

Item (a) from last OLUG report: **Bringing EP performance up to its full specification**  
Item (g) from last OLUG report: **OMEGA EP focal-spot size of the PW beam**  
Item (e) from last OLUG report: **LLE's contrast-ratio improvement program**

Over the past year much progress has been made to improve the diagnostic systems available on the EP system and good progress is being made towards the majority of the users concerns. OLUG would like to highlight and endorse LLE's continued efforts in particular areas of concern for users.

**Improvement of the focal spot size** of the compressed beams remains a top priority with users as this will increase the intensity and OLUG is grateful that LLE is investing a lot of effort into this area.

Near term: Static wavefront correction, expected at the end of FY11 on beam 2 and FY12 for beam 1, is expected to improve the focal spots significantly. Full realization of improved quality will occur with the completion of wavefront correction with the deformable mirror occurring late in the shot cycle, immediately prior to the shot. Late Cycle Wavefront Correction is anticipated by the third quarter of FY12. For details, see B. Kruschwitz OLUG presentation.

The **cross-beam timings** have become more reliable on EP in the past year, particularly the reliability of the 'dial-in' timing at the beginning of the shot day.

Near-term: OLUG endorses LLE's continued efforts to pursue options for further improvements, as the benefit to users is having fewer shots lost to timing checks. Further improvement is expected by the end of FY11 for initial (first shot) short-pulse to short-pulse timing. With the activation of ~100ps UV pulse durations, long-pulse to long-pulse timing is also better calibrated.

The **nanosecond contrast** is now greatly improved to the current  $10^{-8}$  level.

Near-term: A single-shot cross-correlator is being implemented to take measurements for the final 500 ps and LLE intends to make this data available to users for each shot.

**The beam 1 energy increase** is held back by a B-integral problem on the diagnostics table.

Long term: LLE has ordered a large filter to partially mitigate this problem.

**Intermediate pulse widths** (between 1ps and 10ps) with intermediate energies were of interest to the user community. However, until a satisfactory way to measure the pulse length between 1ps, which can be measured using an auto-correlator, and 10ps, which can be measured using a streak camera, is found it is not possible to confidently calculate the energy threshold for a shot.

Intermediate to long-term: LLE is actively working on a method to measure intermediate pulse widths.

**A beam combiner** would allow co-linear pulse propagation experiments. Facility users look forward to this configuration becoming available.

Near term: Beam combiner installation is planned during the September 2011

maintenance period. Significant system time is planned in the FY12 schedule to characterize alignment and performance prior to making co-propagation available for target shots.

Item (b) from last OLUG report: **Bring design options forward to next OLUG workshop for  $2\omega$  and  $3\omega$  conversion of the PW beam**

Initial investigations by LLE into frequency conversion of the PW beams (as requested by OLUG in 2010) concentrated on the  $2\omega$  option. It is probable that crystals for the full beam aperture may not be possible. LLE requires input from the user community so that the design can best fit the need. A request for support and guidance is being sent to the OLUG community.

Near-term: OLUG community to provide LLE with guidance.

Intermediate-term: LLE to further investigate project.

Long-term: Implementation of this project would require significant funding and manpower.

Item (f) from last OLUG report: **Status of the  $4\omega$  probe**

Dustin Froula gave a presentation on the latest status and impressive expected capabilities of the  $4\omega$  diagnostic on the OMEGA EP facility. The system is carefully designed so that multiple arms can be run simultaneously, with initially available diagnostics being Schlieren/shadowgraphy, grid imaging refractometry and interferometry. The flexible design allows the addition of user defined arms to the system. LLE is optimistic that the relative timing of the probe pulse, one of the main OLUG concerns, should be to 10 ps accuracy. The OLUG members foresee it is likely that underdense plasma experiments will become more prevalent in the future as optical diagnostics come online, making the  $4\omega$  probe a valuable asset to the facility.

Near-term: The diagnostics should have been activated and ready for users by January 2012.

Intermediate to long-term: User designed diagnostics can be included into the  $4\omega$  probe system, which is likely to require some resources.