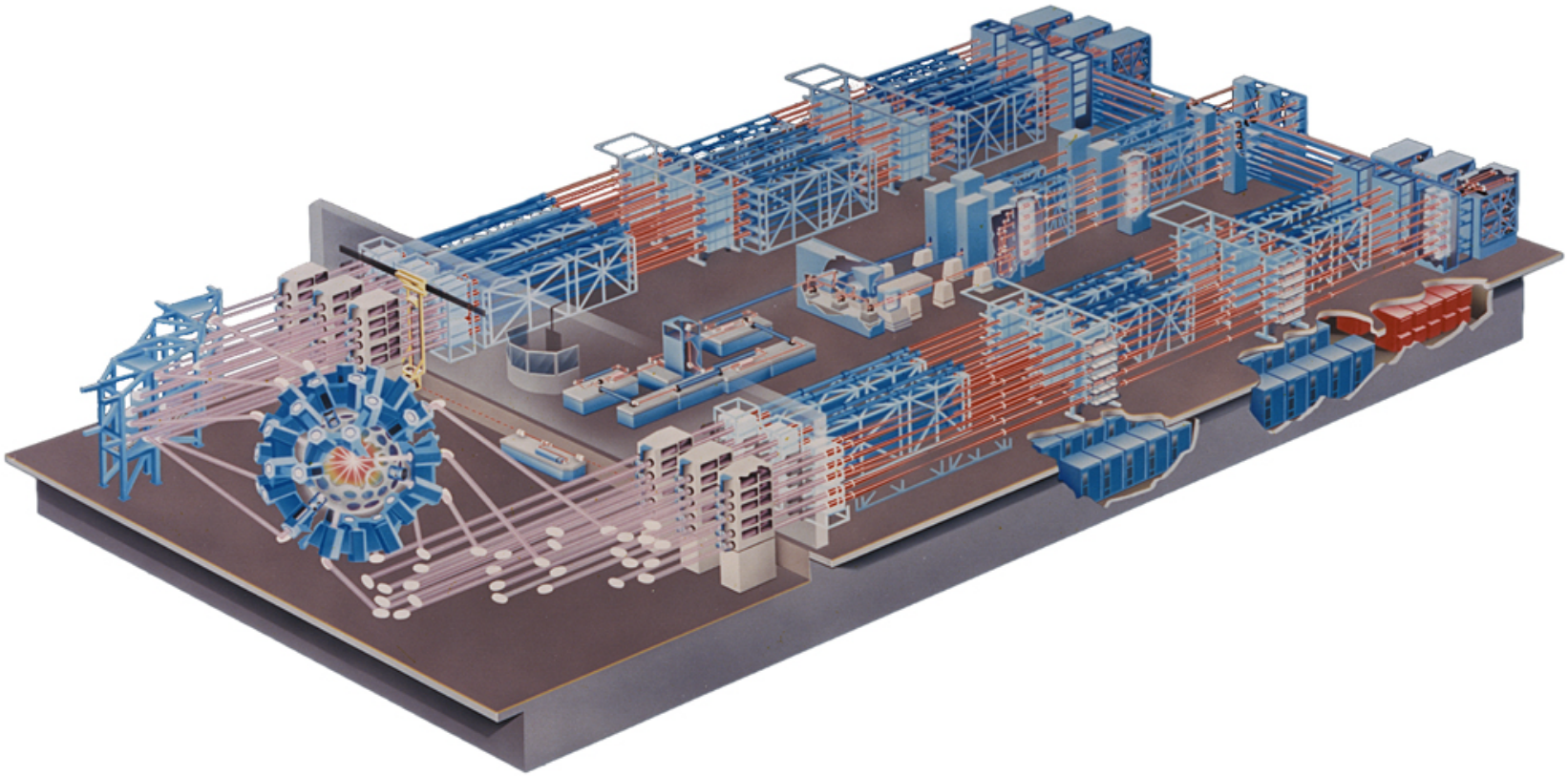
Omega Facility Update: OLUG Recommendations and Items of General Interest



S. F. B. Morse
Omega Facility Division Director
University of Rochester
Laboratory for Laser Energetics

Omega Laser Facility
Users Group Workshop
Rochester, NY
23–25 April 2014

Summary

Omega is an effective and efficient facility and benefits from the strong user community

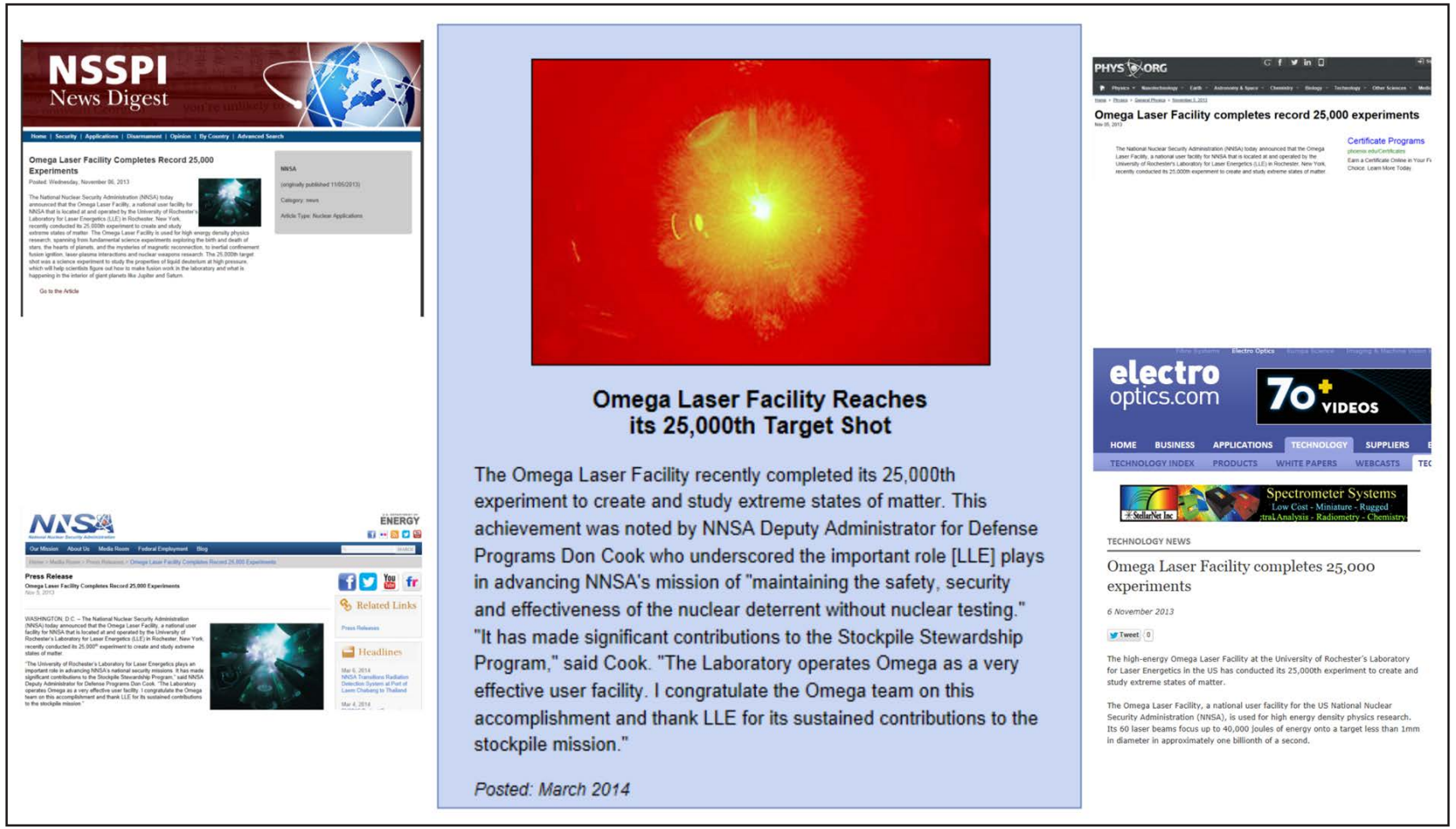
UR LLE

- 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.

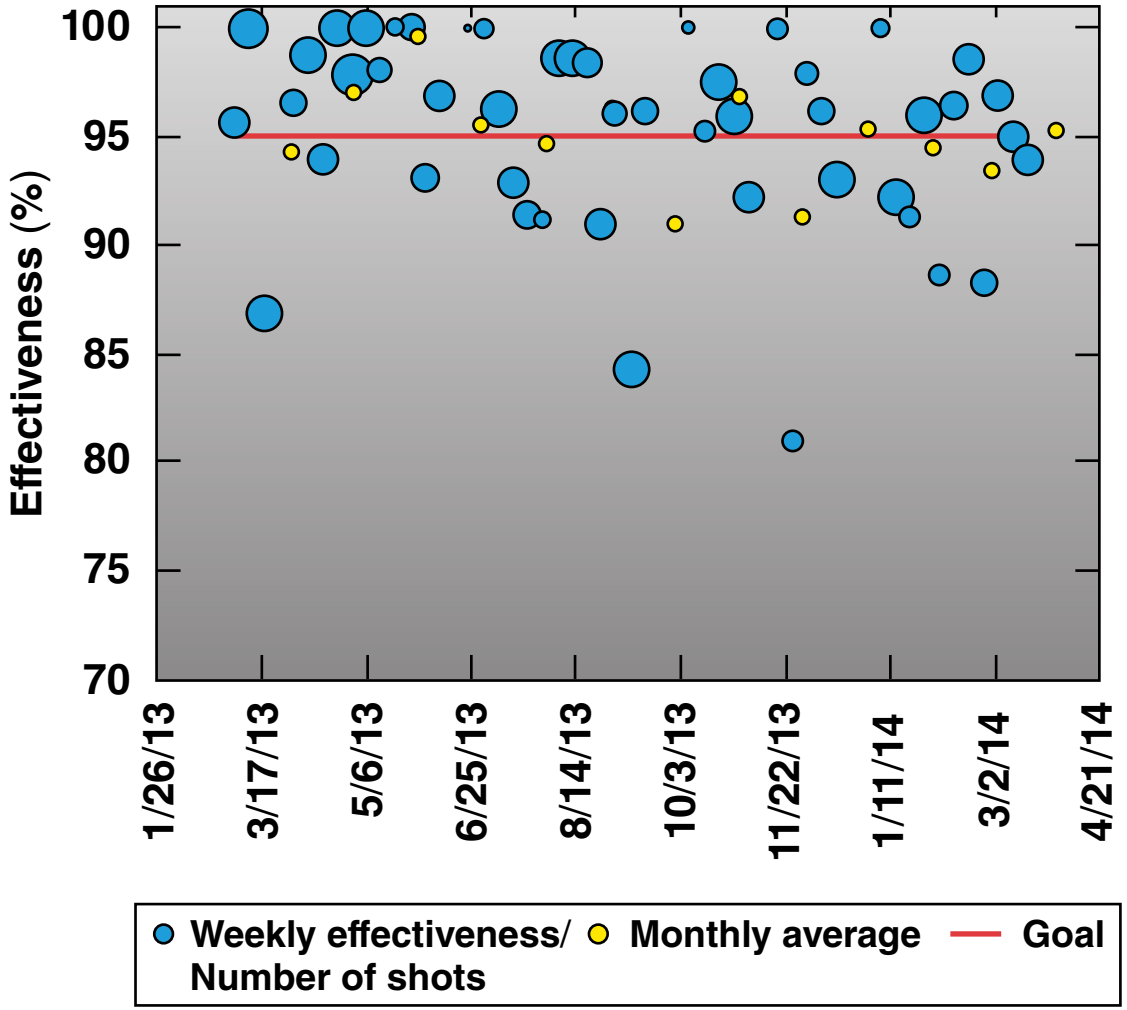
G10147

The Omega Laser Facility surpassed 25,000 target shots in November 2013



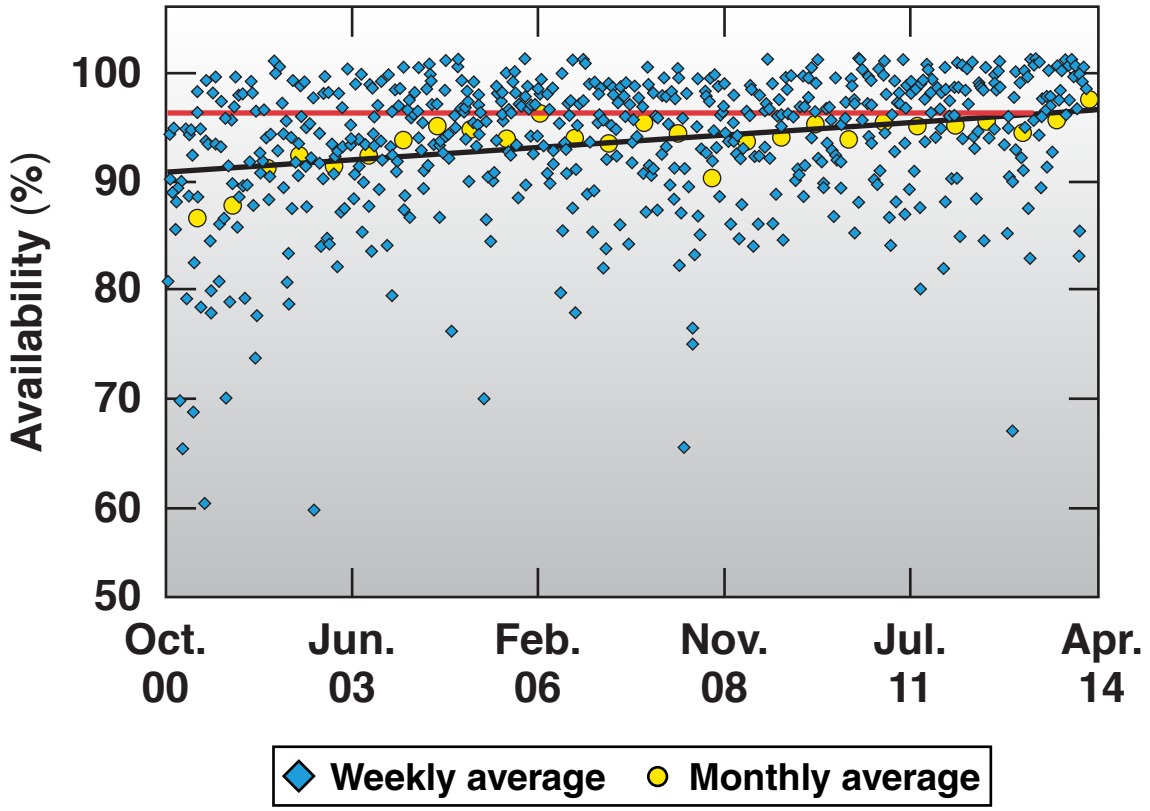
G10149

OMEGA-60 effectiveness data for the past year illustrate excellent performance



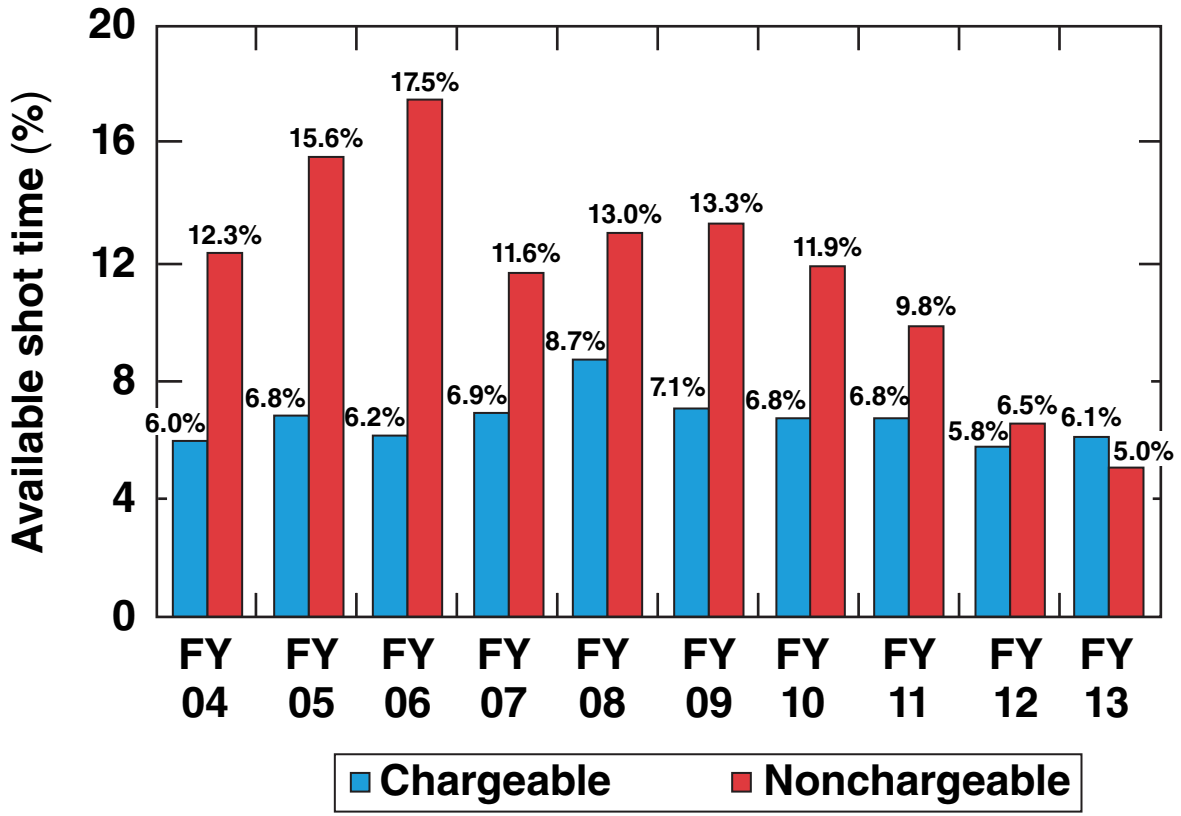
G10150

OMEGA availability consistently exceeds the 95% goal



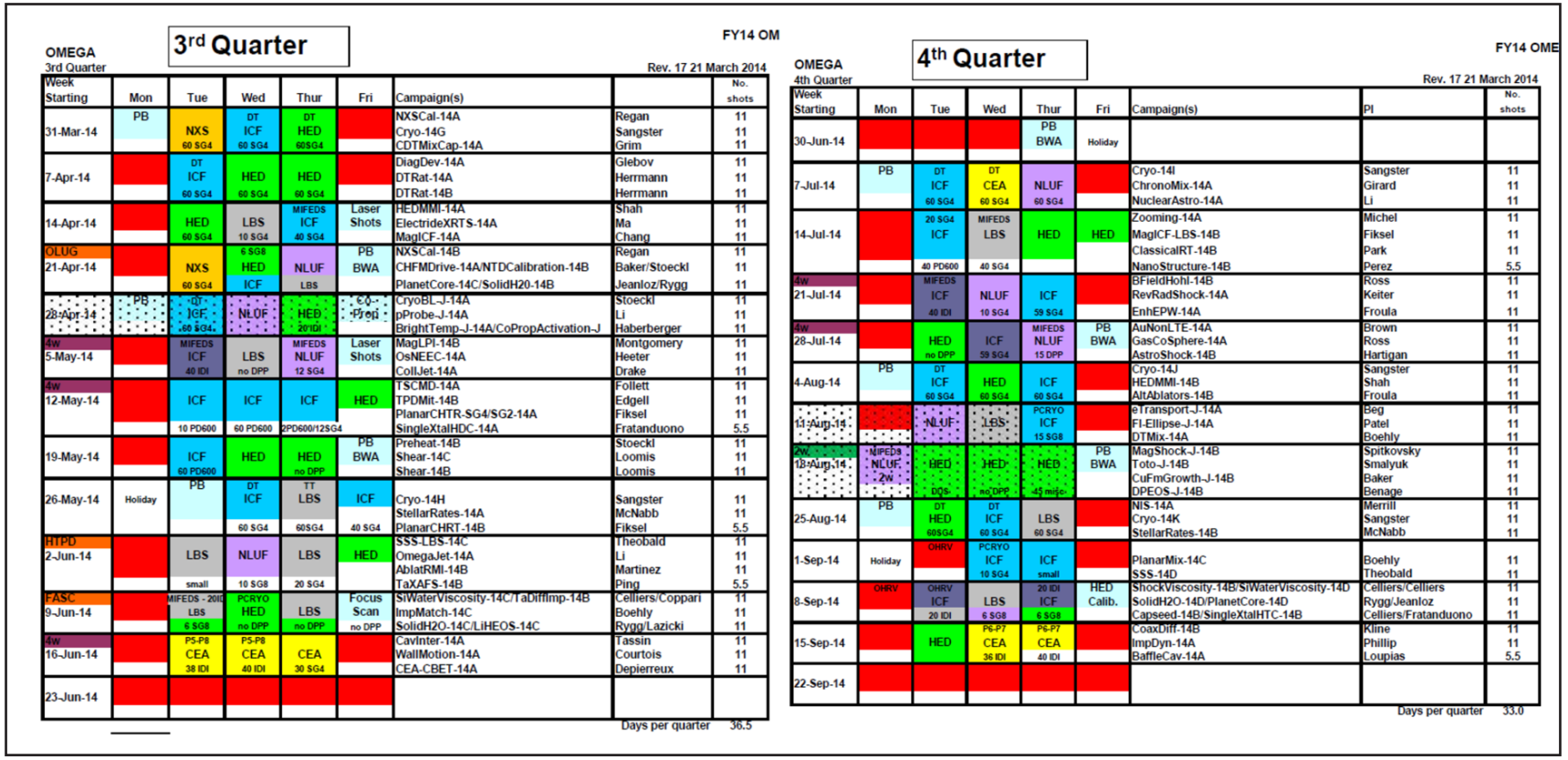
G10151

A decrease in nonchargeable delays has allowed the number of shots per day to increase from 10 to 11



G10152

The OMEGA schedule is at full capacity for the remainder of FY14



OMEGA
3rd Quarter

3rd Quarter

FY14 OM

Rev. 17 21 March 2014

Week Starting	Mon	Tue	Wed	Thur	Fri	Campaign(s)		No. shots
31-Mar-14	PB	NXS 60 SG4	DT ICF 60 SG4	DT HED 60SG4		NXSCal-14A Cryo-14G CDTMixCap-14A	Regan Sangster Grim	11 11 11
7-Apr-14		DT ICF 60 SG4	HED 60 SG4	HED 60 SG4		DiagDev-14A DTRat-14A DTRat-14B	Glebov Herrmann Herrmann	11 11 11
14-Apr-14		HED 60 SG4	LBS 10 SG4	MIFEDS ICF 40 SG4	Laser Shots	HEDMMI-14A ElectrideXRTS-14A MagICF-14A	Shah Ma Chang	11 11 11
OLUG 21-Apr-14		NXS 60 SG4	6 SG8 HED ICF	NLUF LBS	PB BWA	NXSCal-14B CHFMDrive-14A/NTDCalibration-14B PlanetCore-14C/SolidH20-14B	Regan Baker/Stoeckl Jeanloz/Rygg	11 11 11
28-Apr-14	PB	DT ICF 60 SG4	NLUF	HED 20 IDI	CoPrep	CryoBL-J-14A pProbe-J-14A BrightTemp-J-14A/CoPropActivation-J	Stoeckl Li Haberberger	11 11 11
4w 5-May-14		MIFEDS ICF 40 IDI	LBS no DPP	MIFEDS NLUF 12 SG4	Laser Shots	MagLPI-14B OsNEEC-14A CollJet-14A	Montgomery Heeter Drake	11 11 11
4w 12-May-14		ICF 10 PD600	ICF 60 PD600	ICF 2PD600/12SG4	HED	TSCMD-14A TPDMit-14B PlanarCHTR-SG4/SG2-14A SingleXtalHDC-14A	Follett Edgell Fiksel Fratanduono	11 11 11 5.5
19-May-14		ICF 60 PD600	HED	HED no DPP	PB BWA	Preheat-14B Shear-14C Shear-14B	Stoeckl Loomis Loomis	11 11 11
26-May-14	Holiday	PB	DT ICF 60 SG4	TT LBS 60SG4	ICF 40 SG4	Cryo-14H StellarRates-14A PlanarCHRT-14B	Sangster McNabb Fiksel	11 11 5.5
HTPD 2-Jun-14		LBS small	NLUF 10 SG8	LBS 20 SG4	HED	SSS-LBS-14C OmegaJet-14A AblatRMI-14B TaXAFS-14B	Theobald Li Martinez Ping	11 11 11 5.5
FASC 9-Jun-14		MIFEDS - 20ID LBS 6 SG8	PCRYO HED no DPP	LBS no DPP	Focus Scan no DPP	SiWaterViscosity-14C/TaDiffImp-14B ImpMatch-14C SolidH2O-14C/LiHEOS-14C	Celliers/Coppari Boehly Rygg/Lazicki	11 11 11
4w 16-Jun-14		P5-P8 CEA 38 IDI	P5-P8 CEA 40 IDI	CEA 30 SG4		CavInter-14A WallMotion-14A CEA-CBET-14A	Tassin Courtois Depierreux	11 11 11
23-Jun-14								
							Days per quarter	36.5

OMEGA
4th Quarter

4th Quarter

FY14 OME

Rev. 17 21 March 2014

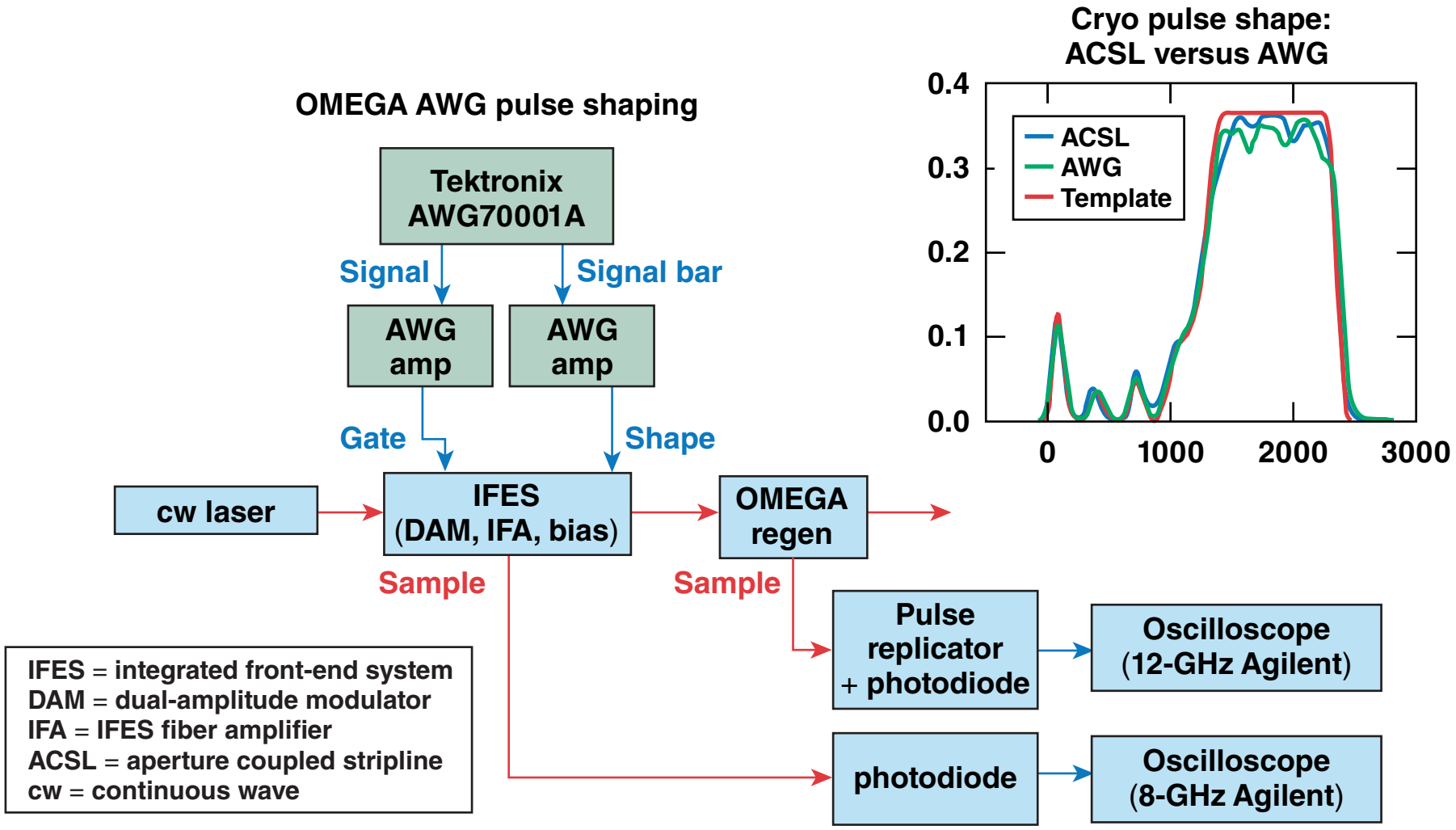
Week Starting	Mon	Tue	Wed	Thur	Fri	Campaign(s)	PI	No. shots
30-Jun-14				PB BWA	Holiday			
7-Jul-14	PB	DT ICF 60 SG4	DT CEA 60 SG4	NLUF 60 SG4		Cryo-14I ChronoMix-14A NuclearAstro-14A	Sangster Girard Li	11 11 11
14-Jul-14		20 SG4 ICF 40 PD600	MIFEDS LBS 40 SG4	HED	HED	Zooming-14A MagICF-LBS-14B ClassicalRT-14B NanoStructure-14B	Michel Fiksel Park Perez	11 11 11 5.5
4w 21-Jul-14		MIFEDS ICF 40 IDI	NLUF 10 SG4	ICF 59 SG4		BFieldHohl-14B RevRadShock-14A EnhEPW-14A	Ross Keiter Froula	11 11 11
4w 28-Jul-14		HED no DPP	ICF 59 SG4	MIFEDS NLUF 15 DPP	PB BWA	AuNonLTE-14A GasCoSphere-14A AstroShock-14B	Brown Ross Hartigan	11 11 11
4-Aug-14	PB	DT ICF 60 SG4	HED 60 SG4	ICF 60 SG4		Cryo-14J HEDMMI-14B AltAblators-14B	Sangster Shah Froula	11 11 11
11-Aug-14		NLUF	LBS	PCRYO ICF 15 SG8		eTransport-J-14A FI-Ellipse-J-14A DTMix-14A	Beg Patel Boehly	11 11 11
2w 18-Aug-14	MIFEDS NLUF 2w	HED DQs	HED no DPP	HED 45 misc	PB BWA	MagShock-J-14B Toto-J-14B CuFmGrowth-J-14B DPEOS-J-14B	Spitkovsky Smalyuk Baker Benage	11 11 11 11
25-Aug-14	PB	DT HED 60SG4	DT ICF 60 SG4	LBS 60 SG4		NIS-14A Cryo-14K StellarRates-14B	Merrill Sangster McNabb	11 11 11
1-Sep-14	Holiday	OHRV	PCRYO ICF 10 SG4	ICF small		PlanarMix-14C SSS-14D	Boehly Theobald	11 11
8-Sep-14	OHRV	OHRV ICF 20 IDI	LBS 6 SG8	20 IDI ICF 6 SG8	HED Calib.	ShockViscosity-14B/SiWaterViscosity-14D SolidH2O-14D/PlanetCore-14D Capseed-14B/SingleXtalHTC-14B	Celliers/Celliers Rygg/Jeanloz Celliers/Fratanduono	11 11 11
15-Sep-14		HED	P6-P7 CEA 36 IDI	P6-P7 CEA 40 IDI		CoaxDiff-14B ImpDyn-14A BaffleCav-14A	Kline Phillip Loupias	11 11 5.5
22-Sep-14								
							Days per quarter	33.0

G10169

Several changes to OMEGA are motivated by "hydro-equivalent" implosion performance

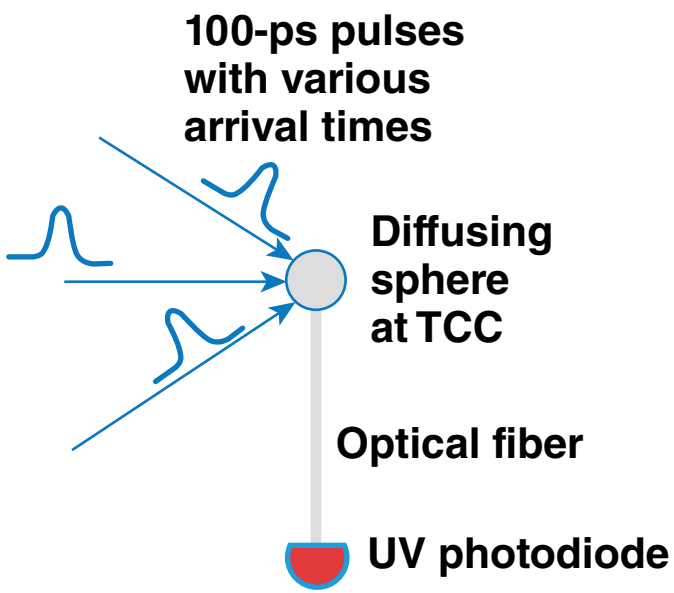
- Recently completed work will be presented in the facility poster session
  - pulse-shaping system replaced for smoothing by spectral dispersion (SSD) driver
  - beam-timing scheme improved
  - power-balance techniques refined
- Projects are underway to mitigate cross-beam energy transfer (CBET)
  -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

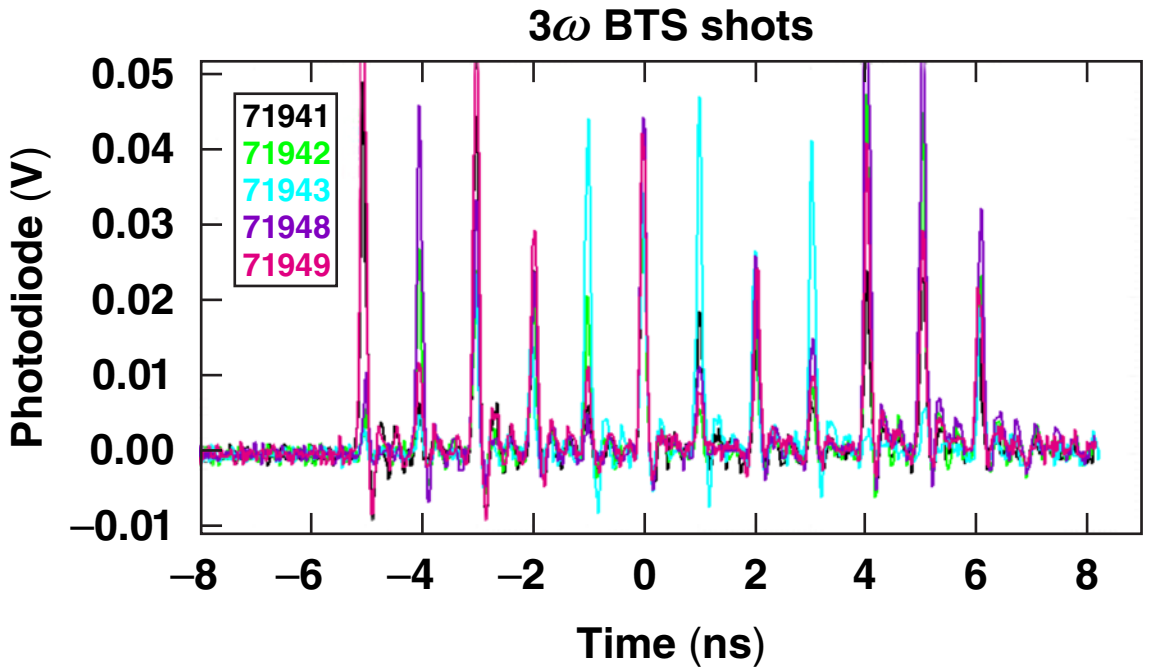
An arbitrary waveform generator (AWG)-based pulse-shaping system adds control precision and flexibility



G10155

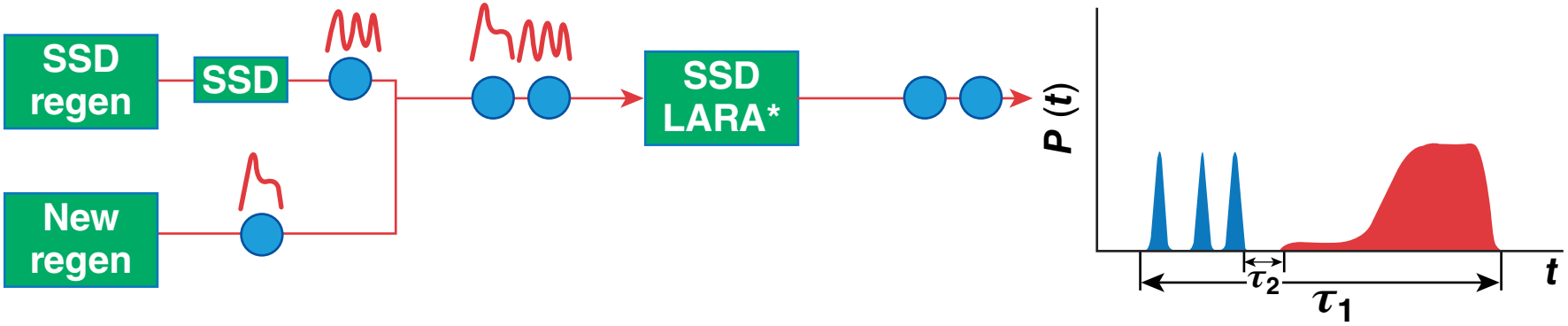
The new 3ω beam-timing system (BTS) utilizes a diffusing sphere at target chamber center (TCC)





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

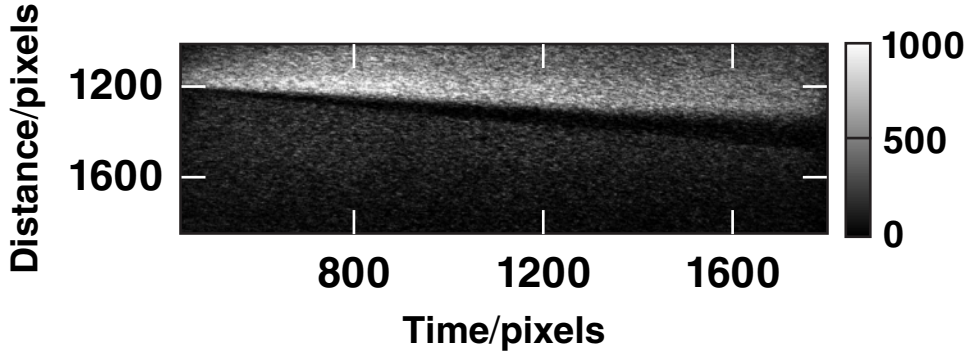
G10158

The diagnostic inventory continues to evolve; new features are underway to benefit all users

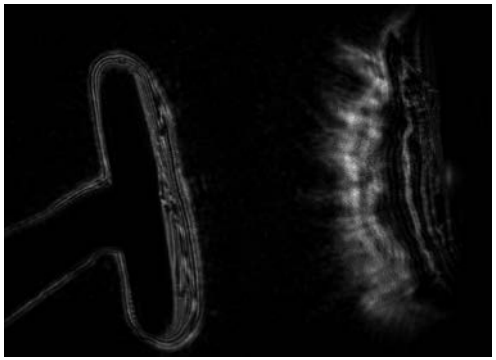
- New target diagnostics—see C. Sorce poster
  - MIFEDS (magneto-inertial fusion electrical discharge system)
  - Thomson scattering
  - NIF x-ray spectrometer (NXS) recently calibrated on OMEGA
  - neutron temporal diagnostic (NTD) revisions in progress
  - neutron diagnostic inserters (NDI's) P11 and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

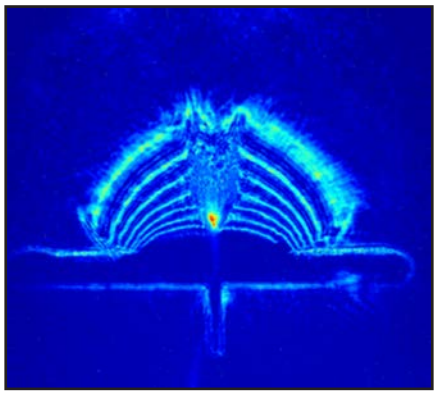
MIFEDS–see D. Mastrosimone poster



Release physics–see P. Nilson presentation



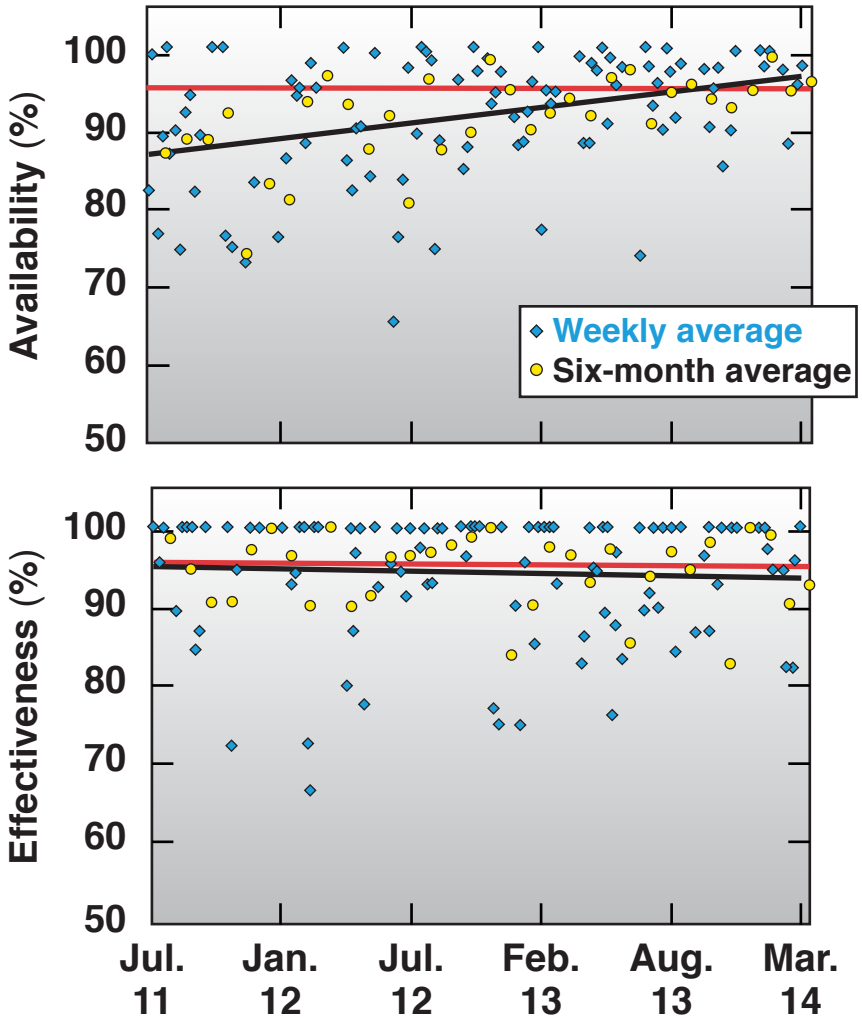
Colliding plasmas



4ω probe, channeling—
see D. Haberberger presentation

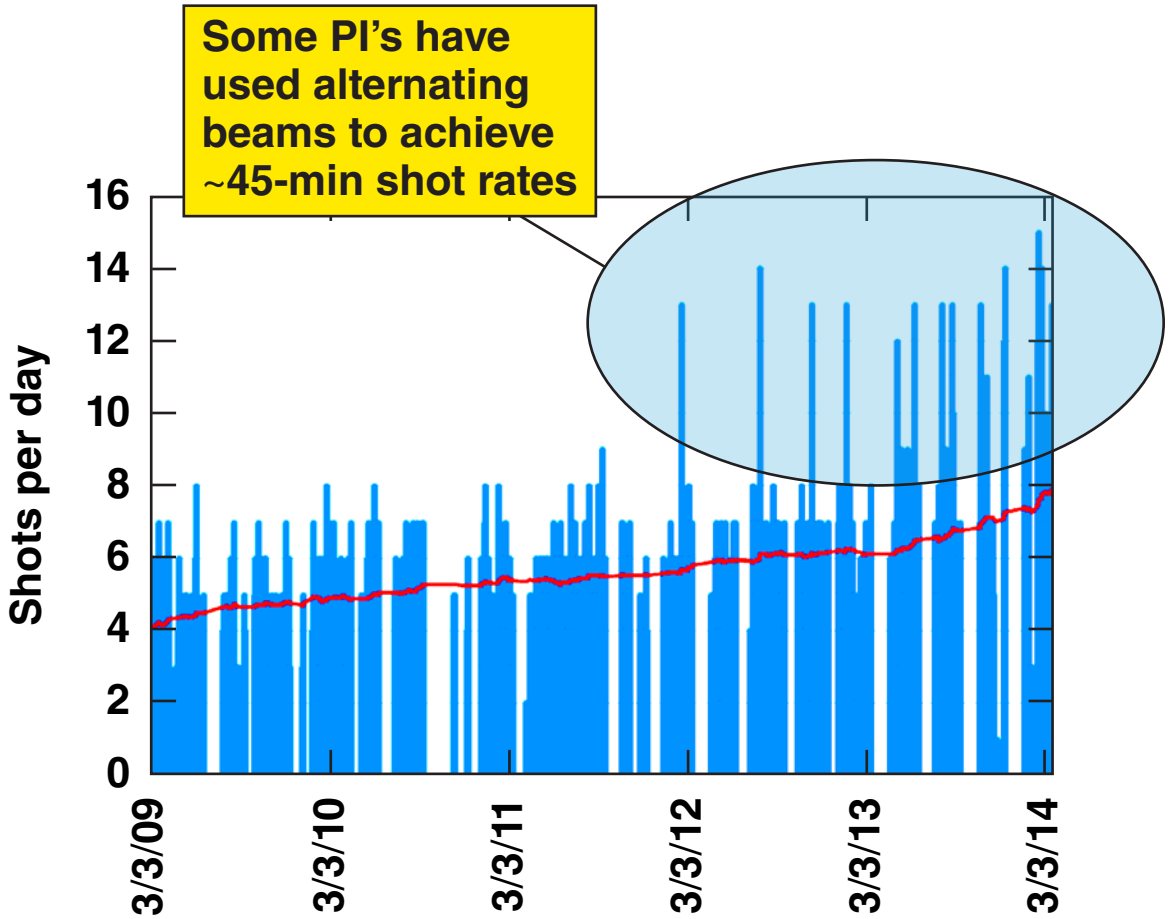
G10160

OMEGA EP continues to maintain high availability and effectiveness



G10161

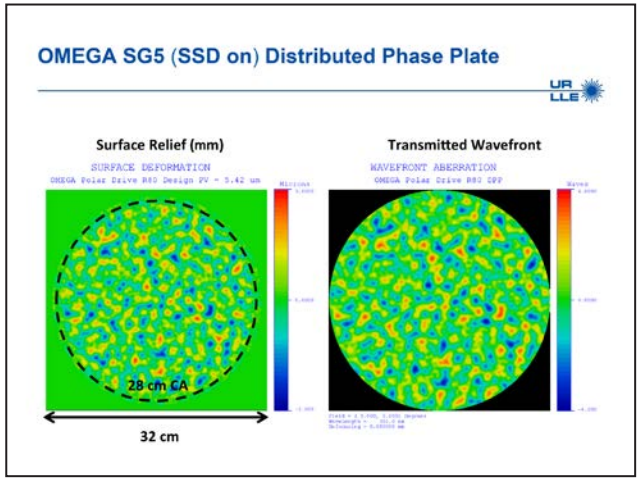
PI shot optimization has significantly increased shots per day

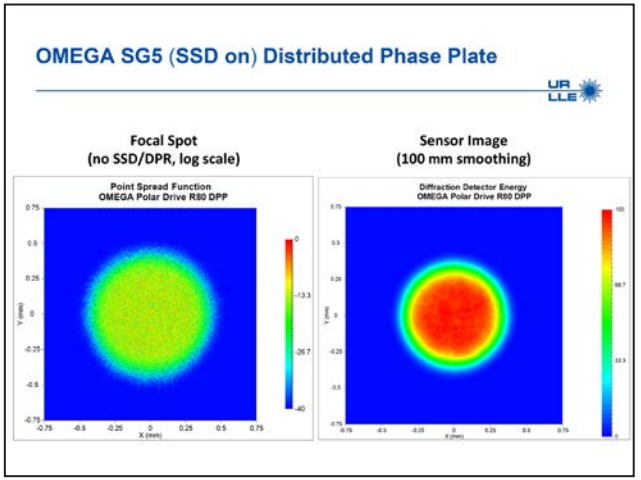


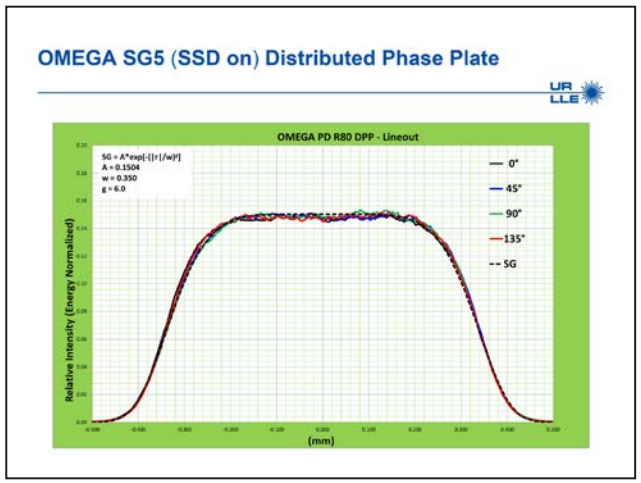
The average shot rate has increased from 6.1, 5.8, and 5.4 for the previous three years.

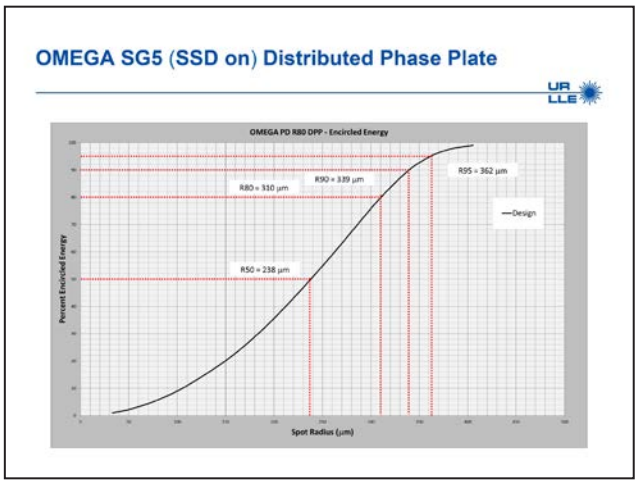
G10163

A new fifth-order super-Gaussian (SG5) phase plate will be available in FY15



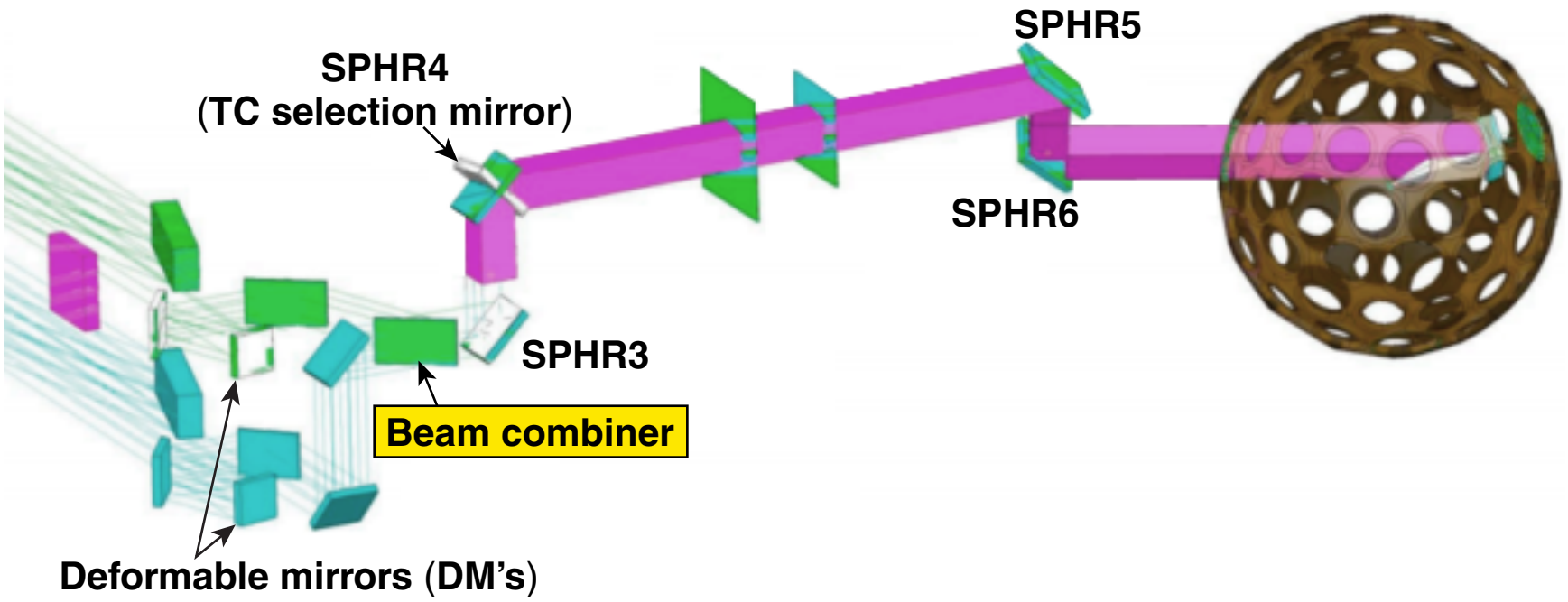






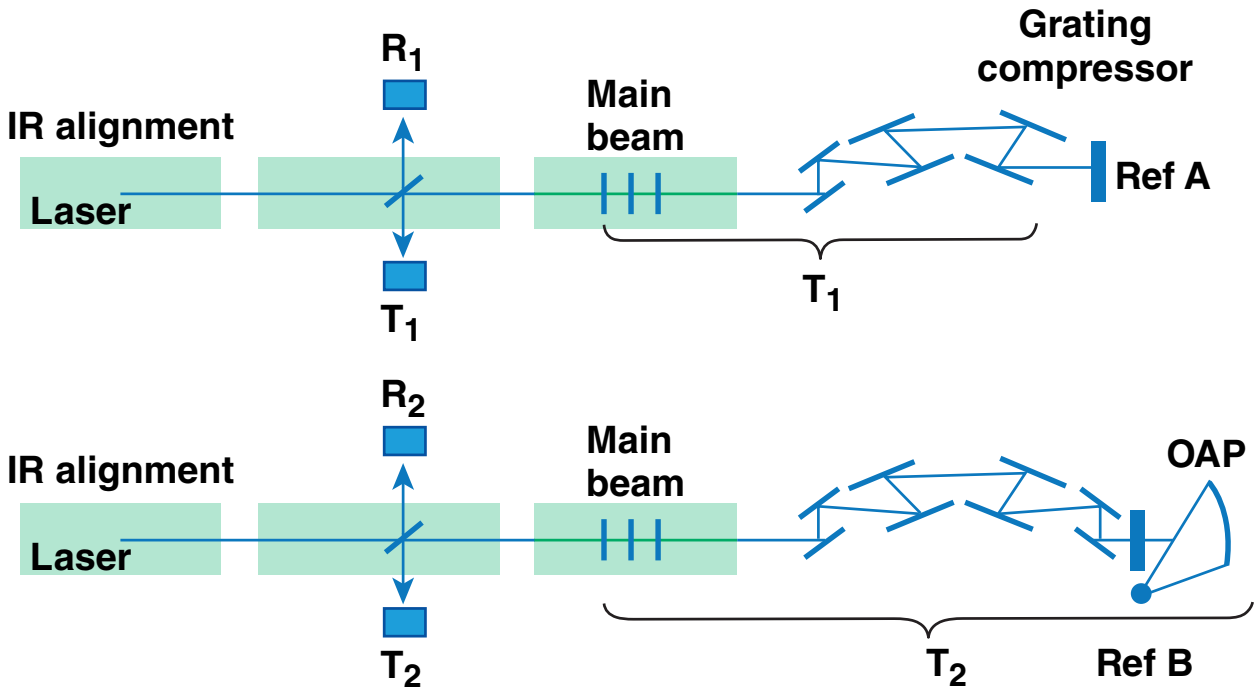
G9869a

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



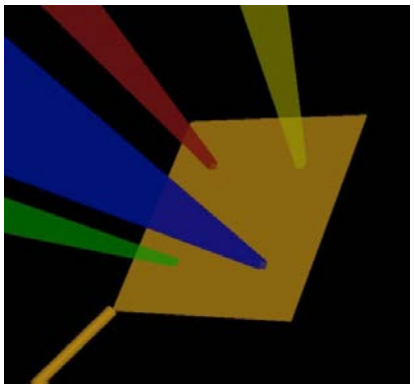
$$\text{OAP transmission } T_3 = \sqrt{\frac{T_2/R_2}{T_1/R_1}}$$

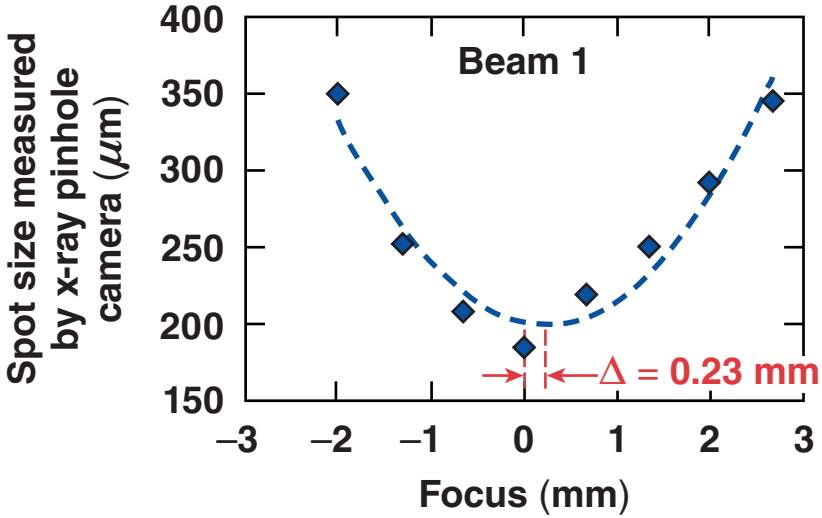
Ref A = Uncoated 4% full-aperture reference
Ref B = Uncoated 4% sphere

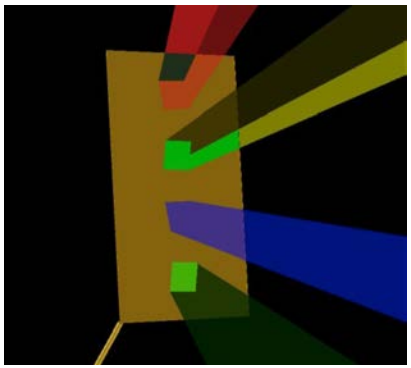
A ratiometer is under construction.

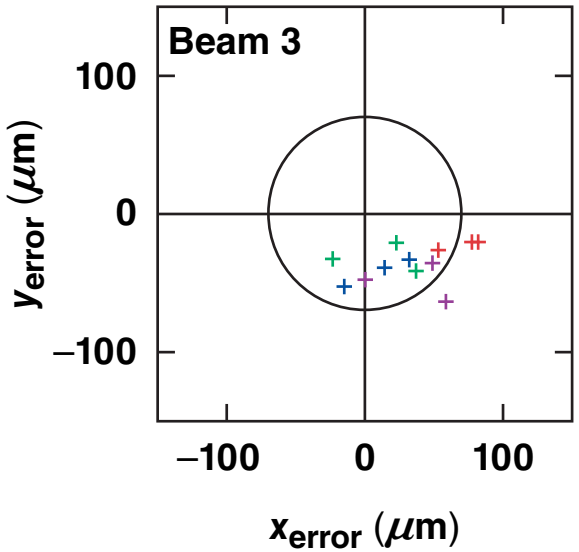
G10166

Improvements have been made to OMEGA EP focusing, pointing, and timing









- Au foil shots are used to measure pointing accuracy and repeatability

G10165

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

Summary/Conclusions

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