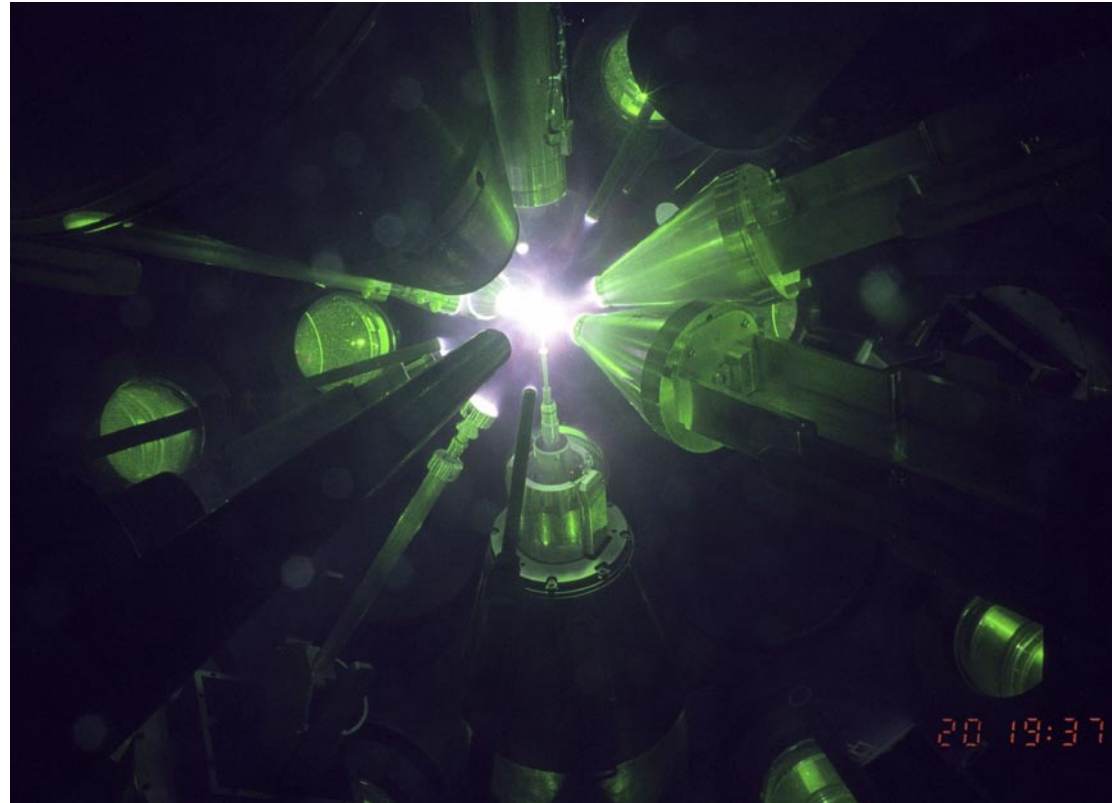


# Diagnostic Status on OMEGA/OMEGA EP

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**University of Rochester**  
**Laboratory for Laser Energetics**

**Omega Laser Facility**  
**Users' Group Workshop**  
**Rochester, NY**  
**29 April – 1 May 2009**

## Summary

# The target diagnostics capabilities on OMEGA/ OMEGA EP (or any other laser) drive the scientific productivity



- Users have access to a broad spectrum of facility diagnostics
  - *Approximately 200 diagnostics are available on OMEGA and 50 on OMEGA EP*
- The status of the facility diagnostics is available online and is frequently updated
- The diagnostic configuration for every shot is established in the Shot Request Form (SRF; available on the OMEGA Operations page)
- Most data can be accessed within minutes following a shot
- LLE maintains a number of diagnostic support facilities

**LLE has a fully documented process for the qualification of new and the upgrade of existing diagnostics (G. Pien).**

# The OMEGA Facility maintains approximately 200 unique diagnostic configurations

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- Facility diagnostics include optical, x-ray, and nuclear instrumentation
- Diagnostics are classified as FIXED, TIM-based, and Neutronics
- Diagnostic specialists can help with the experimental requirements, operations, analysis, and calibration (if appropriate) of the facility diagnostics

**Approximately 10 to 20 diagnostics are being qualified at any given time.**

# Up-to-date information on the availability and expertise associated with the diagnostics is available online



Name 
  Availability

## For FIXED Diagnostics:

ID	Diagnostic	Specialist	Operator	Technician	Status	Note	
208	3-omega Transmitted Beam FIXED (3wTBD)	D. Froula	V. Rekow	C. Sorce	Available	Requires technical support from LLNL	
97	3/2 Spectrometer 1 (3HALF)	C. Stoeckl		R. Bahr	Available		
1	Active Shock Break Out Diagnostic F (ASBO)	T. Boehly	A. Sorce	W. Armstrong	Available	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>LLE is rather acronym intensive ...</b> </div>	
96	CEA XR Diode Array 1 (DMX)	B. Villette	J. Bourgade		Available		
56	Charged Particle Spectrometer 1 (CPS)	R. Petrasso	M. Burke		Available		
57	Charged Particle Spectrometer 2 (CPS)	R. Petrasso	M. Burke		Available		
176	Cryogenic Target Characterization 1 (CTCD)	W. Seka		R. Bahr	Available		
68	Dante 1 (DANTE)	K. Widmann		C. Sorce	Available		Requires LLNL technical support to operate
242	EMP Monitor 1 (EMPMON)	W. Bittle		W. Bittle	Available		
89	Full Aperture Backscatter System 1 (FABS)	W. Seka		R. Bahr	Available		3wSRS streak camera upgraded 8-21-07. 3wSBS streak camera upgraded 10-01-07.
90	Full Aperture Backscatter System 2 (FABS)	W. Seka		R. Bahr	Available		3wSRS & 3wSBS streak cameras upgraded to ROSS cameras w/ calibration modules.
179	Full Aperture Backscatter System 2w (FABS)	D. Froula		R. Bahr	Available		
70	Gated Microscope XR Imager 1 (GMXI)	F. Marshall		F. Marshall	Available	Moved to port H12 September 2006	
94	Hard XR Detector 1-4 (HXRD)	C. Stoeckl			Available		
63	Henway XR Spectrometer 1 (HXRSP)		C. Sorce	C. Sorce	Available	Requires LLNL support	
261	High-Speed Video 1 (HSVideo)	D. Jacobs-Perkins			Available		
66	Kirkpatrick Baez XR Microscope 3 (KBMICRO)	F. Marshall		F. Marshall	Available		
262	LANL Gamma Reaction History Diagnostic 1 (GRH)	H. Herrmann	S. Evans		Available		
236	Magnetic Recoil Spectrometer 1 (MRS)				Available		
181	Near Backscatter Imager 2w (NBI)	D. Froula		C. Sorce	Available	Requires LLNL Tech Support	
180	Near Backscatter Imager 3w (NBI)	R. Bahr		R. Bahr	Available		

<http://omegaops.lle.rochester.edu/diagStatus>

# Up-to-date information on the availability and expertise associated with the diagnostics is available online



## For NEUTRON Diagnostics:

ID	Diagnostic	Specialist	Operator	Technician	Status	Note
247	CVD Neutron Bang-Time Detector 1 (CVDNBT)	V. Glebov			Available	
258	H15 Re-entrant Tube CVD 1-4 (H15DCVD)	T. Duffy			Available	
212	High Yield Neutron Bang-Time Detector 1 (HYNBT)	W. Armstrong		W. Armstrong	Available	
214	LANL LDRD Beta Mix P4G (BMIX)	G. Pien		S. Evans	Available	
216	LANL LDRD Beta Mix SCNT (BMIX)	G. Pien		S. Evans	Available	
215	LANL LDRD Beta Mix SiTel (BMIX)	G. Pien		S. Evans	Available	
238	NIF nTOF detector 1 (NIF-NTOF)	V. Glebov			Available	
41	Neutron Bang-Time Detectors LLE (BTDET)	V. Glebov			Available	
47	Neutron Temporal Diagnostic 1 (NTD)	V. Glebov	C. Stoeckl		Available	
152	Particle Temporal Diagnostic N (PTD)			M. Cruz	Available	
121	Scintillator Counter C 3M NTOF (SCC)	V. Glebov		V. Glebov	Available	
122	Scintillator Counter D 5.4M NTOF (SCC)	V. Glebov		V. Glebov	Available	Cannot be used concurrently with TLDs selected
124	Scintillator Counter E 1.7M NTOF (SCC)	V. Glebov		V. Glebov	Available	
182	Scintillator Counter F 12M NTOF L (SCC)	V. Glebov		V. Glebov	Available	
183	Scintillator Counter G 12M NTOF H (SCC)	V. Glebov		V. Glebov	Available	
255	Scintillator Counter H 2M LARD (SCC)	V. Glebov		V. Glebov	Available	
153	1020 Detector Array 1 (1020_Array)				No Longer Used	
40	Activation Retractor Indium (ACTR)	V. Glebov			No Longer Used	
234	LLNL H7 Gamma Detector 1 (H7GD)				No Longer Used	
75	MEDUSA 1 (MEDUSA)	V. Glebov			No Longer Used	
184	Neutron Fluence Array 1 (NFA)	V. Glebov			No Longer Used	
118	Neutron Temporal Diagnostic Cryo (NTD)	V. Glebov		C. Stoeckl	No Longer Used	
123	Scintillator Counter E 20M NTOF (SCC)	V. Glebov		T. Duffy	No Longer Used	
125	Scintillator Counter F 7.5 Neutron (SCC)	C. Stoeckl		T. Duffy	No Longer Used	
117	Activation Retractor Carbon (ACTR)	V. Glebov			Unavailable	
39	Activation Retractor Copper (ACTR)	V. Glebov			Unavailable	
119	Scintillator Counter A 3M LARD (SCC)	V. Glebov		T. Duffy	Unavailable	
120	Scintillator Counter B 2x2 (SCC)	V. Glebov		T. Duffy	Unavailable	

**Basically just one name to remember!**

# Up-to-date information on the availability and expertise associated with the diagnostics is available online



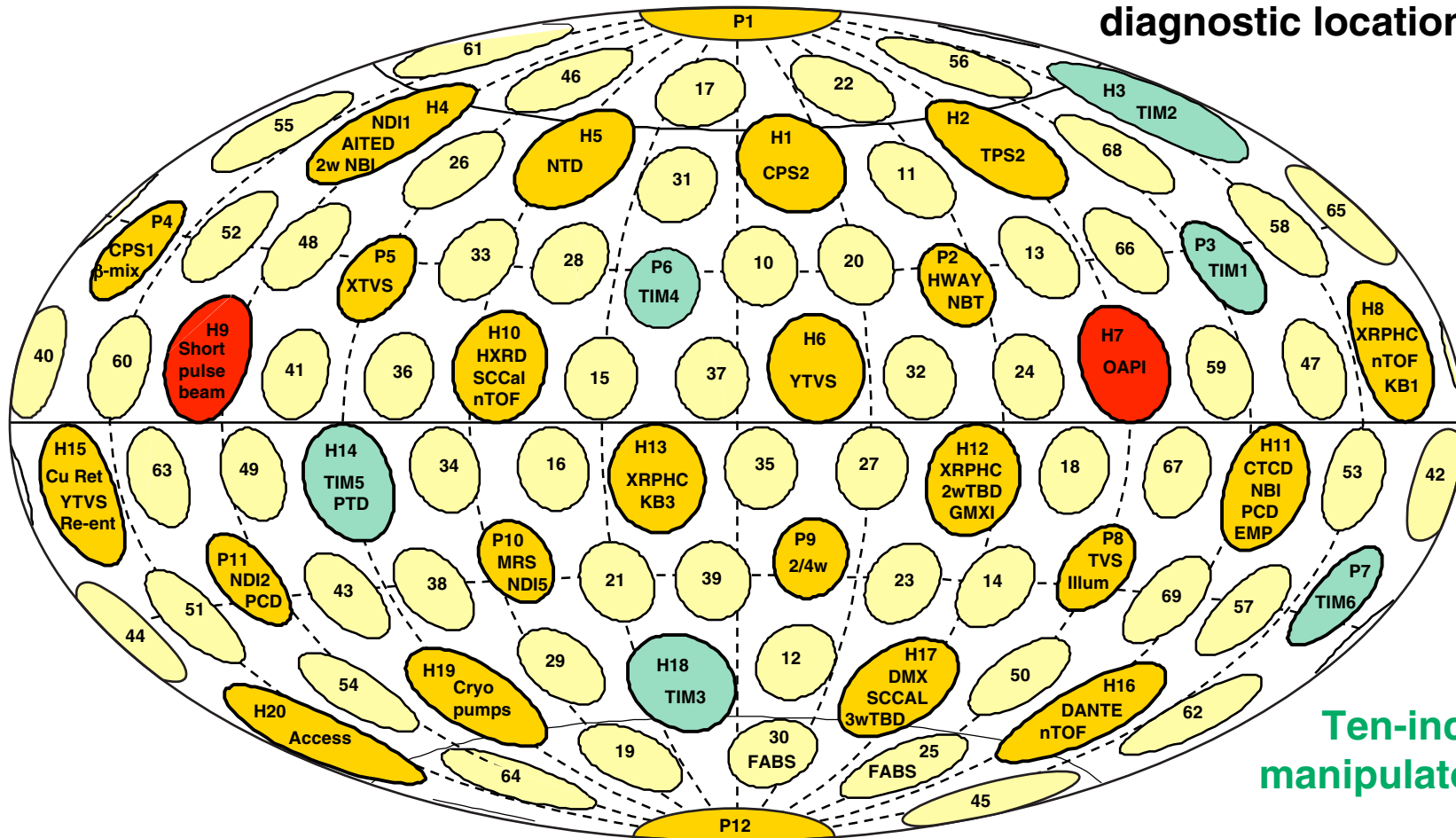
For TIM Diagnostics:

ID	Diagnostic	Specialist	Operator	Technician	Status	Note
186	3-Module Wedge Range Filter Array 1 (WRFMA3)	M. Burke			Available	
187	3-Module Wedge Range Filter Array 2 (WRFMA3)	M. Burke			Available	
188	3-Module Wedge Range Filter Array 3 (WRFMA3)	M. Burke			Available	
189	3-Module Wedge Range Filter Array 4 (WRFMA3)	M. Burke			Available	
190	3-Module Wedge Range Filter Array 5 (WRFMA3)	M. Burke			Available	
191	3-Module Wedge Range Filter Array 6 (WRFMA3)	M. Burke			Available	
207	3-omega Transmitted Beam TIM (3wTBD)	C. Sorce			Available	
192	7-Module Wedge Range Filter Array 1 (WRFMA7)	M. Burke			Available	
193	7-Module Wedge Range Filter Array 2 (WRFMA7)	M. Burke			Available	
194	7-Module Wedge Range Filter Array 3 (WRFMA7)	M. Burke			Available	
195	7-Module Wedge Range Filter Array 4 (WRFMA7)	M. Burke			Available	
196	7-Module Wedge Range Filter Array 5 (WRFMA7)	M. Burke			Available	
197	7-Module Wedge Range Filter Array 6 (WRFMA7)	M. Burke			Available	
160	ASBO Telescope REFR (ASBO_tel)	T. Boehly			Available	
221	AWE SGEMP Detector 1 (AWE_SGEMP)	W. Armstrong	W. Armstrong		Available	
222	AWE SGEMP Detector 2 (AWE_SGEMP)	W. Armstrong			Available	
223	AWE SGEMP Detector 3 (AWE_SGEMP)	W. Armstrong			Available	
224	AWE SGEMP Detector 4 (AWE_SGEMP)	W. Armstrong			Available	
225	AWE SGEMP Detector 5 (AWE_SGEMP)	W. Armstrong			Available	
226	AWE SGEMP Detector 6 (AWE_SGEMP)	W. Armstrong			Available	
213	Air Bubble CVD 1 (CVD_AB)	V. Glebov			Available	
218	Air Bubble CVD 2 (CVD_AB)	V. Glebov			Available	
219	Air Bubble CVD 3 (CVD_AB)	V. Glebov			Available	
231	CEA Vulnerability Diagnostic 1 (CEAVD)				Available	
148	CVD Diamond Detector 1 (DD-RIC)	V. Glebov			Available	
149	CVD Diamond Detector 2 (DD-RIC)	V. Glebov			Available	
150	CVD Diamond Detector 3 (DD-RIC)	V. Glebov			Available	
151	CVD Diamond Detector 4 (DD-RIC)	V. Glebov			Available	
260	Clear LOS to LaCave 1 (Clear_LOS)				Available	
264	Diamond Anvil Cell Target Positioner 1 (DACTP)	C. Sorce			Available	

**Identical versions of some diagnostics are available for multiple TIM's**

# Planning experiments can be complicated...

Aitoff projection with diagnostic locations



Past experience with similar configurations is a good place to start.

# The user interface with the facility is via the Shot Request Form (SRF)



- The laser and diagnostic configurations are specified for each shot using a unique SRF
- Data access is established via the PI fields in the SRF (i.e., the PI's "own" the data)
- Diagnostic priorities include Primary, Secondary, and Ridealong
  - Primary: essential for the experiment (delay shot cycle to fix)
  - Secondary: important for the experiment (consult PI for delay)
  - Ridealong: test mode; operation does not affect schedule
- K. Thorp will describe the SRF interface to the laser



# The available TIM-based diagnostics can be viewed from within the SRF



OMEGA Shot  
Request Form



Go to RID#

This RID#: New

[Facility Status](#)  
[Comments/Problems](#)  
[XOPS](#) [Beamlines](#)  
[Help](#)

[General](#) > [Drivers](#) > [Target](#) > [Beams](#) > **TIM** > [Fixed](#) > [Neutronics](#)

**TIM Configuration** [\(Help\)](#) [XRFC Swap](#)

Setup pages are not needed for Clear\_LOS, FDTFIX, GIXUVS, NRLXUV

	Diagnostic description	Other diagnostic	Priority	Port	Opposing port	
TIM 1	<input type="text"/>	<input type="text"/>	<input type="text"/>	P3	P10	<input type="button" value="Setup"/>
TIM 2	<input type="text"/>	<input type="text"/>	<input type="text"/>	H3	H18	<input type="button" value="Setup"/>
TIM 3	<input type="text"/>	<input type="text"/>	<input type="text"/>	H18	H3	<input type="button" value="Setup"/>
TIM 4	3-Module Wedge Range Filter Array 3 (WRFMA3)	<input type="text"/>	<input type="text"/>	P6	P7	<input type="button" value="Setup"/>
TIM 5	7-Module Wedge Range Filter Array 3 (WRFMA7)	<input type="text"/>	<input type="text"/>	H14	H7	<input type="button" value="Setup"/>
TIM 6	AWE SGEMP Detector 3 (AWE_SGEMP)	<input type="text"/>	<input type="text"/>	P7	P6	<input type="button" value="Setup"/>
	Air Bubble CVD 1 (CVD_AB)	<input type="text"/>	<input type="text"/>			
	Air Bubble CVD 2 (CVD_AB)	<input type="text"/>	<input type="text"/>			
	Air Bubble CVD 3 (CVD_AB)	<input type="text"/>	<input type="text"/>			

- CEA Vulnerability Diagnostic 1 (CEAVD)
- CVD Diamond Detector 1 (DD-RIC)
- CVD Diamond Detector 2 (DD-RIC)
- CVD Diamond Detector 3 (DD-RIC)
- CVD Diamond Detector 4 (DD-RIC)
- Foil Damage Test Fixture 1 (FDTFIX)
- Framed XR Imager 1 (FXI)
- Framed XR Imager 2 (FXI)
- Gas Cherenkov Detector 1 (GCD)
- Gated XR Imager 3 (GXI)
- Gated XR Imager-TRITON 1 (GXI-T)
- Hard XR Spectrometer 1 (HXS)
- High Energy X-Ray Imager 1 (HEXI)
- Indium Activation Holder 1 (IAH)
- LANL Beta Detector 1 (LANLBD)
- LANL Beta Detector 2 (LANLBD)
- LANL Large-Format XRFC 1 (LFC)
- LANL Pinhole Camera 1 (LAPC)
- LANL Pinhole Camera 2 (LAPC)
- LANL Soft XR Framing Camera 1 (3DXRC)
- LANL XR Framing Camera 1 (QXI)
- LLNL Crystal Recovery Diagnostic 1 (CRD)
- LLNL Crystal Recovery Diagnostic 2 (CRD)

[Beam Editor](#) [SRF Auditor](#)

**This will likely be as close as you get to actually touching a diagnostic!**

# Most diagnostics require the completion of a specialized setup sheet



## Setup for GXI-3 (framing camera)

Optics

	Make selections in one column only	
Nosecone Type	<input checked="" type="radio"/> LLE	<input type="radio"/> LLNL
Magnification	Cryo6X-16	
Pinhole Size	8um	
Blast Shield	None	
Frame Type	Straight	
Stand-off Distance		
Roll Angle		
Pinhole Substrate	.001"	
Rear Filter	1 mil Be	
	SXR Rear Filter	

Interstrip Timing

Strip#	Requested delay (ns)
1	0
2	0.3
3	0.4
4	0.6

Internal Settings

Phosphor	3000 Volts
MCP Bias	0 Volts
PFM Type	200 ps

Misc

Acquisition start time (relative to T-0)	3.7 ns
Power Supply	18V DC
Monitor Atten.	-9 dB
Trigger Atten.	-10 dB

Comments/Requirements

Bang time expected about 4.0ns

Steering

Make selections in one row only			
<input checked="" type="radio"/>	Target Chamber Center		
<input type="radio"/>	Radius	um	Theta Phi
<input type="radio"/>	Distance	um toward Port	

Instrument specialists can help!

# Most data can be accessed immediately following the shot (and from “home”) using a web interface

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- All of the facility diagnostic data is recorded in the database
- Database access is granted individually on a shot-by-shot basis
- Film is processed on-site, typically within 30 min of the shot; common to hold the next shot until the film has been examined
- Post-shot software routines are generally available to look at data immediately (may need to contact the instrument specialists)
- Instrument specialists can help with routines to access and analyze data remotely, apply calibrations, timing, pulse shape, etc.
- **Ultimately, the Principal Investigator is responsible for the analysis and interpretation of his/her data**
  - *This may include devoting shots for calibration/flat-fielding, sensitivity response, timing setup, etc.*

# Much of the OMEGA data can be accessed after the shot on the Shot Summary page



## OMEGA Shot Images and Reports



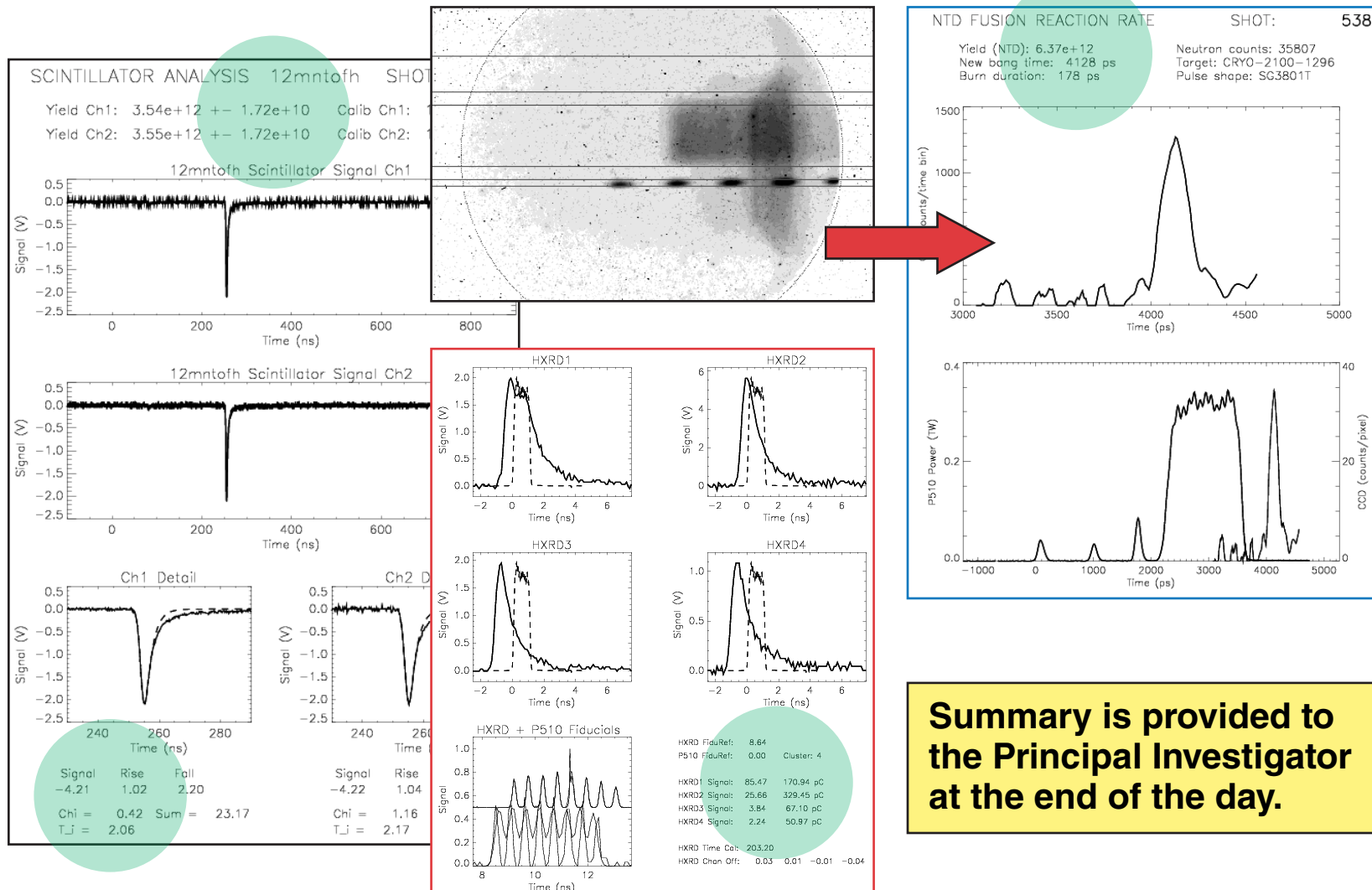
- Site contents:
  - Laser Reports
  - Laser Images
  - Experimental Reports
  - Experimental Images
    - CTCD
    - DANTE
    - GXI
    - KB-CID
      - gmxi\_53066\_a\_cid.hdf
      - gmxi\_53066\_b\_cid.hdf
      - gmxi\_53066\_c\_cid.hdf
      - gmxi\_53066\_d\_cid.hdf
    - NBL\_3w\_SBS
    - NBL\_3w\_SRS
    - NTD
    - PLASMA
    - PTD
    - SBS\_STREAK
    - SCINTILLATOR
    - SRS\_STREAK
    - TMON
    - TPD\_STREAK
    - TVL
    - TVS
    - XRPHC-CID
    - XRS2

### Omega Shot Summary

**Shot:** 53066  
**Date:** 09-Dec-2008 17:22:29  
**Shot Type:** Target High Yield  
**Shot Status:** System Shot

	Requested	On Shot	Associated Report
<b>Shot Request Form ID:</b>	26634		<a href="#">Original Shot Request Form</a>
<b>Experiment:</b>	CRYO		
<b>Principal Investigators:</b>	Sangster, Goncharov, Smalyuk		
<b>Target ID(s):</b>	<a href="#">CRYO-2097-1304</a>	<a href="#">CRYO-2097-1304</a>	
<b>Target Desc:</b>	Strong CD[9.6]DT(67.5) 879.4 Spherical		
<b>Cryo Cart:</b>	MCTC 3		<a href="#">PGR/Driver Report</a>
<b>Pulse shape(s):</b>	SSD: SG3801T	SSD: SG3801T	
<b>SSD Modulation:</b>	max x max	1.46 x 10.92	<a href="#">Beam Termination Diagram</a>
<b>Number of Beams On Target:</b>	60	60	
<b>On-Target Energy Delivered:</b>	22000.0 J	22513.2 J	<a href="#">Energy Report for Beams on Target</a>
<b>Neutron Information:</b>	Neutron Yield: 5.76E+12 +/- 2.19E+10 (12mntofh) Secondary Yield: 0.00E+00 +/- 0.00E+00 () Ion Temperature: 2.1 +/- 0.5 (12mntofh) Bang Time: 4157 +/- 50 (NTD) Burn Width: 154 +/- 25 (NTD)		<a href="#">Online Target Diagnostics Report</a>
	Visible Camera Gated Microscope XR Imager 3/2 Spectrometer Magnetic Recoil Spectrometer Gated XR Imager NIF nTOF detector NIF nTOF6, 3-petal detector Kirkpatrick Baez XR Microscope		

# Fully analyzed neutronics data can be obtained directly from V. Glebov, M. Cruz, or C. Stoeckl



# Not all diagnostics can be operated on a given shot

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- Only six TIM's available on OMEGA (there will soon be six TIM's on OMEGA EP)
- Contamination issues limit the use of some instruments (tritium and beryllium)
- Conflicts with the short-pulse beam paths in OMEGA and OMEGA EP limit what can be put where in the target chambers (conflicts are noted in the SRF's)
- Personnel support may be unavailable (e.g., limited bandwidth to acquire and analyze charged-particle data, set up ASBO, etc.)
- Infrequently, the same diagnostic may be requested on both facilities
- **In general, shot time is most effectively utilized by operating only the diagnostics needed to do the science!**

# Diagnostic support facilities are available for staging the development of new instrumentation

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- **X-ray lab (absolute dc source up to 20 keV)**
- **Diagnostic TIM (test fit, pump down, data acquisition, and HTS channel)**
- **“Ray’s lab” with Manson source, bench space, tools, etc.**
- **Particle diagnostics lab (CR-39 etch/scan)**
- **X-ray/optical film-processing lab**
- **Film-digitization lab (film to electronic images)**
- **Nuclear lab (NaI arrays for Cu/C counting)**

## Summary/Conclusions

# The target diagnostics capabilities on OMEGA/ OMEGA EP (or any other laser) drive the scientific productivity



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- The status of the facility diagnostics is available online and is frequently updated
- The diagnostic configuration for every shot is established in the Shot Request Form (SRF; available on the OMEGA Operations page)
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