

Bringing EP performance up to full spec and 4 ω probe utilization

Current Omega EP short-pulse laser energy specs

OLUG 2011:
300 J
1250 J
1250 J

OMEGA EP Performance Envelope descriptive values*

Revision date: 02/21/12

Short Pulse (IR)	On target energy	Pulselength	Beam			
			1 (current)	1 (full spec)	2 (current)	2 (full spec)
No Disposable Debris Shield		0.7 ps	50 J	700 J	400 J	700 J
		10 ps	850 J	2600 J	1500 J	2600 J
		100 ps	1000 J	2600 J	2000 J	2600 J

Note: Beam 1 is also known as the "Sidelighter" or alternatively the "Lower Compressor"
Beam 2 is the "Backlighter" (OMEGA EP or OMEGA) or the "Upper Compressor"

Short Pulse (IR)	On target energy	Pulselength	Beam			
			1 (current)	1 (full spec)	2 (current)	2 (full spec)
With Disposable Debris Shield		0.7 ps	50 J	50 J	50 J	50 J
		10 ps	810 J	850 J	850 J	850 J
		100 ps	1000 J	2600J	1500 J	2600 J

Disclaimer: The values represented in this chart are most recent estimates for near term (current) energy maximum values and are subject to change without advance notice.

Beam 1 energies are held back by a B-integral problem on the diagnostics table. LLE has a large filter on order to partially mitigate this problem.

(Vacuum) focal spot improvements

- Static wavefront correction improves focal spot from 25 μm to 20 μm (approx 15-20% R80 improvement), but as system warms and changes through the day, focal spot degrades
 - B2 static wavefront correction is operational.
 - B1 static wavefront correction is expected in FY12.
- Late cycle wavefront correction (deformable mirror run immediately before shot) was anticipated in the 3rd quarter of FY12

Nanosecond contrast

- Energy contrast is currently at the 10^{-8} level
- Parametric gain providing a short pulse OPA to generate a clean high energy seed for EP installed in the next quarter – B1 first. Expect a x200 to x300 improvement
- A single shot auto-correlator is being implemented to take measurements for the final 500 ps
- 500 ps measurement to be made available to users (when?)

Beam combiner

- To allow co-linear pulse propagation experiments
- Installation completed in fall 2011 maintenance period
- Tests and commissioning to characterize the combiner are expected to be completed in FY12
- Availability for users in FY13

Cross-beam timing

- Reliability for the first shot of the day of the timing of the short pulse can be “dialled in” with a 50 ps accuracy
- Long pulse can be “dialled in” with a 100 ps accuracy
- Jitter of ± 25 ps cannot be removed

Intermediate pulse widths

- i.e. between 1 ps and 10 ps – challenge is the pulse-characterization measurement, which would require a method between an auto-correlator and a streak camera.
- LLE is actively working on this method.

Design options for conversion of a short-pulse beam to 2ω (or 3ω)

- Frequency conversion of one of the PW beams with 2ω being more realistic.
- Full aperture crystals will not be an option.
- OLUG community needs to define requirements for LLE.
 - Titan can achieve ≥ 100 J at 2ω , (1-10 ps)
- LLE is to look into design options and requires significant funding for this project to go ahead.

4 ω optical probe beam update

- OLUG 2011 reported availability by January 2012, which is unfortunately delayed due to integrating probe system with main EP system.
- Expected to be commissioned in the 1st quarter FY13 and available for users in the 2nd quarter of FY13
- Includes a system to record the on-shot relative timing of the beams
- Longer-term prospects – user designed diagnostics can be included. This is likely to require some resources.

High Purity Germanium Detector (HPGD)

- For measuring γ -spectra from activated material
- LLE has a HPGD, but it currently has a broken preamplifier and is a well detector designed to measure indium slugs
- Does anyone have an interest in using a HPGD?