Omega Facility Update: OLUG Recommendations and Items of General Interest
Omega is an effective and efficient facility and benefits from the strong user community.

- OMEGA and OMEGA EP have had an excellent year since last the OLUG Workshop.
- OMEGA improvements include pulse shaping, beam timing, and continued new diagnostic improvements.
- Upcoming OMEGA changes are focused on improving implosion performance.
- OMEGA EP operational performance has allowed Principal Investigators (PI’s) to optimize experimental platforms.
- OMEGA EP operational statistics show significant progress.
- New capabilities continue to be activated on OMEGA EP.

User feedback is instrumental in targeting facility improvements.
The Omega Laser Facility surpassed 25,000 target shots in November 2013
OMEGA-60 effectiveness data for the past year illustrate excellent performance
OMEGA availability consistently exceeds the 95% goal.

Weekly average

Monthly average
A decrease in nonchargeable delays has allowed the number of shots per day to increase from 10 to 11.
The OMEGA schedule is at full capacity for the remainder of FY14.
Several changes to OMEGA are motivated by “hydro-equivalent” implosion performance

- Recently completed work will be presented in the facility poster session
  - pulse-shaping system replaced for smoothing by spectral dispersion (SSD) driver
  - beam-timing scheme improved
  - power-balance techniques refined
- Projects are underway to mitigate cross-beam energy transfer (CBET)
  - multipulse driver line
  - time-multiplexed pulse shaping
  - new SG5 phase plates
An arbitrary waveform generator (AWG)-based pulse-shaping system adds control precision and flexibility.

**OMEGA AWG pulse shaping**

- Tektronix AWG70001A

**Signal**
- AWG amp
- Signal bar

**Gate**
- IFES (DAM, IFA, bias)

**Shape**
- OMEGA regen

**Sample**
- cw laser
- IFES = integrated front-end system
- DAM = dual-amplitude modulator
- IFA = IFES fiber amplifier
- ACSL = aperture coupled stripline
- cw = continuous wave

**ACSL versus AWG**

- Cryo pulse shape:
  - ACSL
  - AWG
  - Template

**Instrumentation**
- Oscilloscope (12-GHz Agilent)
- Oscilloscope (8-GHz Agilent)

**Additional Notes**

- OMEGA regen
- Pulse replicator + photodiode
- Photodiode
The new $3\omega$ beam-timing system (BTS) utilizes a diffusing sphere at target chamber center (TCC)

W. R. Donaldson details performance improvements in the facility poster session.
A multipulse driver line (MPD) will provide the capability to perform dynamic bandwidth reduction

- The MPD project will provide on-shot, co-propagation of two separate pulse shapes in all 60 OMEGA beams
  - the option of SSD bandwidth on any one of the two pulse shapes; dynamic bandwidth reduction (bandwidth only on pickets) provides increased energy in the drive pulse

*Large-aperture ring amplifier*
The diagnostic inventory continues to evolve; new features are underway to benefit all users

• New target diagnostics—see C. Sorce poster
  – MIFEDS (magneto-inertial fusion electrical discharge system)
  – Thomson scattering
  – NIF x-ray spectrometer (NXS) recently calibrated on OMEGA
  – neutron temporal diagnostic (NTD) revisions in progress
  – neutron diagnostic inserters (NDI’s) P11 and P2 operational
  – framing cameras

• Co-propagation activation—see B. Kruschwitz poster

• Isotope separator—see M. Wittman poster

• Ten-inch manipulator (TIM) upgrades; final TIM to be completed in June 2014
OMEGA EP utilization has increased and many experimental platforms are maturing

MIFEDS—see D. Mastrosimone poster

Colliding plasmas

Release physics—see P. Nilson presentation

4ω probe, channeling—see D. Haberberger presentation
OMEGA EP continues to maintain high availability and effectiveness
PI shot optimization has significantly increased shots per day

Some PI’s have used alternating beams to achieve ~45-min shot rates

The average shot rate has increased from 6.1, 5.8, and 5.4 for the previous three years.
A new fifth-order super-Gaussian (SG5) phase plate will be available in FY15.
Co-propagation of short-pulse beams has been reactivated

Co-propagation allows for backlighting using alternating single beams on a 45-min shot cycle.
Measurement of off-axis parabola (OAP) reflectivity will allow more accurate reporting of IR energy.

\[
OAP \text{ transmission } T_3 = \sqrt{\frac{T_2/R_2}{T_1/R_1}}
\]

Ref A = Uncoated 4\% full-aperture reference
Ref B = Uncoated 4\% sphere

A ratiometer is under construction.
Improvements have been made to OMEGA EP focusing, pointing, and timing.

- Spot size measured by x-ray pinhole camera:
  \[ D = 0.23 \text{ mm} \]

- Au foil shots are used to measure pointing accuracy and repeatability.
User input is important to optimizing operations

- Real-time review of Experimental Effectiveness forms by the Shot Director and Facility managers is used to add appropriate resources to an issue

- Monday following the campaign, Experimentalists evaluate the initial data and diagnostic performance; scientists and instrument specialists are appraised of campaign issues

- Two weeks after the campaign, critiques are submitted and reviewed by the Facility Advisory and Scheduling Committee, action items are assigned, and positive critiques are shared with operators
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