on-target intensity balance

- X-ray emission measurements by F. J. Marshall imply significant asymmetry in OMEGA drive intensities
- There is little correlation between x-ray balance factors and harmonic energy diagnostic (HED) balance factors



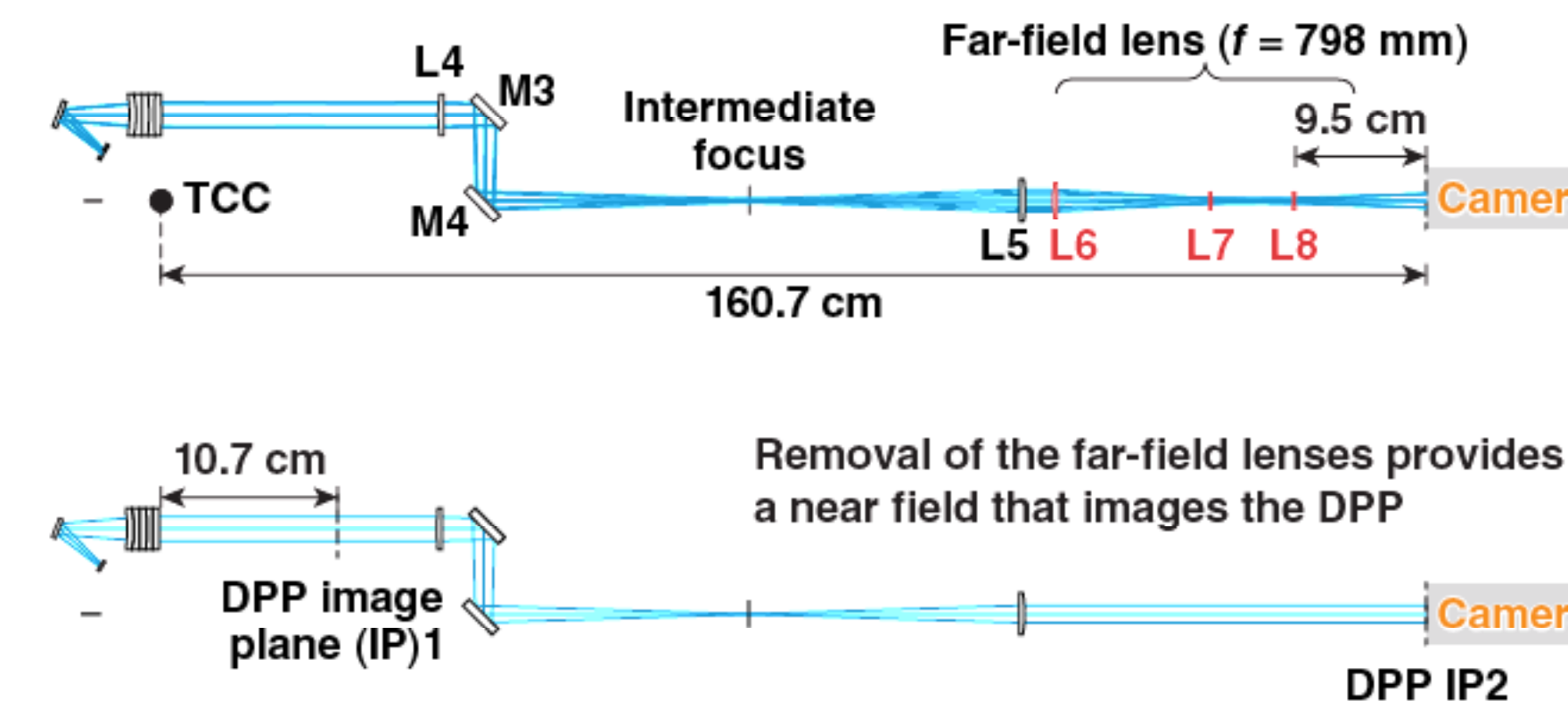
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LLE is developing a diagnostic to measure the on-shot fluence of an OMEGA beam at target chamber center



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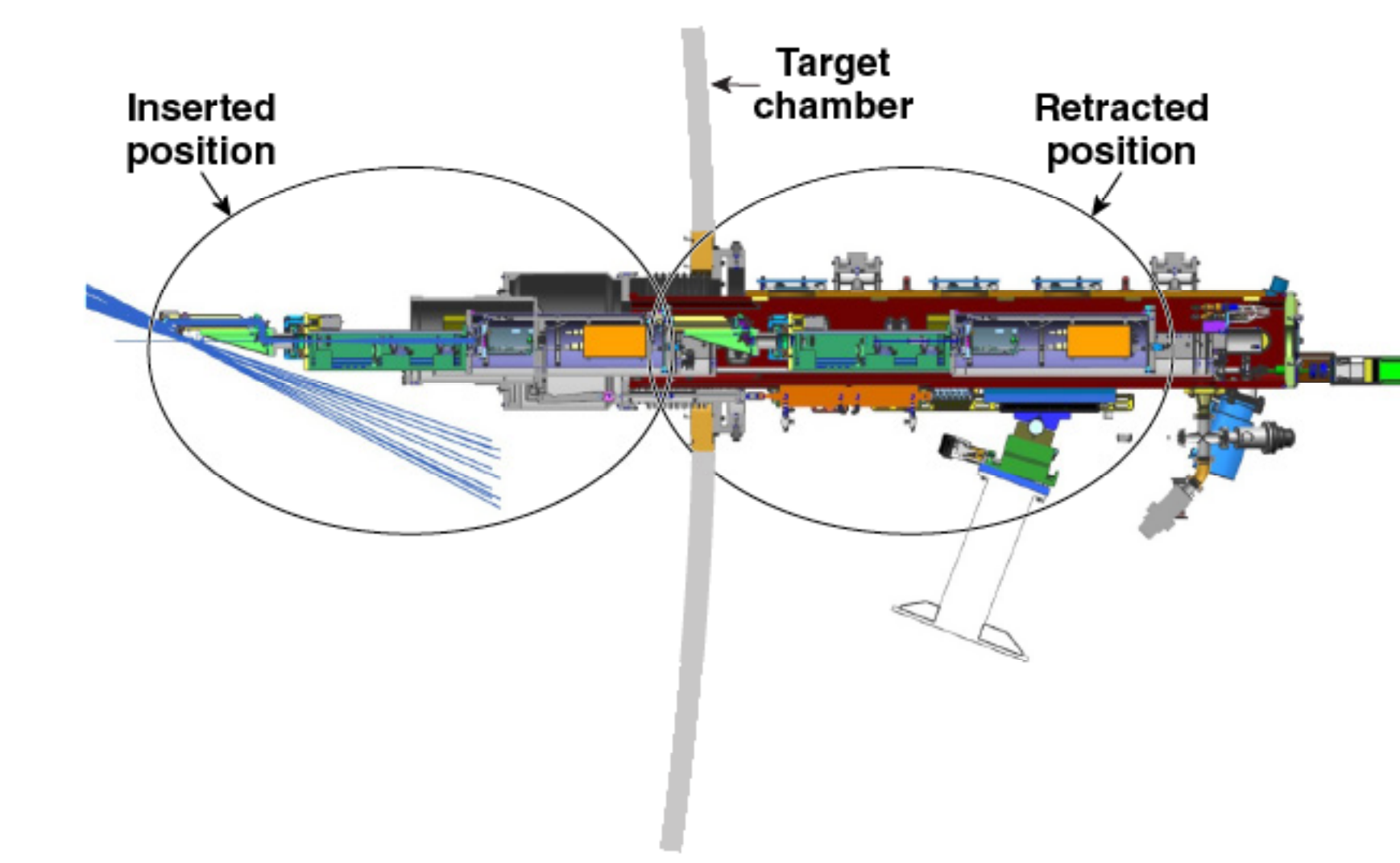
The far-field configuration provides ~10x focal spot magnification with a 2.6-mm (at TCC) field-of-view



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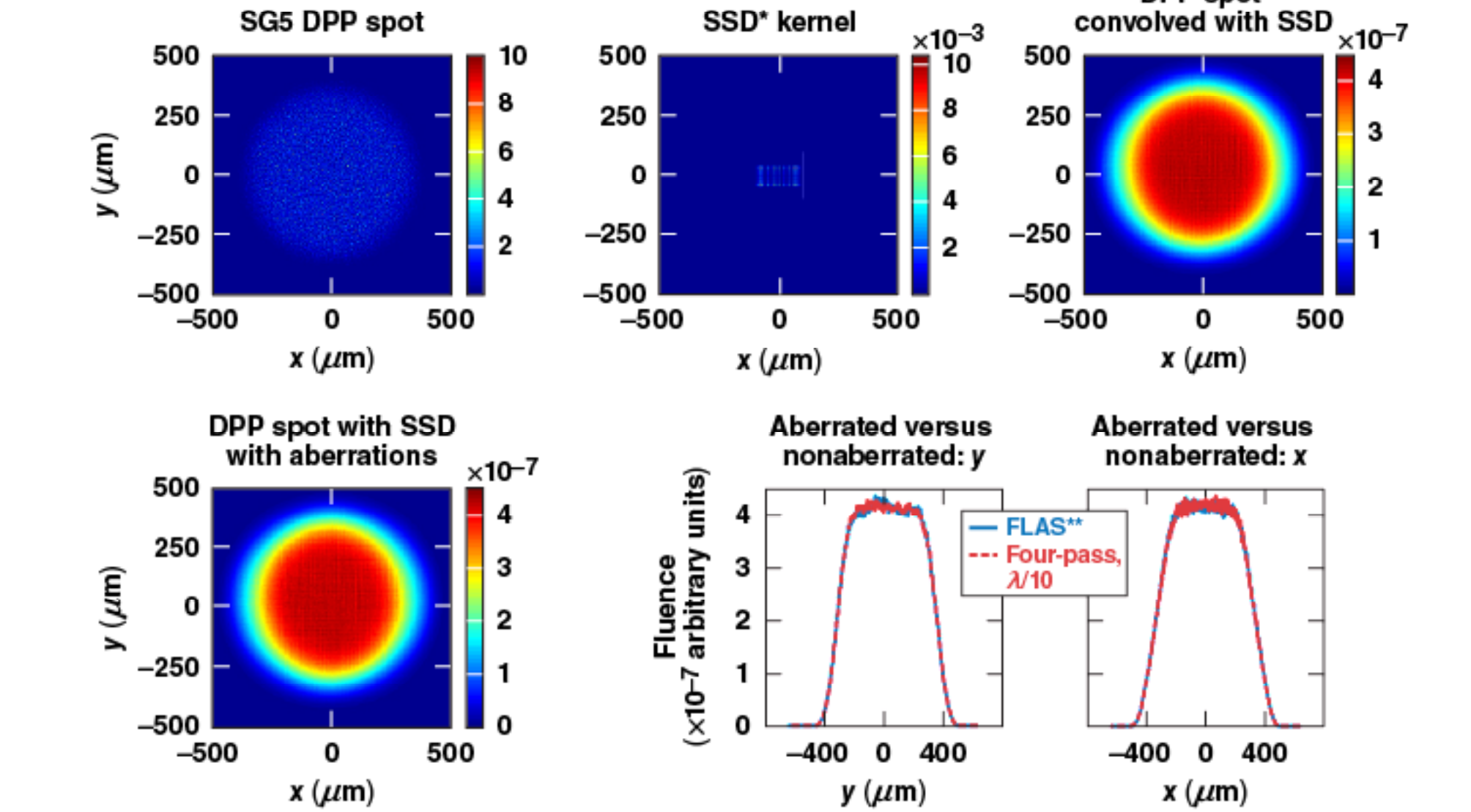
- A DPP conditions the beam to provide a highly modulated, ~800- μm focal spot at target chamber center
- Modulations from the DPP necessitate the imaging of the DPP onto the camera in order to obtain an accurate measurement of the near field

Final design, acquisition, and assembly are complete



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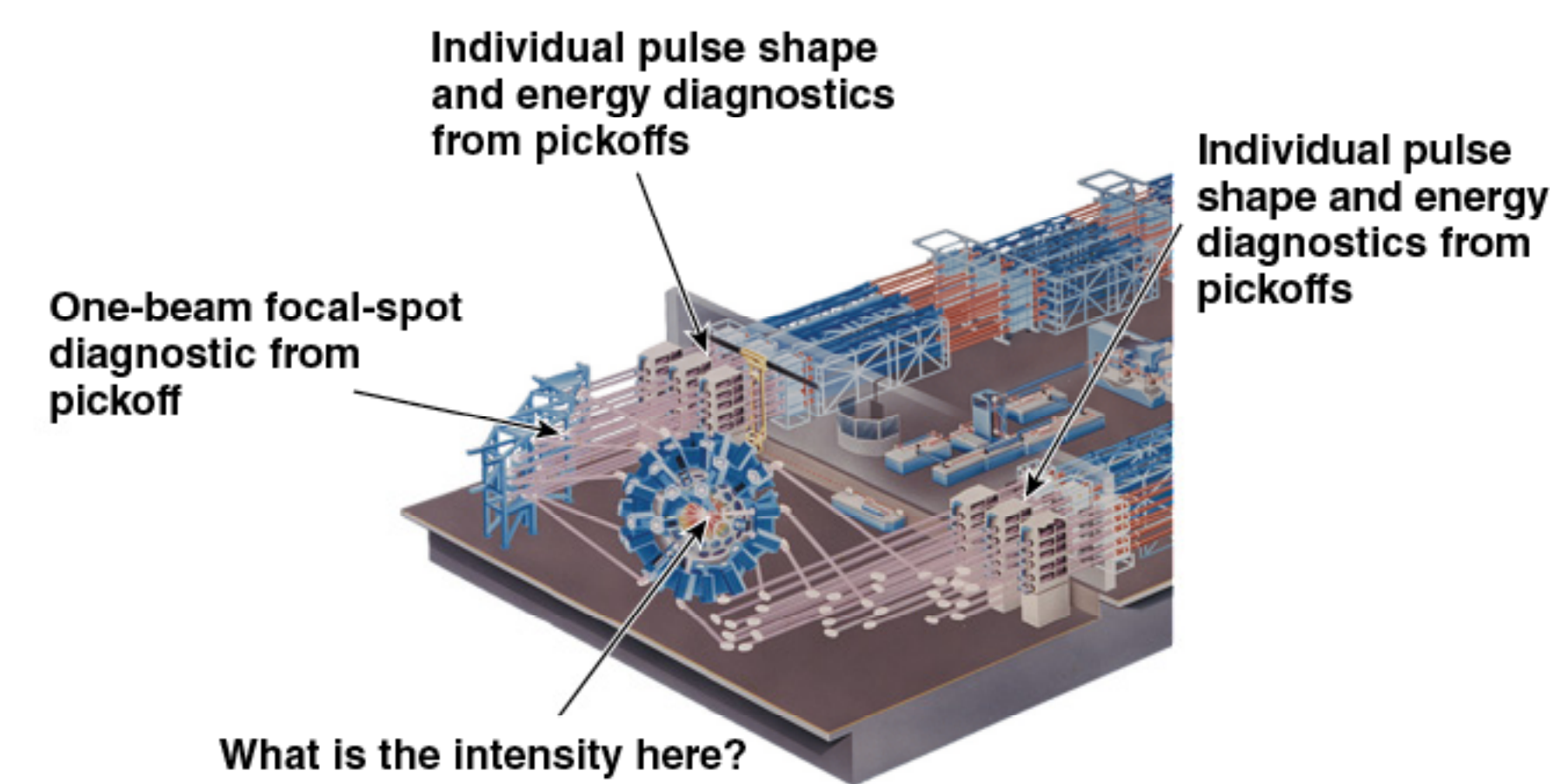
OMEGA implosions use a DPP



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*SSD: smoothing by spectral dispersion
**FLAS: focus lens assembly

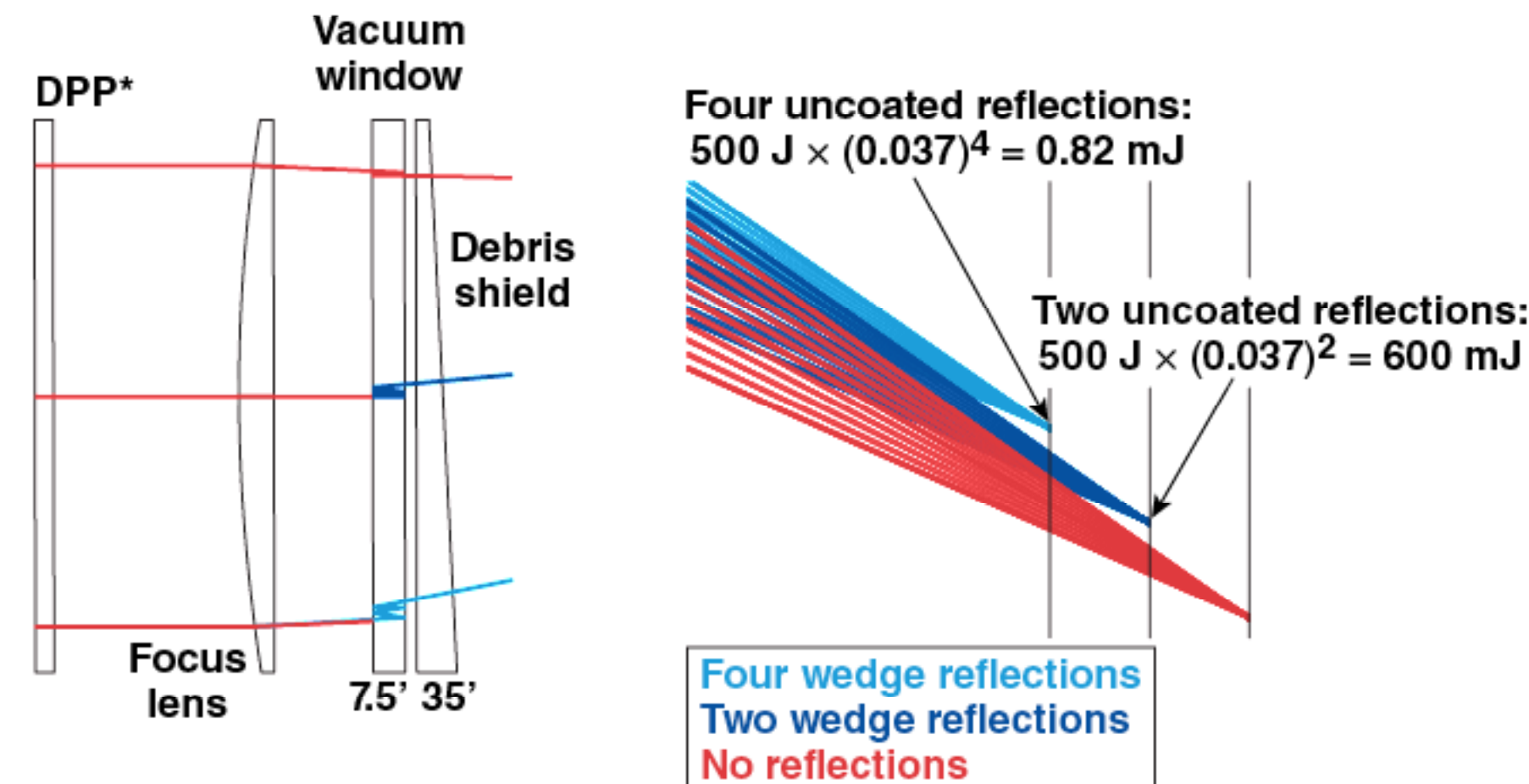
OMEGA currently measures the on-shot pulse power for 60 beams upstream of the target chamber



A 60-beam on-shot intensity measurement in the target chamber is needed.

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A wedged vacuum window will provide a sample of the full-energy OMEGA beam

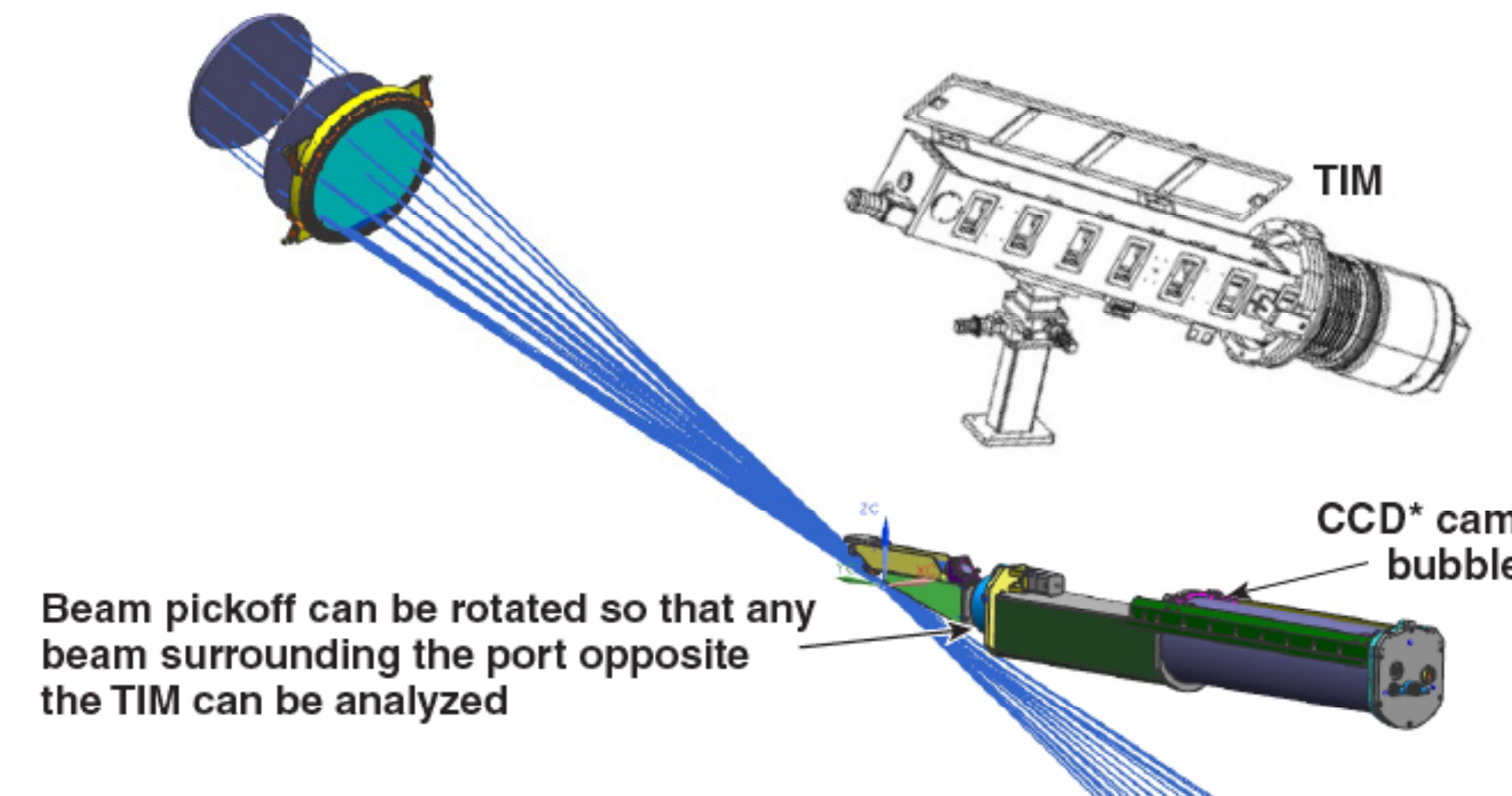


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A wedged debris shield compensates for aberrations introduced by fourth-order reflection from the wedged vacuum window.

*DPP: distributed phase plate

The diagnostic will be brought into the target chamber in a ten-inch-manipulator (TIM) diagnostic package

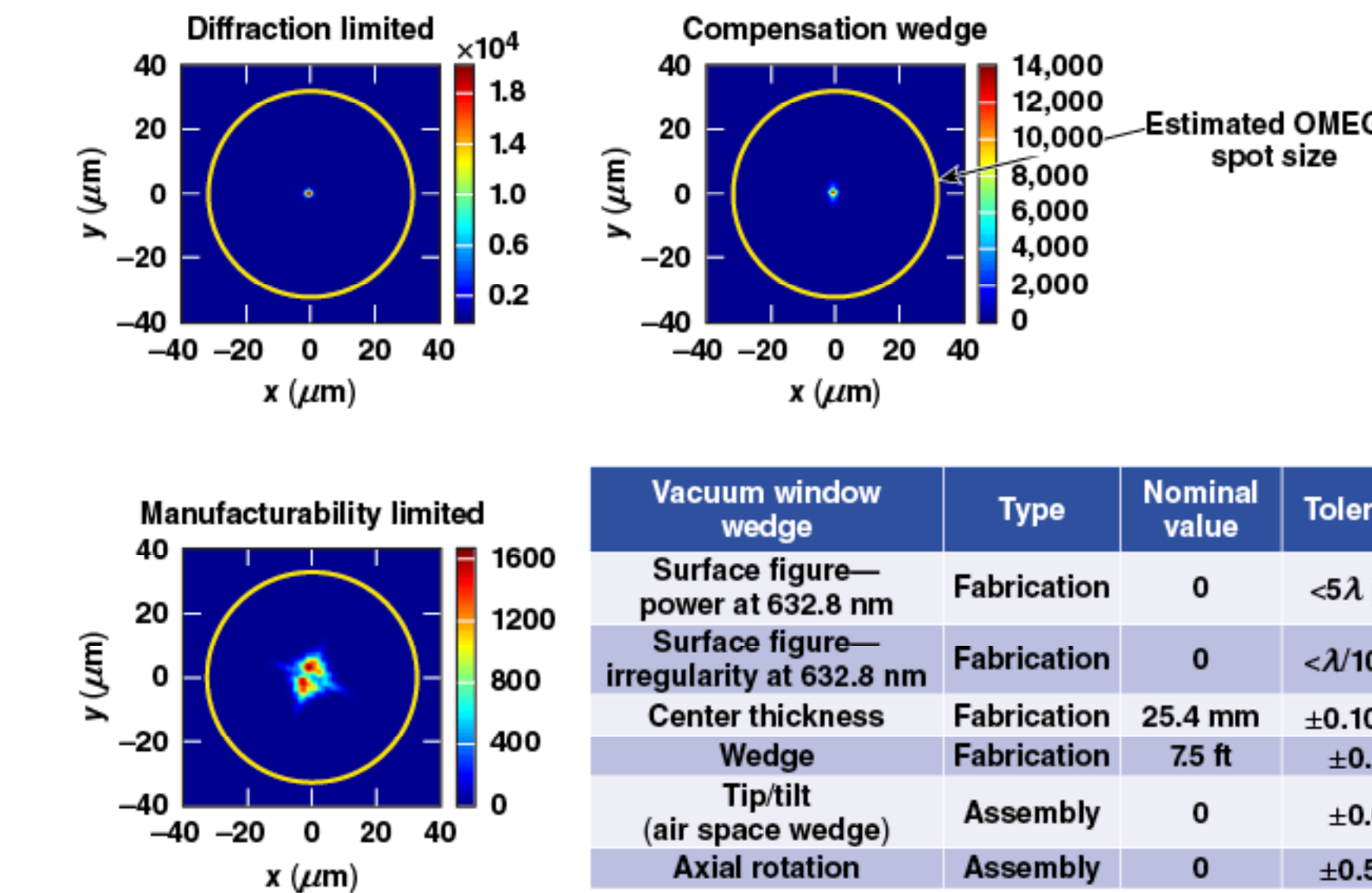


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A total of 51 different beams can be accessed using the six TIM locations on the OMEGA target chamber.

*CCD: charge-coupled device

A focal-spot diagnostic will introduce some aberrations



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*p-v: peak-to-valley

LLE is developing a focal-spot diagnostic to measure the on-shot, on-target fluence of OMEGA beams

- OMEGA laser diagnostics are located upstream of the target chamber
- Experimental results suggest that the intensity balance on target is different than that predicted by laser diagnostics
- This diagnostic will provide a direct measurement of the focal spot at the target location at full energy
- The measurement will be energy calibrated using a calorimeter mounted in the opposing port of the target chamber
- The diagnostic will be TIM-based and have access to 51 different OMEGA beams (one at a time)
- We estimate that aberrations introduced by the diagnostic will be less than the current system aberrations
- The diagnostic aberrations will have a minimal effect on the DPP focal spot, which is of primary interest for experiments

Diagnostic assembly is complete and first shots on OMEGA will be in June 2018.

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