OMEGA EP Facility Update and Progress on OLUG Recommendations

D. CANNING, S. F. B. MORSE, S. HOUSEHOLDER, M. LABUZETA, E. HILL, B KRUSCHWITZ, and M. MOORE

University of Rochester, Laboratory for Laser Energetics

Summary

OMEGA EP Continues to Evolve into a More-Effective User Facility

- Availability and effectiveness are improving as the system matures
- The average number of shots per day has seen an increase in the last year
- Timing performance is benefiting from new pre-shot timing diagnostics
- Available energy, focal performance, and contrast have improved and will continue to do so in the coming year
- Several OLUG recommended projects will add flexibility to the OMEGA EP Laser System to facilitate new experimental platforms

G9490

Maximum Available Energy Continues to Increase

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- LLE has achieved the full specification energy on target for a limited number of Beam 4 UV shots
- Work continues to improve the UV performance of Beams 1 and 2

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	100 ps	1000 J	2600 J	2000 J	2600 J

Note: Beam 1 is also known as the "sidelighter" or the "lower compressor"
Beam 2 is the "backlighter" (OMEGA EP or OMEGA) or the "upper compressor"

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New laser diagnostics have improved the beam-to-beam timing accuracy

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  - to determine absolute on-shot timing, a time-resolved target diagnostic must be used
- Beam-to-beam timing on the first target shot of the day can be expected to be within 100 ps for UV beams and 50 ps for SP beams
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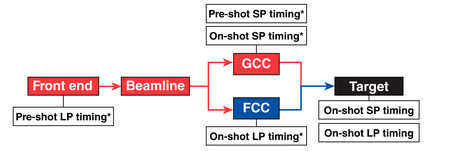
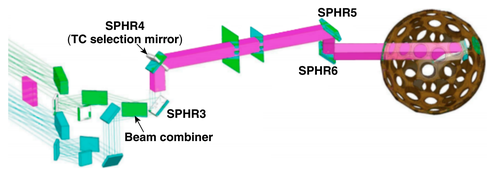


*Calibrated to target on-shot timing diagnostics

G9493

A Beam Combiner has been Installed in the GCC to Support Co-Propagation of Beams 1 and 2

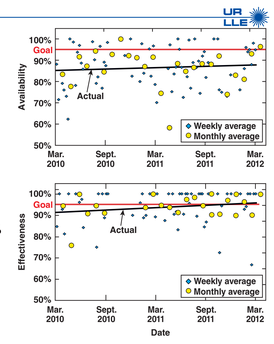


- Co-propagation of Beams 1 and 2 will first be activated to the OMEGA EP backlighter path and then to OMEGA
- Significant differential wavefront between the beams reflected off and propagated through the beam-combiner optic results in one or both beams picking up significant aberrations
- Co-located foci will be activated before spot separation is explored

G9505

OMEGA EP Availability and Experimental Effectiveness Continue to Improve

- Availability
  - overall availability = 84%
- Effectiveness
  - overall effectiveness = 95%



G8844l

OMEGA EP Now Offers Increased Operational Flexibility

- Short-pulse (SP) and UV focal-spot size changes may be made between shots without extending the shot cycle
- SP and UV pointing changes can be supported with a minimal (30-min) extension to the shot cycle when planned in advance
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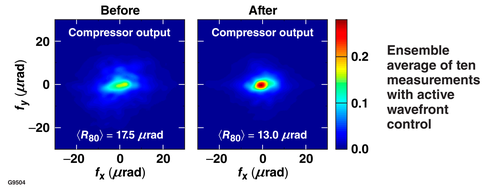
- SP pulse length changes between 10 and 100 ps can be accomplished with a 30-min extension to the shot cycle and some modest energy restrictions
- Changes to or from best compression will cost approximately one shot cycle
- It is imperative that an SRF for every potentially desired energy and pulse shape/width be in the system at the one week brief

G9547

OMEGA EP Focal Spot Quality Continues to Improve

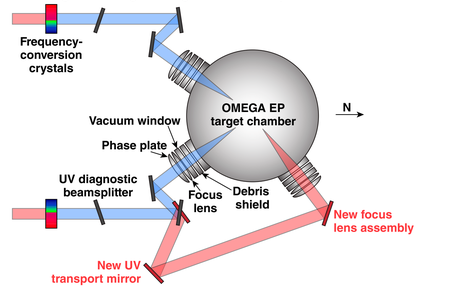
- Static wavefront correctors have been added to beamlines 1 and 2
  - the number of shots with $R_{80} < 20\ \mu$m has significantly increased
  - a 10% to 20% reduction in the average focal-spot size has been realized
- Focal spot performance is now dominated by low-order wavefront drift between stopping active correction and shot time
- A project to permit active wavefront correction much closer to shot time is underway and expected to provide significant improvement



G9504

A FY13–FY17 Project is being Developed to Support an OLUG Request for OMEGA EP Configuration Flexibility

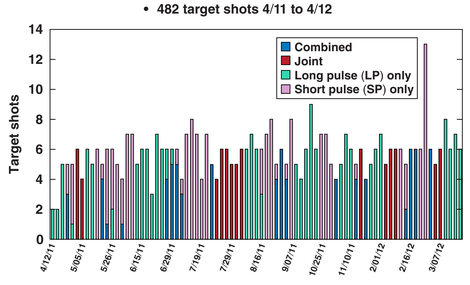
- Beams 2 and 4 would be reconfigurable to illuminate the back side of a target entering the target chamber at ports 44 and 59



G9506

OMEGA EP Averaged 5.8 Shots per Day Over the Past Year, Up from 5.4 for the Previous Year

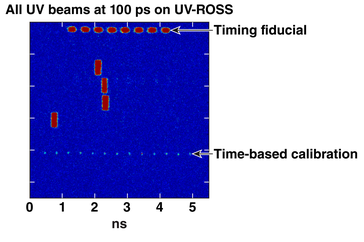
- 482 target shots 4/11 to 4/12



G8961b

Subnanosecond UV Pulses have been Activated on OMEGA EP

- 100-ps UV pulses with an energy of 100 J are now available on all four beamlines
- A discrete set of additional subnanosecond UV pulse lengths with energies greater than 100 J will be activated in FY12 Q3



G9495

Short-Pulse Front Ends will be Upgraded to Improve Contrast

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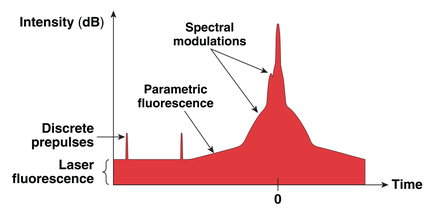
- Contrast is anticipated to improve by a factor of ~100 to 1000



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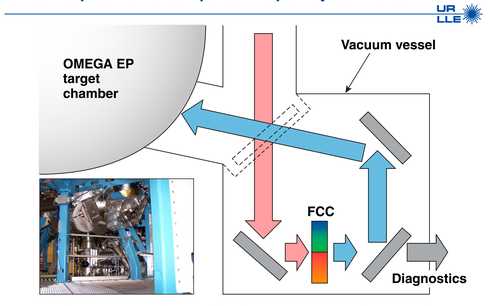
An FY13–FY17 project is being developed to support the OLUG request for short-pulse frequency conversion



- A vacuum vessel containing frequency-conversion crystals will add $2\omega/3\omega$ capability to the OMEGA EP short pulse

G9361

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- **Availability**
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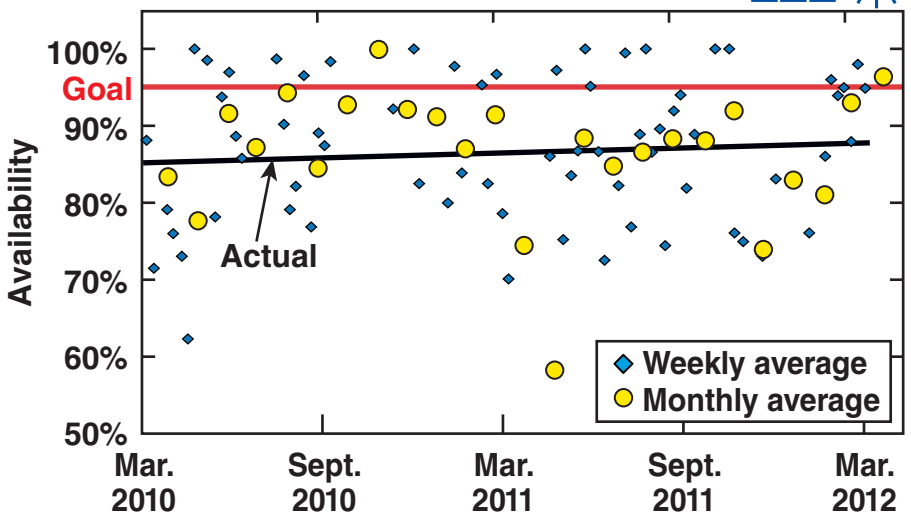
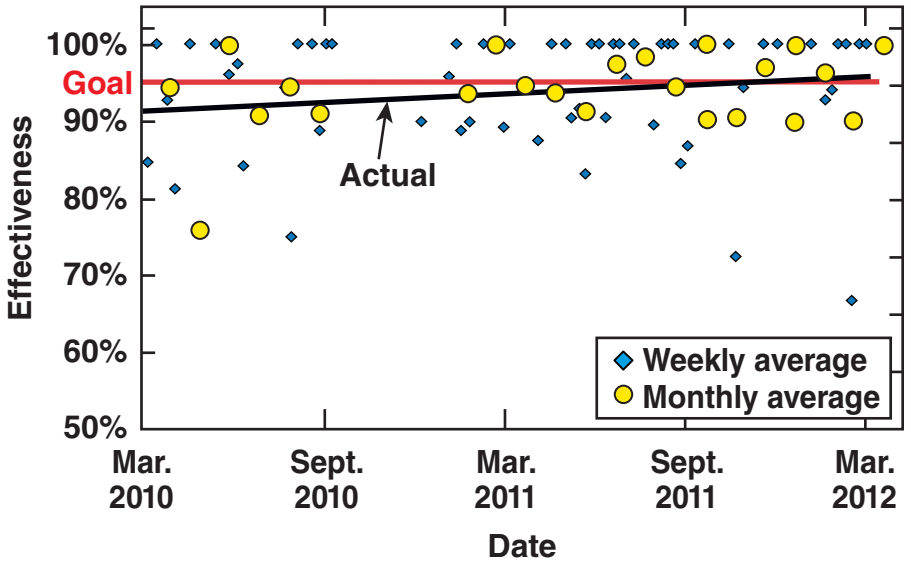


- **Effectiveness**
  - **overall effectiveness = 95%**



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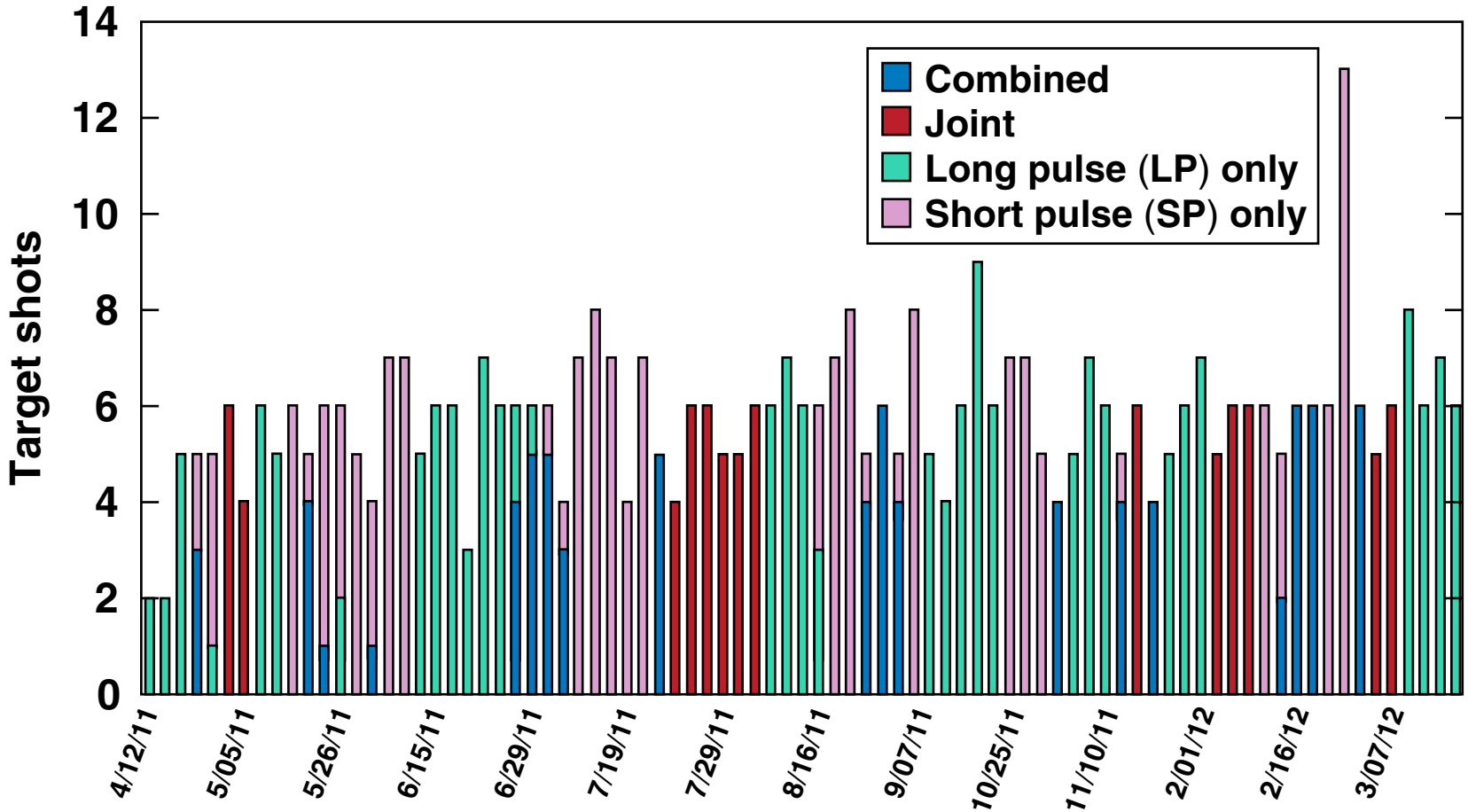

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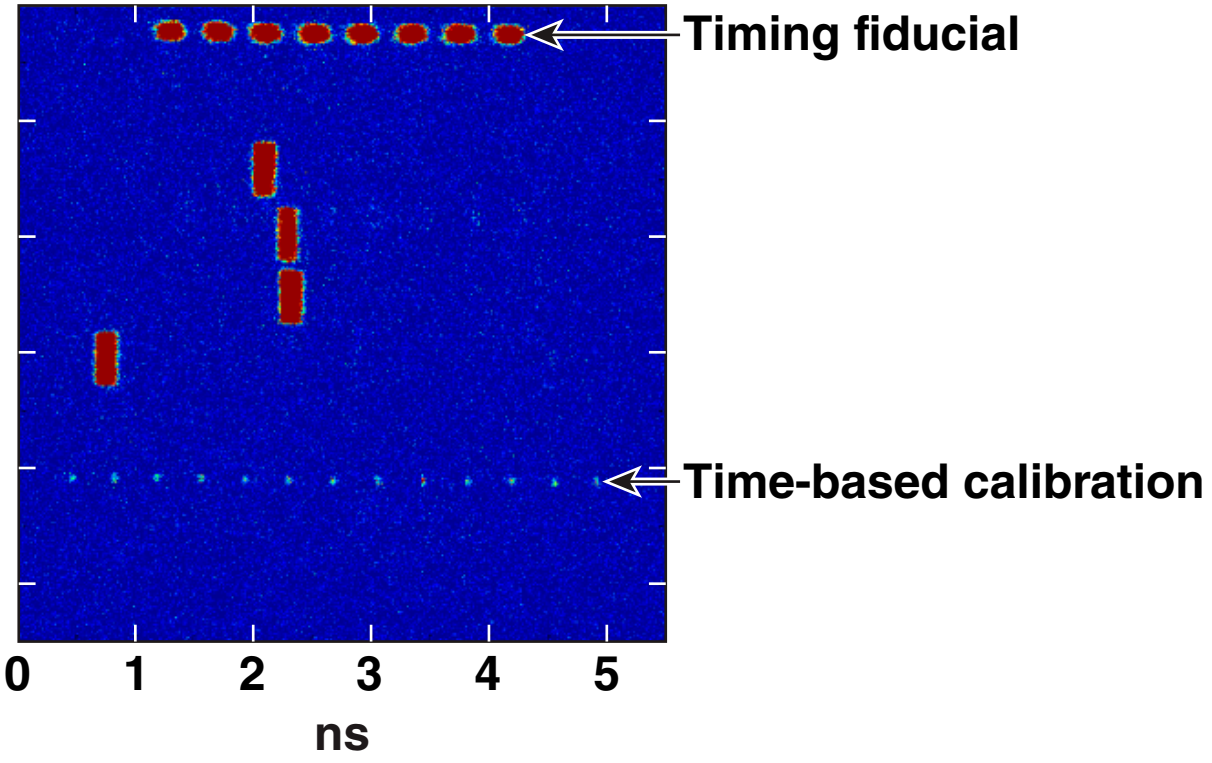
All UV beams at 100 ps on UV-ROSS



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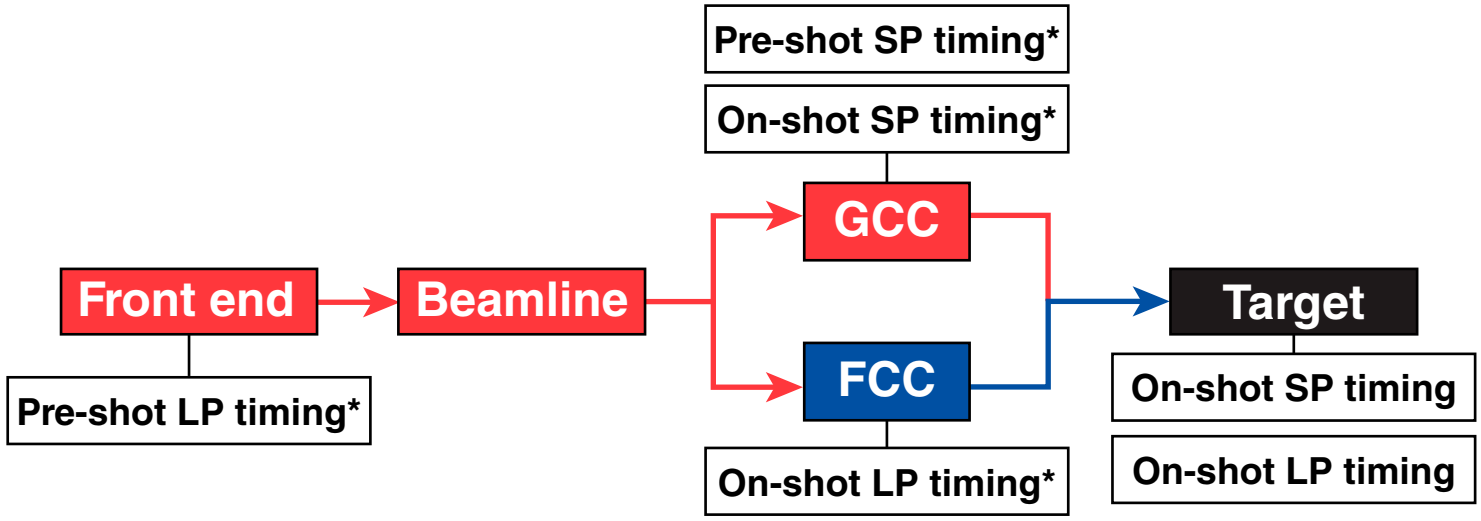

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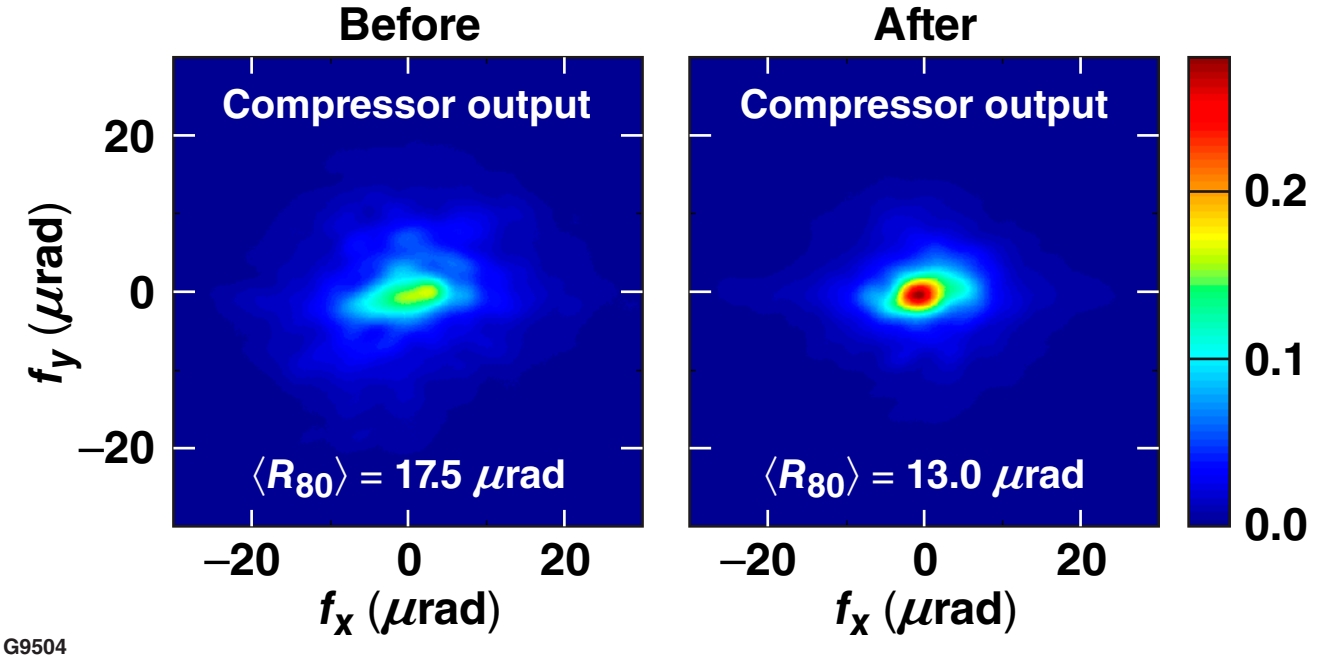

Ensemble average of ten measurements with active wavefront control

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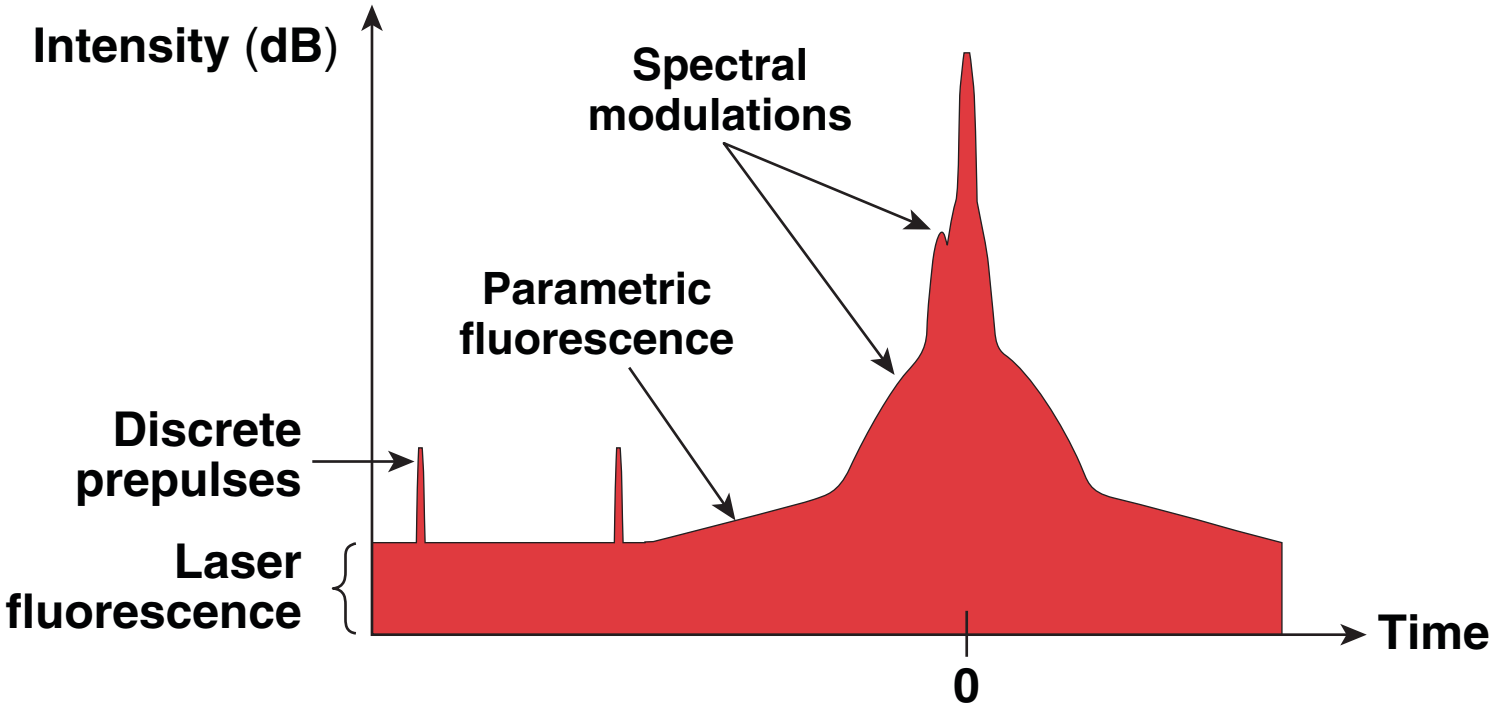

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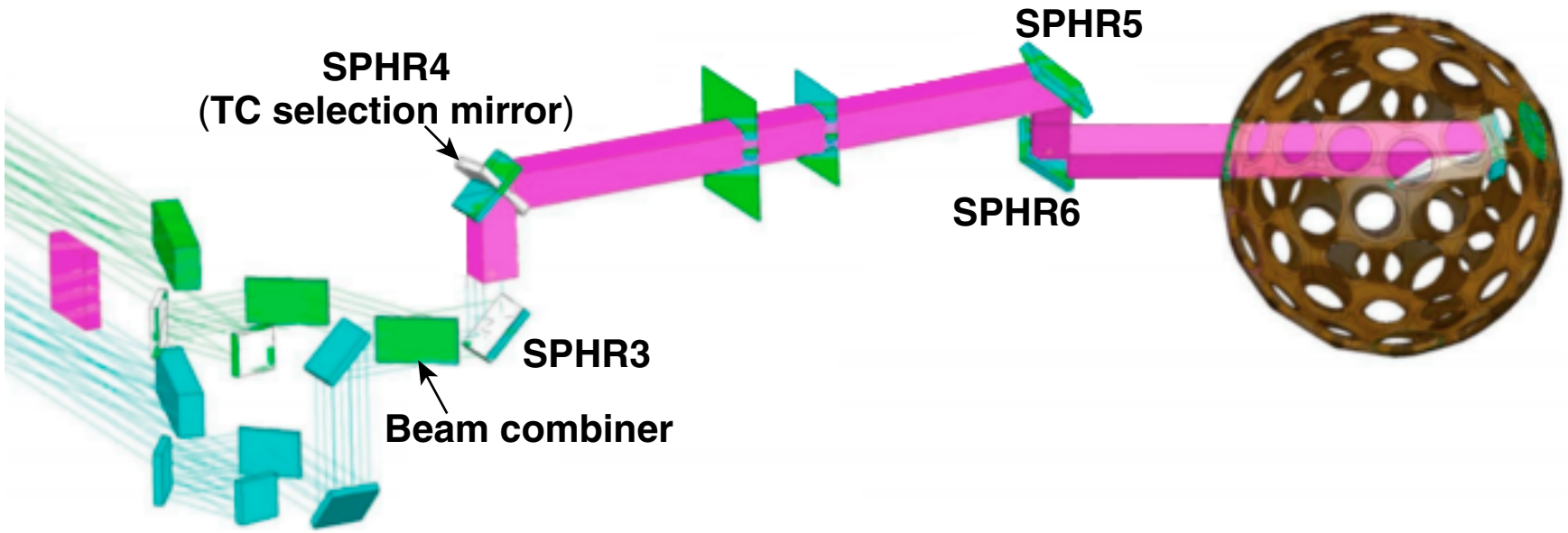

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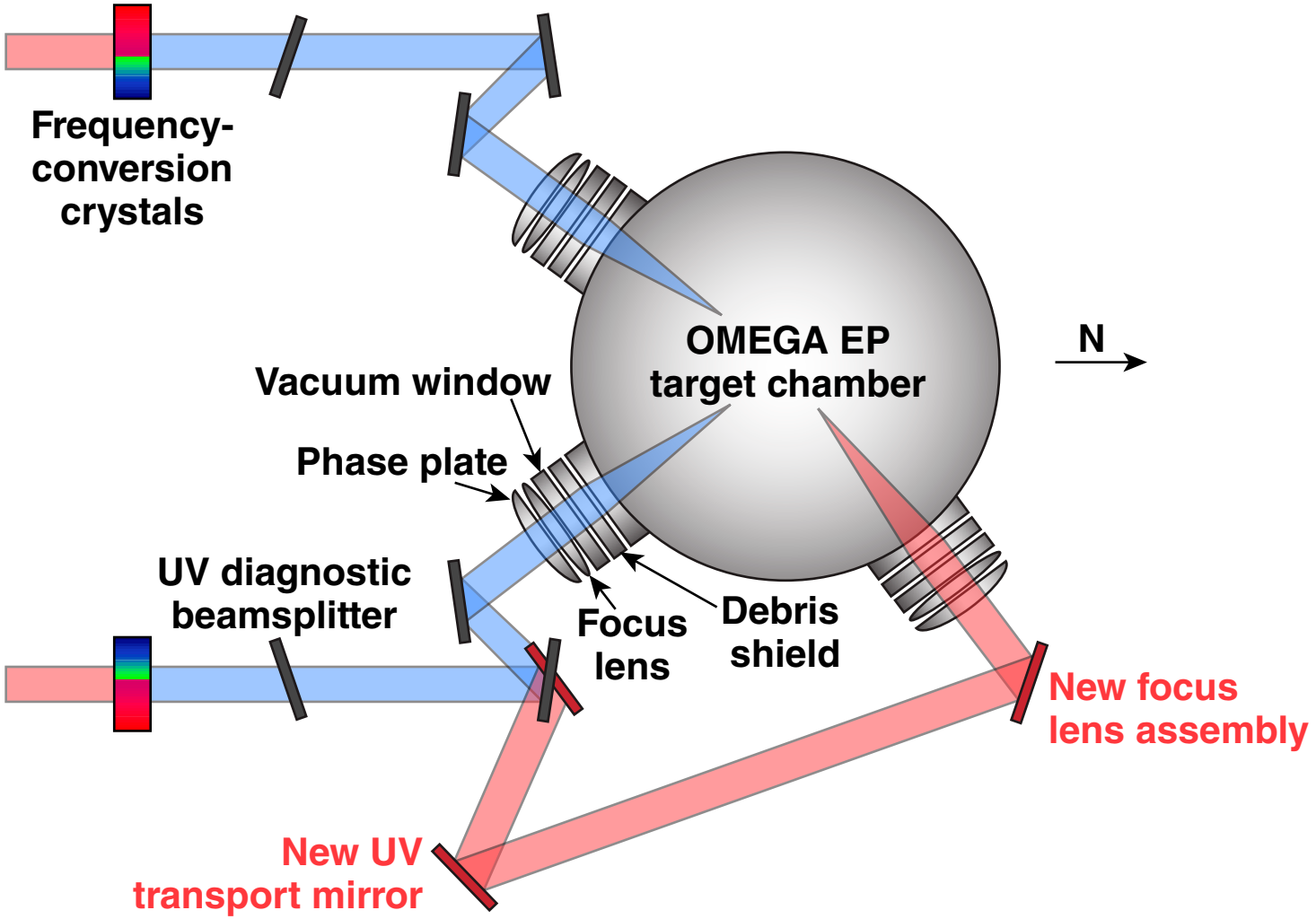

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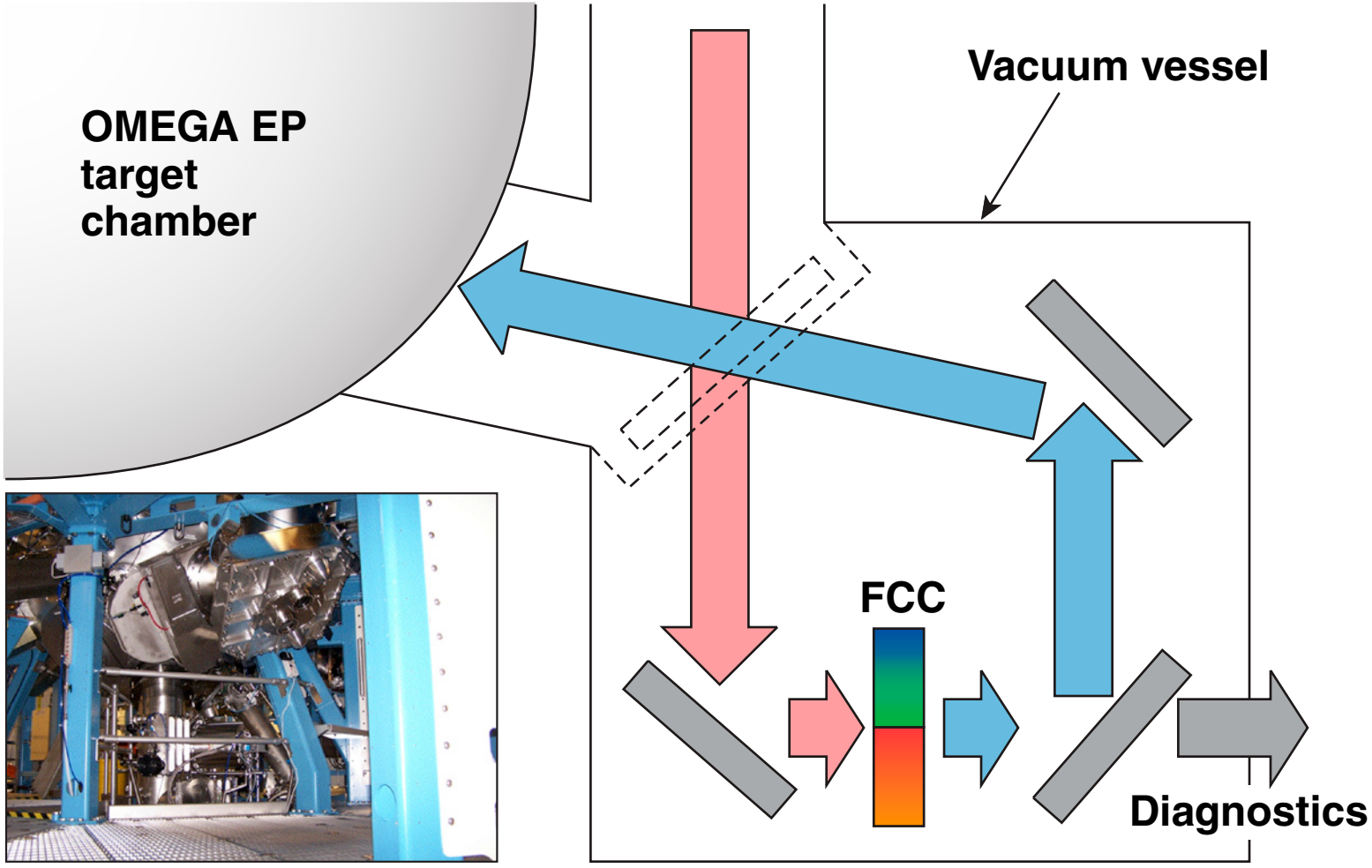

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