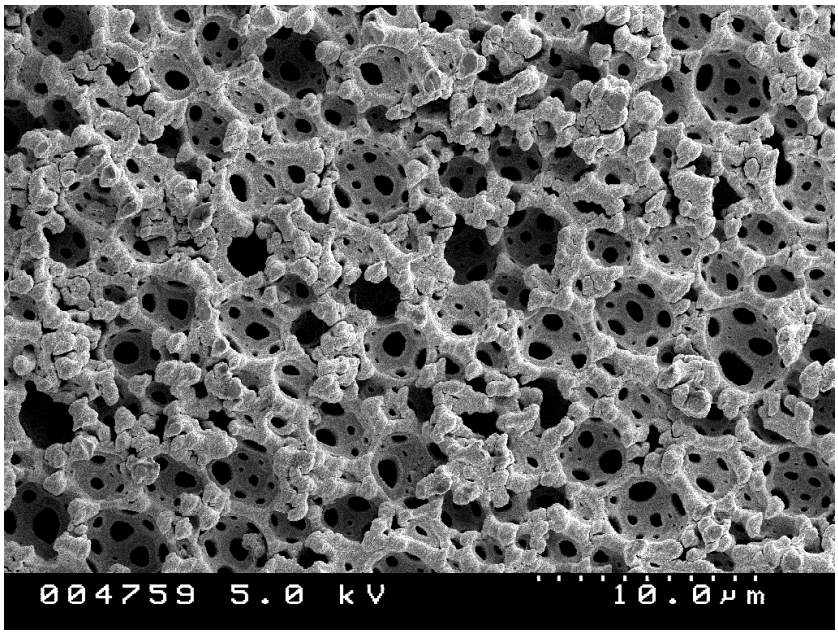
LA-UR-00-113

Direct Drive Experiments
on the
OMEGA Laser
at the
Laboratory for Laser Energetics
of the
University of Rochester



SEM of Gold Foam Surface

Pre-Shot Report
Direct Drive Cylinder Mix (DDCYLMIX) 00-1 and Backlighter Studies
January 17-21, 2000

Los Alamos
ICF and Radiation Physics

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This document is intended to give an overview of this experimental campaign. Where information conflicts with experimental configurations submitted by official methods, those configurations take precedence. Contact the Principal Investigators prior to making any changes in the configuration to accommodate conflicts of information based on this document.

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OVERVIEW

LANL Experimental Week on OMEGA January 17-21, 2000 (DDCYLMIX 00-1 and Backlighters)

Super PI: Cris Barnes (505)665-5687, cbarnes@lanl.gov

Tuesday&Wednesday, January 18-19, 2000: DDCYL Mix
PI: Steve Batha, (505)665-5898, sbatha@lanl.gov
PD: (Mike Dunne, AWE, 011-44-1189-824258, mdunne@awe.co.uk)

Thursday, January 20, 2000: Backlighters
PI: Jonathan Workman, (505)665-1784, workman@lanl.gov

OMEGA will be configured for direct drive (distributed phase plates, LLE blast shields) and the beams pointed for the direct drive cylinder experiments. In addition to the usual 55 beams setup for DDCYLs, the 5 beams around Pent 6 will have their DPPs removed and pointed for use as point backlighters.

At the end of Wednesday, overnight 12 beams around Hex 7 will be repointed and retimed and have their DPPs removed. Four TIM-based diagnostics will have to be setup: the XRFC4 in TIM4 at 12X re-aligned, a streak camera and XRFC2 already aligned both installed, and a low (or no) mag pinhole camera (LAPC) with film-pack.

Diagnostic List for Week

	Campaign Segment		
TIM	DDCYL Mix	DDCYL (Point Backlighter)	Backlighter
1 (Pent 3)			XRFC2 @ 6X
2 (Hex 7)	LXS (Cl)	LXS (Cl)	**LAPC @ 2X**
3 (Hex 18)	XRFC3 @ 6X	XRFC3 @ 6X	
4 (Pent 6)	**XRFC4 @ 12X**	XRFC4 @ 12X	
5 (Hex 14)			XRFC4 @ 12X and 6X
6 (Pent 7)	LAPC @ 2X, QXI @ 8X	**QXI**	SSCA (Fe & Ge)
Pent 2b	Henway	Henway	**Henway**
	Pinhole Cameras	Pinhole Cameras	Pinhole Cameras
	P510s	P510s	P510s
	"FFLEX"	"FFLEX"	"FFLEX"
	Backscatter Calorimetry	Backscatter Calorimetry	
	Prepulse monitors	Prepulse monitors	
	IXRSC	IXRSC	

CYLMIX Experiment

January 18 & 19, 2000

Experimental Team: Steve Batha (P-24), Cris Barnes (P-24), Steve Rothman (AWE)
Design Team: Mike Dunne (AWE), Graham Dillon (AWE)

Goals of the experiment:

Primary:

- Radiograph small diameter static targets for image analysis evaluation
- Observe Richtmeyer-Meshkov induced mix in a compressible material in a convergent geometry

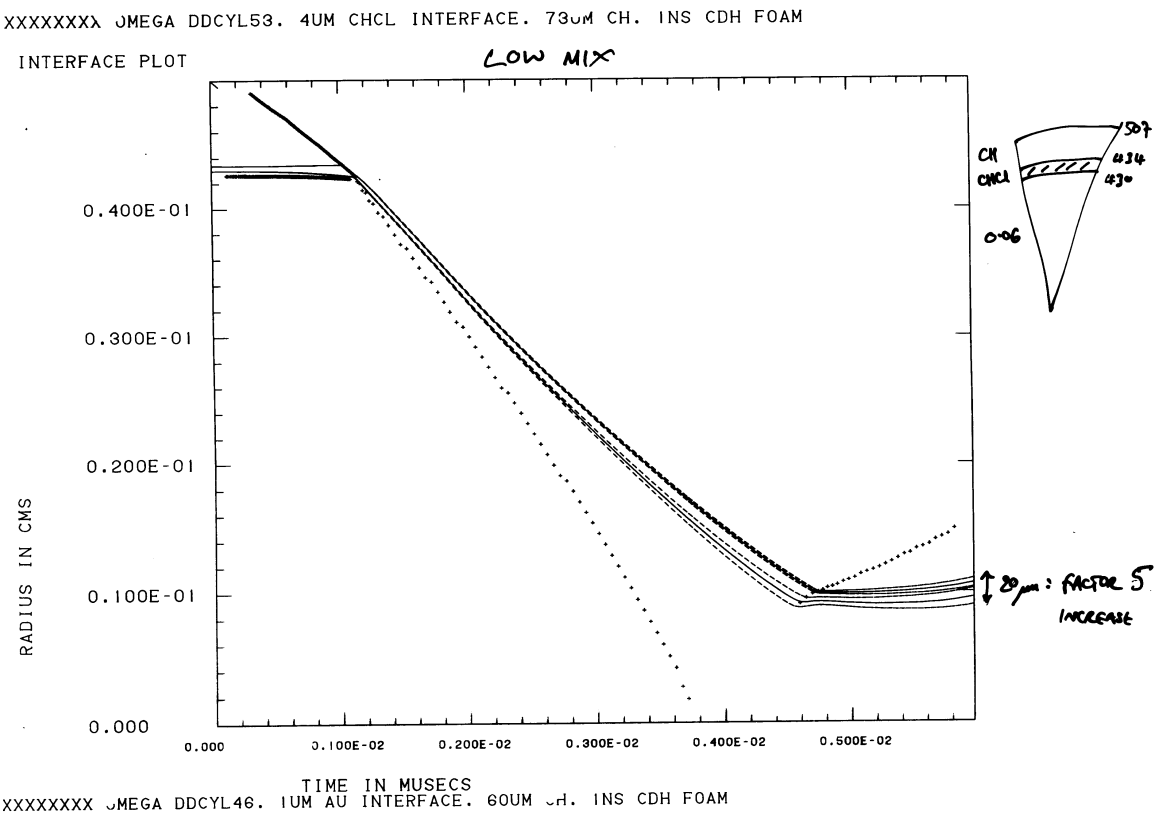
Secondary:

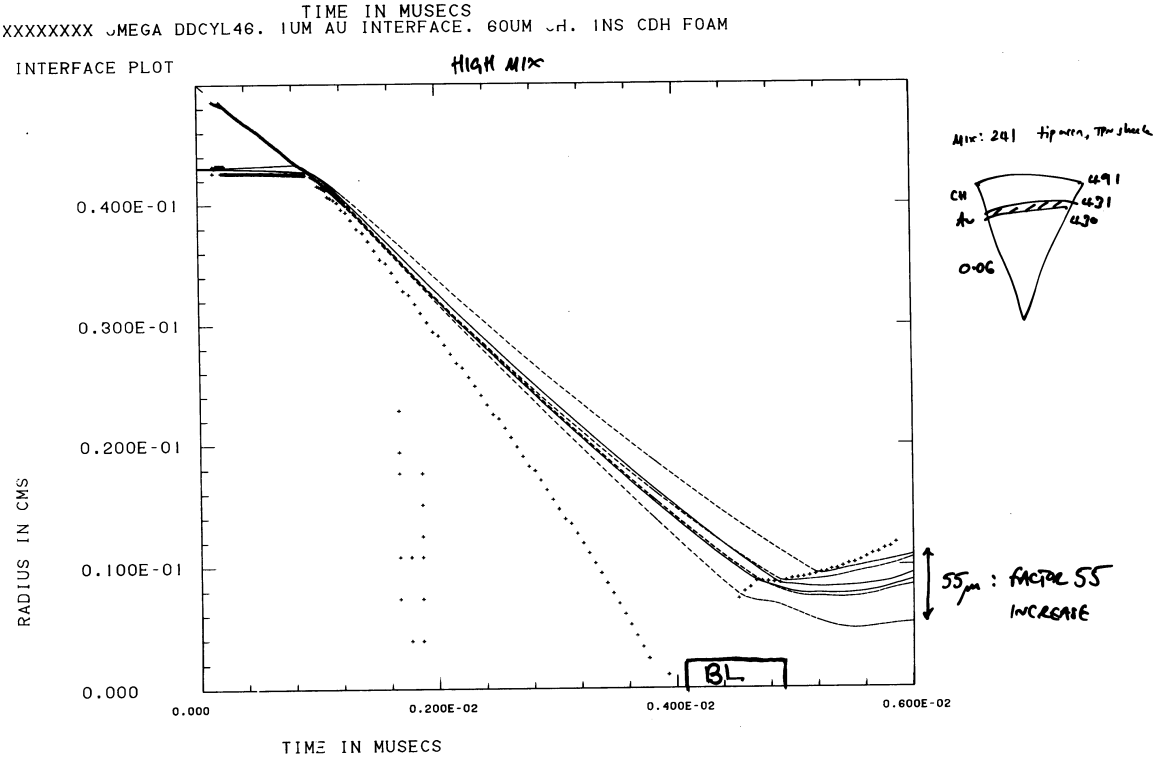
- Initiate LANL program in pinhole-apertured point backlighters (PAPBL)
- Spectroscopy of chlorine-doped foams and marker layers

Bibliography

LA-UR-99-2180	LANL Campaign DD-99-1, May 1999 preshot report
LA-UR-99-6446	LANL Campaign DD-99-1, May 1999 postshot report
LA-UR-99-6286	"AWE Experiments on Laser-Driven Mix in Planar and Convergent Geometry"
P-24-2000-009	"Final Target Request for Direct Drive Cylindrical Mix Experiment on OMEGA the week of January 17, 2000"

Mix Target Calculations





Experimental Template

- Experiment title, principal investigator's name, and, if related to LLE direct-drive experimental program, which category (i.e., ISE, RTI, etc.) the experiment falls under, and planned shot dates.

Title: CYLMIX: Richtmyer-Meshkov Induced Mix
PI: Steve Batha
Date: January 18 & 19, 2000

- Summary of the experiment's objectives.

  Primary Objectives:
  1. Radiograph small diameter static targets for image analysis evaluation
  2. Observe Richtmyer-Meshkov induced mix in a compressible material in a convergent geometry.

  Secondary Objective:
  3. Initiate LANL program in pinhole-apertured point backlighter (PAPBL) technology.

- Laser conditions required for the experiment:

  - Pulse shape *SG1011 (1 ns square) and RM2001 (2.5 ns ramp)*
  - SSD, DPP, and DPR conditions
    - *Remove DPPs from 5 beams around P6 (10, 15, 28, 31, 37)*
    - *All other DPPs in*
    - *DPR in beam 50 remains in*
    - *Maximum SSD available (1.5Å x 3Å).* ***Use no SSD on PAPBL targets with focussed backlighter beams.***
  - Power/energy balance *Nominal 450 J/beam, reasonable effort on beam balance*
  - Number of beamlines and target pointing summary requirements
    - *50 beamlines in cylindrical illumination geometry timed at t_0*
    - *5 beams (42, 44, 53, 57, 62) pointed 1.625 mm towards P7(θ = 116.6°, ϕ = 162.0°)*
    - *5 beams (10, 15, 28, 31, 37) pointed 16.4 mm towards P6 (θ=63.44°, ϕ=342°), with three beams (10, 28, 31)up 0.5 mm (θ=61.70°) and two beams (15, 37) down 0.5 mm (θ=65.20°).*
  - Backlighting requirements and beam timing delays
    - *2 sets of backlighter beams with different delays on each day*
    - *January 18: BL set 1 (42, 44, 53, 57, 62) delayed 4.0 ns*
    - *January 18: BL set 2 (10, 15, 28, 31, 37) delayed 4.0 ns*
    - *January 19: BL set 1 (42, 44, 53, 57, 62) delayed 2.0 ns*
    - *January 19: BL set 2 (10, 15, 28, 31, 37) delayed 4.0 ns*
  - Special laser conditions *None.*

1) Diagnostics required and target chamber port assignments (indicate any non-LLE-provided diagnostics).

LANL will supply the QXI and LAPC diagnostics.
Other Diagnostics requested:

- The IXRSC in port H3F is a primary diagnostic on all shots with drive beams on. Minimal filtration required, starting at 0 ns.
- Static PHCs are required with minimal filtration.
- SBS backscatter calorimeters on both beamlines.
- P510 pulse shape measurements on all shots.

TIM	PORT	Diagnostic	Priority/Purpose
1	P3		
2	H7	LSX	2/Cl lines
3	H18	XRFC3	2/Transverse view
4	**P6**	**XRFC4**	**1/Primary end-on view**
5	H14		
6	P7	QXI (2x, 8x, no snout), LAPC	**QXI primary for PAPBL shots.** LAPC priority 2.
		IXRSC	**1/implosion trajectory**
		Henway	2/backlighter spectra

2) Type and number of targets including number of spares (this section must be completed even if using non-LLE-provided targets). NOTE: if special targets are required, they must be specified more than two months in advance. Additionally, special target geometries may require metrology prior to delivery to LLE and verification after arrival at LLE using LLE's Powel scope.

Two pointing targets will be required from LLE target fabrication.

All other targets will be constructed by LANL. Twenty (20) new cylinder targets have been requested. In addition, up to 6 "old" targets will be remounted. Cylinder targets consist of three pieces: a cylinder approximately 1 mm OD and 2 mm long, a 2 mm OD backlighter disk cantilevered off one end, and a view-blocking aperture cantilevered from the opposite end.

Since these targets have not been used with the H2 target positioner, a test target was delivered to LLE for alignment tests. These tests have been completed satisfactorily.

3) Number of required laser shots.

20 laser shots will be required. This experiment has been allotted 2 full days minus any facility time needed to prepare for the backlighter experiments on January 20.

VII. Special shot schedule considerations associated with experiment.

Diagnostics will not change port locations during these two days of shots. However, TIM 6 will be a very active location. The QXI will need to be timed at several different magnifications, including without a snout. QXI is the primary diagnostic for the pinhole-apertured point backlighter (PAPBL) shots.

When the PAPBL targets are shot, they face the opposite direction from the rest of the targets. That is, the backlighter is on the P6 end of the target rather than on the P7 end. Different backlighter beams will be used for those shots as well.

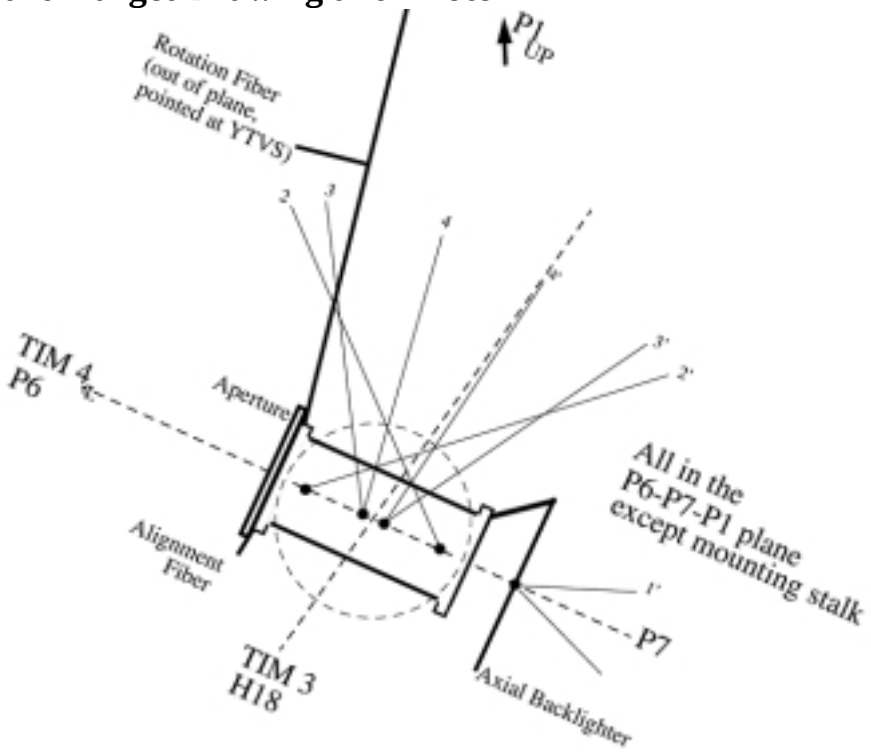
Also, the LAPC (Los Alamos Pinhole Camera) will replace the QXI for a few shots

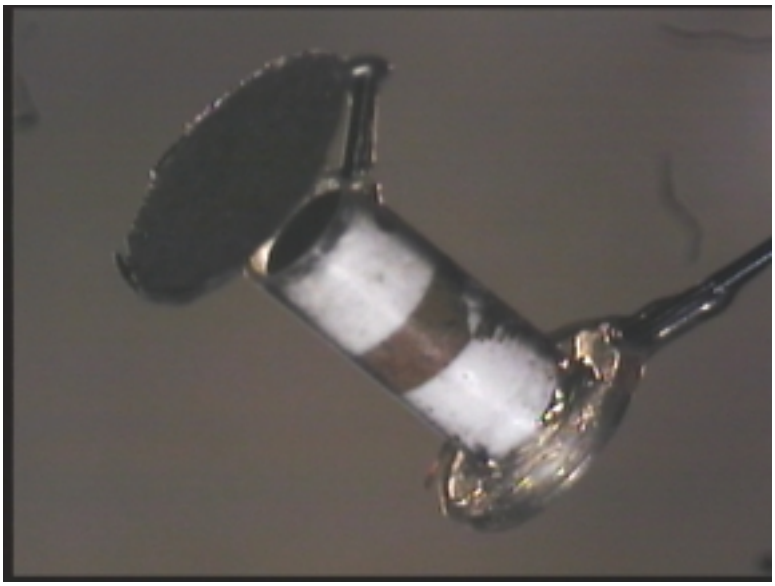
Laser Beam Pointing by beam groups

Beam Pointing by beam groups CYLMIX Experiments: January 18 & 19, 2000								
	Group #	Beams	Focus	Direction	R (mm)	Theta (deg)	Phi (deg)	Delay (ns)
	2	40,45,47,51,69	0.0	P6	0.720	63.4	342.0	0.0
	2'	16,17,20,33,35	0.0	P7	0.720	116.6	162.0	0.0
	3	11,21,22,26,27,32,34,36,39,46	0.0	P6	0.108	63.4	342.0	0.0
	3'	25,50,54,58,59,60,63,64,65,67	0.0	P7	0.108	116.6	162.0	0.0
	4	12,13,23,24,29,38,41,48,56,61	0.0	P6	0.108	63.4	342.0	0.0
	4'	14,18,19,30,43,49,52,55,66,68	0.0	P7	0.108	116.6	162.0	0.0
	BL1	42,44,53,57,62	0.0	P7	1.625	116.6	162.0	4.0 (Tues)
			0.0	P7	1.625	116.6	162.0	2.0 (Weds)
	BL2	15,37	400 μm spot	P6	16.408	65.2	342.0	4.0
	BL2'	10,28,31	400 μm spot	P6	16.408	61.7	342.0	4.0

Targets

Standard Target Drawing and Photo



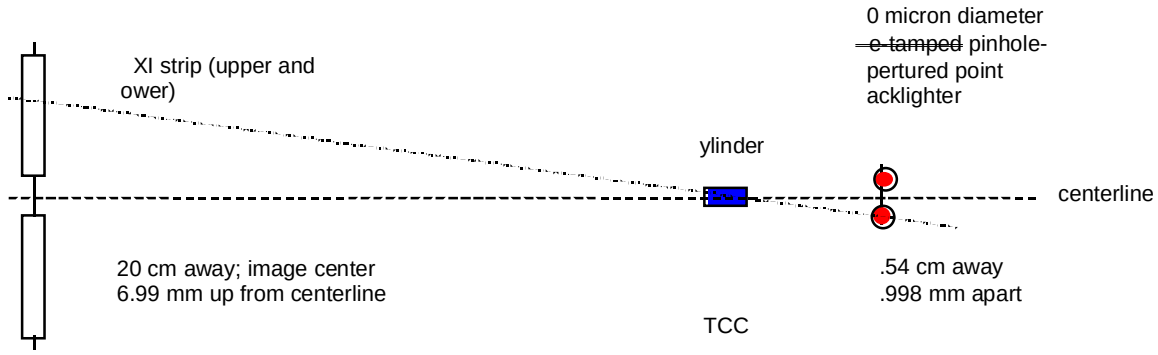


Standard CYLMIX (high-mix) target showing backlighter at upper left, marker/mix layer band in center, and leaded-acrylic aperture at lower right end. The mounting stalk going to the H2 TPS2 is attached to the aperture. The XYZ alignment fiber is on the aperture near the bottom in back.

Pinhole Apertured Point Backlighter (PAPBL) Tests

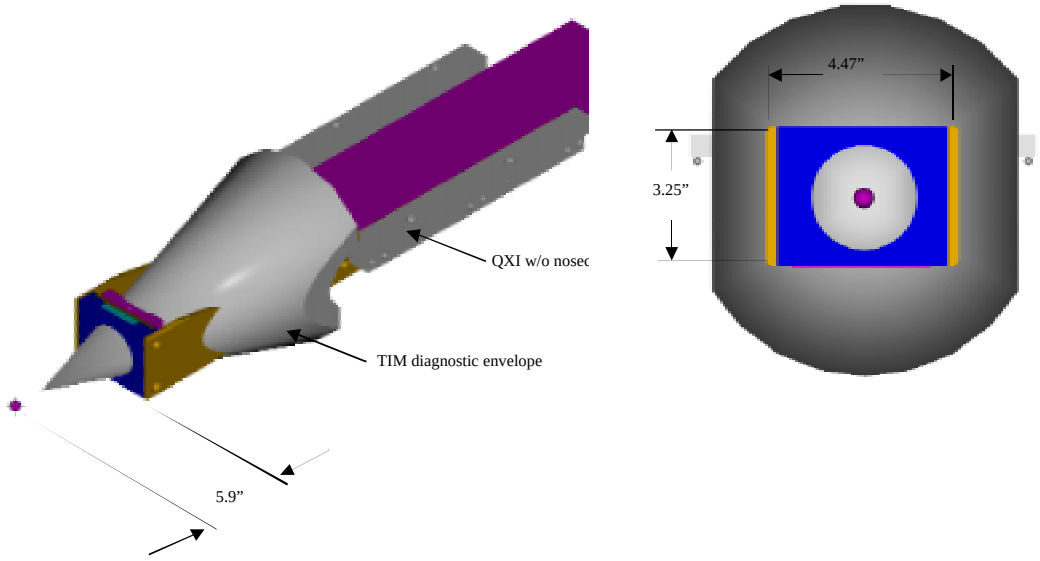
During the DDCYL00-1 campaign in January 18-20, 2000 we are planning a test of x-ray imaging using LLNL-designed Pinhole-Apertured Point BackLighter (PAPBL) arrays. To detect these x-rays we will use the QXI two-strip module; each strip will fire at some time during the emission from the appropriate PAPBL to create a single image. The shots will image a direct-drive cylinder undergoing implosion.

The cylinder image is up to 1014 microns in diameter; however the key physics region that we can backlight through is approximately 800 microns in diameter. I want to keep the parallax from the two point sources relative to the cylinder axis to less than 2 degrees. The QXI strips are a bit over "double-wide" and are 15 mm across. There is a 2.78-mm gap between the strips. The five beams around Pent6 on OMEGA (beams 10, 15, 28, 31, and 37) can only be focussed a distance approximately 17.9 mm from TCC, and this number varies up to a millimeter and a half in time[*], which is a significant design constraint. I design to a 16.4-mm defocus distance which should be good over time. The distance F of the pinhole to TCC is going to be 16.4-1=15.4 mm assuming a 1.0-mm distance from backlighter foil to pinhole substrate. Since the height of the center of the image H needs to be above the centerline by (0.8xM+2.78)/2, and the detector distance D must be greater than H/tan2^o, and the magnification itself is (D+F)/F, then the magnification needs to be greater than [2.78+2Ftan2^o]/(2Ftan2^o-0.8)=13.99 for F=15.4. So we will operate actually at (200+15.4)/15.4=14X magnification with the detector 200 mm from TCC. In keeping with the preliminary design for a NIF point backlighter, I wanted to operate at a magnification M of about 12, so this works out well (but choosing a reduced image region closer to the centerline). The point backlighter array is then placed 15.4 mm on the other side. The image center will be H=(0.8*14+2.78)/2=6.99 mm above the centerline. Each pinhole should be 6990/14=499 microns from the center line, or 998 microns between them (call it a round 1000 microns).



At 20 cm from TCC the detector just barely violates the TIM diagnostic envelope. We will be using TIM6 in Pent 7; by "turning the cylinder around" and mounting the backlighter in the opposite direction we don't affect the XRFC4 in TIM4, and we can have the otherwise unused beams pointed at this 1.64 cm away location for the point backlighter. In either case the 5 laser beams around the pent port of the diagnostic are not fired and hence do not affect the envelope. According to the review no other diagnostics will conflict with this setup.

[*] Phone conversations with Keith Thorp, November, 1999.



Violation of TIM-diagnostic envelope for detector at 15 cm (5.9”). Diagnostic space envelope defined by 16º solid angle set back 1.6”. There is no interference when defined at TCC. At 20 cm things are even less problematic.

Now I calculate the size of the leaded-acrylic aperture needed. It will be located at the far end of the cylinder from the backlighter, on the side towards QXI as usual.[#] Thus it will be 15.4+1.125=16.525 mm from the backlighter. The top of the QXI strip is 15+2.78/2=16.39 mm from the centerline, or 16.39-0.499=15.89 mm above the offset position of the PAPBL, and is 200+15.4=215.4 mm from the PAPBL. Thus the aperture shield needs to block a ray that is

$$0.499 + (16.525/215.4)*15.89 = 1.72 \text{ mm}$$

above the centerline. Thus we need a leaded-acrylic aperture that, instead of the usual 1500 micron diameter, is actually 3440 microns in .

Addition by SHB (12/3/99): The inner diameter of the aperture must be small enough to block light from the wrong pinhole hitting the bottom of the strip, but must be large enough so that it does not obscure the desired image. The minimum ID of the washer is:

$$2*\{[(16.525+0.2)/(16.525-1.125)]*[0.5+(0.8/2)]-0.5\} = 0.955 \text{ mm},$$

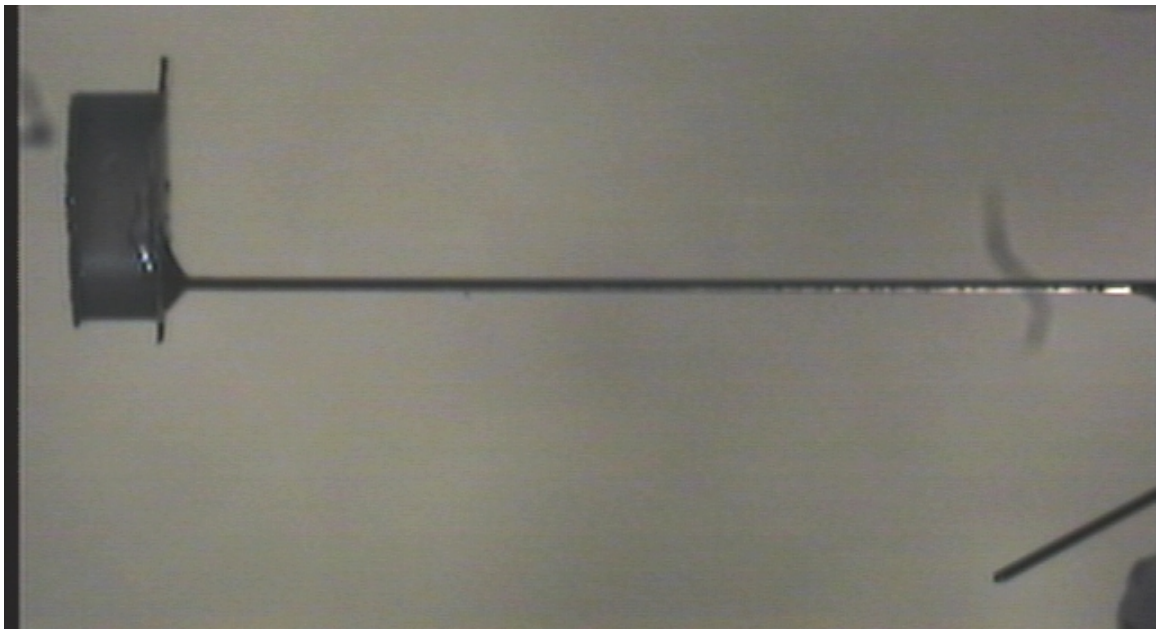
where I assume that the cylinder is 0.8 mm in diameter at the time of interest and the point of interest is the center of the cylinder, 1.125 mm from the aperture. The aperture is assumed to be 0.2 mm thick. The maximum ID of the aperture is:

$$2*\{0.5+(16.525/215.4)*[(2.78/2)-0.5]\} = 1.137 \text{ mm}$$

[#] There was a major problem with this design. This oversized (compared to standard DDCYL targets) leaded-acrylic aperture needs to be offset from the cylinder towards the camera, or it blocks drive beams. For the January 2000 shots we will have to turn off cone 2’ beams from that side and possibly cone 3’.

Therefore, choose an inner diameter of 0.98 +/- 0.01 mm and an outer diameter of 3.50 +/- 0.01 mm.

The PAPBL alignment target showing, starting at the right, the leaded-acrylic washer, the high-mix cylinder, the alignment fiducial (at the top left corner of the cylinder), the mounting stalk (directed to the bottom of the figure), the rotation flag on the mounting stalk, and the backlighter boom extending off to the left.



The PAPBL alignment target showing, starting at the right, the backlighter boom, the square Ta foil that has the pinholes in it, the 1 mm spacer, and the Ti backlighter foil at the far left.

Target Table for DDCYL targets

DYNAMIC Targets:

Target	Target Name	descriptor	Perturbation	Tracer	foam fill	Flash Coating	backlighter	aperture
#1-2 low mix	DDCYL 1 Gold 1-2Yellow	**73 μm CH (1014 μm OD)**	unperturbed	4 μm $C_8H_6Cl_2$	60 mg/cc CH	Yes	6 μm Ti/1 mil Be (cyl. side) Axial mount	Pb-plastic washer XRFC side
#3 low mix	DDCYL 1 Gold 3 Yellow	**73 μm CH (1014 μm OD)**	unperturbed	4 μm $C_8H_6Cl_2$	60 mg/cc CH	Yes	6 μm **Fe**/1 mil Be (cyl. side) Axial mount	Pb-plastic washer XRFC side
#4-6 high mix	DDCYL 2 Gold 1-3Yellow	**60 μm CH (980 μm OD)**	unperturbed	**1 μm Au over foam**	60 mg/cc CH	Yes	6 μm Ti/1 mil Be (cyl. Side) Axial mount	Pb-plastic washer XRFC side
#7-9 high mix defect	DDCYL 3 Gold 1-3Yellow	**60 μm CH (980 μm OD)**	**w/wire defect** unperturbed	**1 μm Au over foam**	60 mg/cc CH	Yes	6 μm Ti/1 mil Be (cyl. Side) Axial mount	Pb-plastic washer XRFC side
#10-12 high mix PAPBL	DDCYL 1 Blue 1-3Yellow	**60 μm CH (980 μm OD)**	unperturbed	**1 μm Au over foam**	60 mg/cc CH	Yes	PAPBL TBD	Pb-plastic washer XRFC side
#13	Be Cyl	Dropped						
#27	Plain 2 Blue 1 Yellow	**60 μm CH (980 μm OD)**	unperturbed	None	60 mg/cc CH	Yes	6 μm Ti/1 mil Be (cyl. Side) Axial mount	Pb-plastic washer XRFC side

STATIC Targets:

Target	Target name	Outer Diameter	Inner Diameter	Perturbations	Attenuator	backlighter	aperture
#14-15	DDCYL 1 Silver 1-2Yellow	525 μm	400 μm	25 μm grooves, m=14	250 μm thick CH	6 μm Ti/1 mil Be (cyl. Side) Axial mount	Pb-plastic washer XRFC side
#16	DDCYL 2 Silver 3Yellow	525 μm	400 μm	25 μm grooves, m=14	None	6 μm Ti/1 mil Be (cyl. Side) Axial mount	Pb-plastic washer XRFC side
#17-20	DDCYL 3 Silver 1-4Yellow	325 μm	200 μm	25 μm grooves, m=14	250 μm thick CH	6 μm Ti/1 mil Be (cyl. Side) Axial mount	Pb-plastic washer XRFC side

REMOUNT Old Targets:

Target	Target name	descriptor	Perturbation	Tracer	foam fill	Flash Coating	backlighter	aperture
#21,28	DDCYL 1 Red 2,5 Yellow	16 μm CH (900 μm OD)	unperturbed	4 μm $C_8H_6Cl_2$	60 mg/cc CH	Yes	6 μm Ti/1 mil Be (cyl. side) Axial mount	Pb-plastic washer XRFC side
#22, 24, 25	DDCYL 1 White 2,4,7 Yellow	26 μm CH (920 μm OD)	unperturbed	4 μm $C_8H_6Cl_2$	60 mg/cc CH	Yes	6 μm Ti/1 mil Be (cyl. side) Axial mount	Pb-plastic washer XRFC side
#26	DDCYL 1 Green 3 Yellow	20 μm CH (900 μm OD)	unperturbed	No marker	60 mg/cc CHCl	Yes	none	Pb-plastic washer XRFC side

Shot Schedules

SHOT SCHEDULE: Tuesday, January 18, 2000

	Target	Pulse Shape	Drive Beams	BL Set 1	BL Set 2	TIM 6
1	Pointing	1 ns square (SG1011)	On	Off	Off	QXI @ 2x
2	Pointing	1 ns square (SG1011)	On	Off	Off	QXI @ 2x
3	AWE Low Mix	1 ns square (SG1011)	On	4.0 ns delay	Off	QXI @ 8x
4	AWE High Mix	1 ns square (SG1011)	On	4.0 ns delay	Off	QXI @ 8x
5	AWE defect	1 ns square (SG1011)	On	4.0 ns delay	Off	QXI @ 8x
6	Pause	*Pause*	*Pause*	*Pause*	*Pause*	*Pause*
7	PAPBL	1 ns square (SG1011)	On, set 2'&3' off	Off	4.0 ns delay	QXI no snout
8	AWE Low Mix/Fe	1 ns square (SG1011)	On	4.0 ns delay	Off	LAPC – Fe
9	AWE defect	1 ns square (SG1011)	On	4.0 ns delay	Off	LAPC – Ti
10	Static – large dia.	Ramp (RM2001)	Off	4.0 ns delay	Off	QXI @ 8x
11	Static – small dia.	Ramp (RM2001)	Off	4.0 ns delay	Off	QXI @ 8x

* Contingency shots at end of day will be more static targets.

Between Tuesday and Wednesday, the timing of BL set 1 (beams 42, 44, 53, 57, and 62) changes to a delay of 2.0 ns (from a delay of 4.0 ns).

SHOT SCHEDULE: Wednesday, January 19, 2000

	Target	Pulse Shape	Drive Beams	BL Set 1	BL Set 2	TIM 6
1	PAPBL	1 ns square (SG1011)	On, set 2' off	Off	4.0 ns delay	QXI no snout
2	PAPBL	1 ns square (SG1011)	On, set 2' off	Off	4.0 ns delay	QXI no snout
3	AWE High Mix	1 ns square (SG1011)	On	2.0 ns delay	Off	QXI @ 8x
4	Static – small dia.	Ramp (RM2001)	Off	2.0 ns delay	Off	QXI @ 8x
5	Pause	*Pause*	*Pause*	*Pause*	*Pause*	*Pause*
6	*Static – large dia.*	Ramp (RM2001)	Off	2.0 ns delay	Off	QXI @ 8x
7	Static – small dia.	Ramp (RM2001)	Off	2.0 ns delay	Off	LAPC – Ti
8	May target	Ramp (RM2001)	On	2.0 ns delay	Off	LAPC – Ti
9	May target	Ramp (RM2001)	On	2.0 ns delay	Off	QXI @ 8x
10	May target	Ramp (RM2001)	On	Off	Off	Off
11	Static.	Ramp (RM2001)	Off	2.0 ns delay	Off	QXI @ 8x

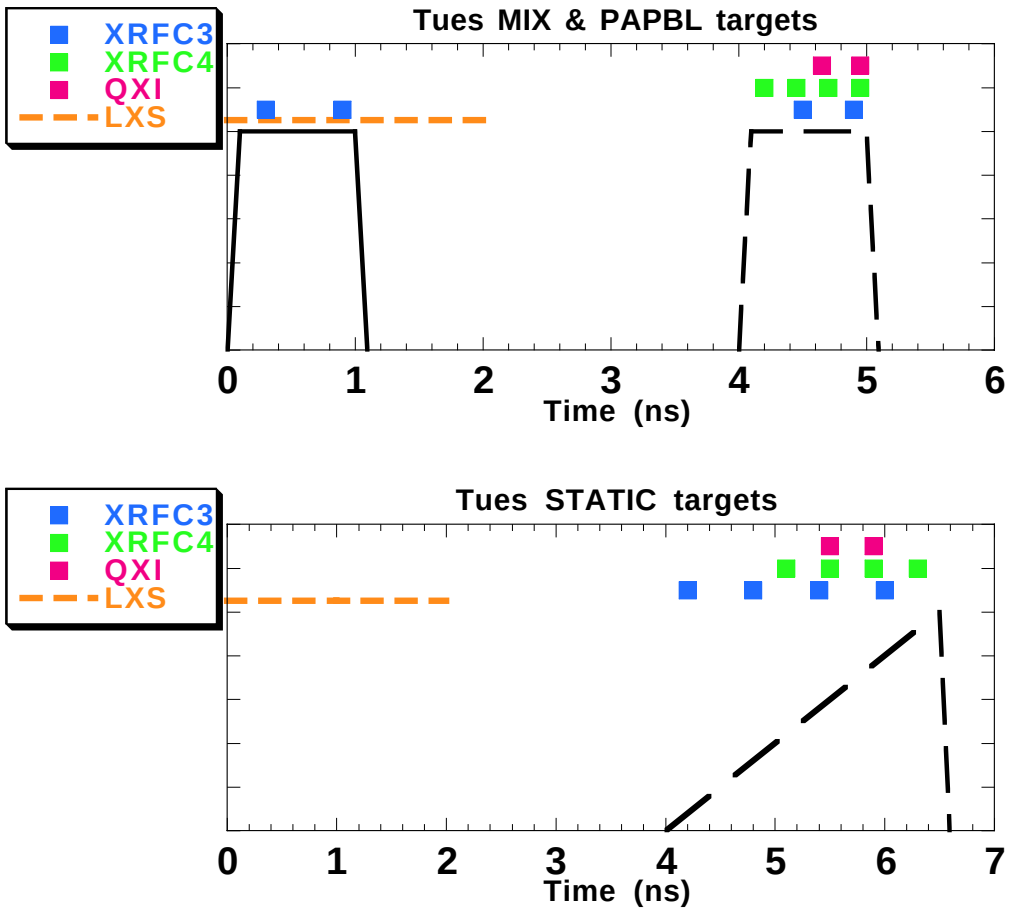
* Contingency shots at end of day will be more static targets.

DIAGNOSTICS

DIAGNOSTIC SETTINGS, Tuesday:

Day 1: January 18, 2000				
Shot	**Type**	**XRFC3/TIM3**	**XRFC4/TIM 4**	**TIM 6**
1	Pointing	2x, 10 μm pinhole, 10 mil Be, bias=+100V, interstrip 0.25 ns, T0-0.5 ns	2x, 10 μm pinhole, 10 mil Be, bias=+100V, interstrip 0.25 ns, T0-0.5 ns	QXI, 2x, 10 μm pinhole, 7 mil Be, 12 μm Ti, bias=+200V, interstrip 0.2 ns, T0-0.1 ns
2	Pointing	same	same	same
3	AWE Mix	6x, 10 μm pinhole, 10 mil Be, bias=+100V, strips fire at 0.3, 0.9, 4.5, & 4.9 ns	12x, 8 μm pinhole, 5 mil Be + 6 μm Ti + 1 mil Be, bias=+100V, interstrip 0.25 ns, T0+4.2 ns	QXI, 8x, 10 μm pinhole, bias=+200V, 7 mil Be, 12 μm Ti, strip 1 @ 4.65; strip 2 @ 4.95 ns
4	AWE Mix	same	same	same
5	AWE Mix	same	same	same
6	*Pause*	*Pause*	*Pause*	*Pause*
7	PAPBL	same	same	QXI, no snout or pinholes, 20 mil Be, 12 μm Ti, bias=+100V, strip 1 @ 4.65; strip 2 @ 4.95 ns
8	AWE Mix/Fe	same	12x, 8 μm pinhole, 5 mil Be + 12.5 μm Fe + 1 mil Be, bias=+100V, interstrip 0.25 ns, T0+4.2 ns	LAPC – Fe
9	AWE Mix	same	12x, 8 μm pinhole, 5 mil Be + 6 μm Ti + 1 mil Be, bias=+100V, interstrip 0.25 ns, T0+4.2 ns	LAPC – Ti
10	Static	6x, 10 μm pinhole, 10 mil Be, bias=+100V, strips fire at 4.2, 4.8, 5.4, & 6.0 ns	12x, 8 μm pinhole, 5 mil Be + 6 μm Ti + 1 mil Be, bias=+100V, interstrip 0.4 ns, T0+5.1 ns	QXI, 8x, 10 μm pinhole, 7 mil Be, 12 μm Ti, bias=+200V, interstrip 0.4 ns, strip 1 @ 5.5 ns; strip 2 @ 5.9 ns
11	Static	same	same	same

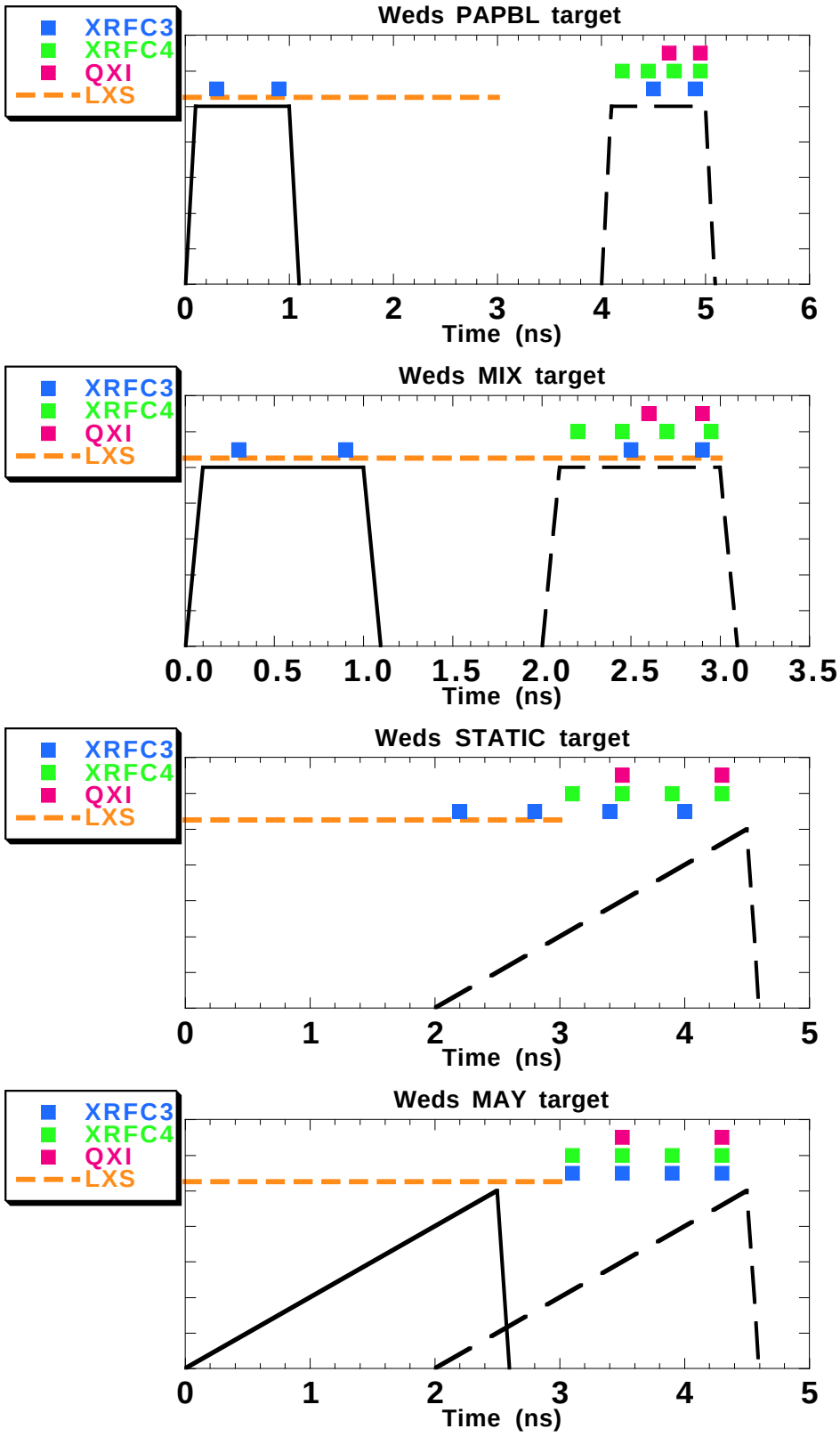
Diagnostic Timing Diagrams, Tuesday



DIAGNOSTIC SETTINGS, Wednesday

Day 2: January 19, 2000				
Shot	**Type**	**XRFC3/TIM3**	**XRFC4/TIM 4**	**TIM 6**
1	PAPBL	6x, 10 μm pinhole, 10 mil Be, bias=+100V, strips fire at 0.3, 0.9, 4.5, & 4.9 ns	12x, 8 μm pinhole, 5 mil Be + 6 μm Ti + 1 mil Be, bias=+100V, interstrip 0.25 ns, T0+4.2 ns	QXI, no snout or pinholes, 20 mil Be, 12 μm Ti, bias=+100V, strip 1 @ 4.65; strip 2 @ 4.95 ns
2	PAPBL	same	same	same
3	AWE Mix	6x, 10 μm pinhole, 10 mil Be, bias=+100V, strips fire at 0.3, 0.9, 2.5, & 2.9 ns	12x, 8 μm pinhole, 5 mil Be + 6 μm Ti + 1 mil Be, bias=+100V, interstrip 0.25 ns, T0+2.2 ns	QXI, 8x, 10 μm pinhole, bias=+200V, 7 mil Be, 12 μm Ti, strip 1 @ 2.6; strip 2 @ 2.9 ns
4	Static	6x, 10 μm pinhole, 10 mil Be, bias=+100V, strips fire at 2.2, 2.8, 3.4, & 4.0 ns	12x, 8 μm pinhole, 5 mil Be + 6 μm Ti + 1 mil Be, bias=+100V, interstrip 0.4 ns, T0+3.1 ns	QXI, 8x, 10 μm pinhole, 7 mil Be, 12 μm Ti, bias=+200V, interstrip 0.4 ns, strip 1 @ 3.5 ns; strip 2 @ 4.3 ns
5	*Pause*	*Pause*	*Pause*	*Pause*
6	Static	same	same	LAPC – Ti
7	Static	same	same	LAPC – Ti
8	May target	6x, 10 μm pinhole, 10 mil Be, bias=+100V, interstrip 0.4 ns, T0+3.1 ns	12x, 8 μm pinhole, 5 mil Be + 6 μm Ti + 1 mil Be, bias=+100V, interstrip 0.4 ns, T0+3.1 ns	QXI, 8x, 10 μm pinhole, 7 mil Be, 12 μm Ti, bias=+200V, interstrip 0.4 ns, strip 1 @ 3.5 ns; strip 2 @ 4.3 ns
9	May target	same	same	same
10	May target	same	same	same
11	Static	6x, 10 μm pinhole, 10 mil Be, bias=+100V, strips fire at 2.2, 2.8, 3.4, & 4.0 ns	12x, 8 μm pinhole, 5 mil Be + 6 μm Ti + 1 mil Be, bias=+100V, interstrip 0.4 ns, T0+3.1 ns	QXI, 8x, 10 μm pinhole, 7 mil Be, 12 μm Ti, bias=+200V, interstrip 0.4 ns, strip 1 @ 3.5 ns; strip 2 @ 4.3 ns

Diagnostic Timing Diagrams, Wednesday



TIM Setup Sheets

Ω XOPS TIM Setup Sheet

V 2.0 10/7/00

TIM # 4 Pointing Shots Tues 1-2

Payload: XRF 4 **Date:** 1/18/00

Campaign CYLMIX

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**2**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N		
Rear Filter	**none**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1		0 nS
2		0.25 nS
3		0.5 nS
4		0.75 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T0-0.5	nS

Monitor Output

Scope #	Channel #	Atten:

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 4 Target Shots Tues 3-11; Weds 1-11

Payload: XRF 4

Date: 1/18/00
1/19/00

Campaign CYLMIX

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**12**	X
Pinhole Size	**8**	μm
Blast Shield	**0.005" Be**	
Rear Filter Carrier S/N		
Rear Filter	**6 μm Ti + 0.001" Be**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1		0 nS
2		0.25 nS
3		0.5 nS
4		0.75 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T0+4.2	nS

Monitor Output

Scope #	Channel #	Atten:

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 6 Pointing: Shots Tues 1-2

Payload: QXI **Date:** 1/18/00

Campaign CYLMIX

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**2**	X
Pinhole Size	**LANL - 10**	μm
Blast Shield	**0.007" Be**	
Rear Filter Carrier S/N		
Rear Filter	**none**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**200**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1		0 nS
2		0.2 nS
3		nS
4		nS

Steering

Points to:	**Backlighter**
ϕ =	162.0°
θ =	116.6°
T =	0

Power Supply

Voltage:	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T0-0.1	nS

Monitor Output

Scope #	Channel #	Atten:

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 6 Backlighter Monitor: Shots Tues 3-5, 10-11; Weds 3-11

Payload: QXI

Date: 1/18/00
1/19/00

Campaign CYLMIX

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**8**	X
Pinhole Size	**10**	μm
Blast Shield	**0.007" Be**	
Rear Filter Carrier S/N		
Rear Filter	**12 μm Ti**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**200**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1		0 nS
2		0.3 nS
3		nS
4		nS

Steering

Points to:	**Backlighter**
ϕ =	162.0°
θ =	116.6°
T =	1.625 mm

Power Supply

Voltage:	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T0+4.65	nS

Monitor Output

Scope #	Channel #	Atten:

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 6 PAPBL: Shots Tues 7; Weds 1-2

Payload: QXI

Date: 1/18/00
no pinhole array 1/19/00

Campaign CYLMIX

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**NA**	X
Pinhole Size	**NA**	μm
Blast Shield	**0.020" Be**	
Rear Filter Carrier S/N		
Rear Filter	**12 μm Ti**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1		0 nS
2		0.3 nS
3		nS
4		nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	200 mm

Location of microchannel plate

Power Supply

Voltage:	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T0+4.65	nS

Monitor Output

Scope #	Channel #	Atten:

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 3 Pointing Shots 1-2

Payload: XRF 3 **Date:** 1/18/00

Campaign CYLMIX

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**2**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N		
Rear Filter	**none**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1		0 nS
2		0.25 nS
3		0.5 nS
4		0.75 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T0-0.5	nS

Monitor Output

Scope #	Channel #	Atten:

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 3 Target Shots Tues 3-11; Weds 1-11

Payload: XRF 3

Date: 1/18/00
1/19/00

Campaign CYLMIX

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**6**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N		
Rear Filter	**none**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1		0 nS
2		0.6 nS
3		4.2 nS
4		4.6 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T0+0.3	nS

Monitor Output

Scope #	Channel #	Atten:

Authorized by G. Pien Confirmed by:

X-ray Streak Camera Configuration Request

Date 12/22/99

request # _____ For official use only

Date needed	1/18/00					
Requester	Steve Batha; (505) 665-5898					
Campaign	CYLMIX; LANL ID-00-01					
Purpose of Diagnostic	Observe Cl emission from marker layer					
Streak Camera	**SSC1**	**SSC4**	**SSCA**	**LXS**		
TIM#	2					
Pointing	TCC					
Photocathode						
substrate	parylene	.5 mil Be	1 mil Be	other: _____		
material	Au	CsI	KBr	other: _____		
fluffy	Y	N	available only for CsI and KBr			
fiducial	Y	N	not available with 5000 μm slit			
slit width	250 μm	330 μm	500 μm	1500 μm	5000 μm	
grid (1.5 mm spacing)	none	50 μm	75 μm			
Imager	Y	N	fiducial not available with Imagers			
SMP	10x	20x				
other requirements	_____					
Spectrometer	Y	N				
Preferred Spectrometer	Ar	Xe	Cl	Al-1	LXS-1	don't care
				Al-2	LXS-2	
Preferred Crystal	RbAP	ADP	PET	Quartz	other: _____	
						don't care
Desired Range:	Min.	center	Max.			
	2.5	_____	3.6	keV	NOTE: if wider	
	_____	_____	_____	Ang.	coverage available	
Blast Shield					want more to red.	
Material	Be	other:	_____	_____	_____	
Thickness	.004"	other:	3 mil	_____	_____	
Filtering						
Material	Be	Al	Fe	Ti	other:	Be
Thickness	.001"	.002"	.0005"	9μm	other:	0.0005"
Intensifier Gain	max					
Sweep Speed	3.2 ns/full sweep					
Timing wrt T0	1.5	ns	at center of sweep			

X-ray Streak Camera Configuration Request (cont.)

Date 12/22/99

request # _____ For official use only

To be completed by assembler:

Photocathode installed	__/__/__	___:___	_____			
Photocathode ID #	_____					
comments	_____					
Fiducial fiber installed	__/__/__	___:___	_____			
comments	_____					
Spectrometer complete	__/__/__	___:___	_____			
spectrometer name	Ar	Xe	Cl	Al-1	LXS-1	
				Al-2	LXS-2	
crystal	RbAP	ADP	PET	Quartz	other:	_____
expected range:	Min.	center	Max.			
	_____	_____	_____	keV		
	_____	_____	_____	Angstroms		
comments	_____					
Imager complete	__/__/__	___:___	_____			
comments	_____					

Front end attached to streak camera with minimum of 3 screws?					Y	N
Fiducial fiber secured within limits of TIM boat?					Y	N
Sweep Speed set to:	1	2	3	4	5	
Switches set? (electron optics on, bias on, intensifier on, gain set)					Y	N
Streak Camera delivered	__/__/__	___:___	_____			
comments	_____					

Backlighter Studies

Experimental Proposal Template

- Experiment title, principal investigator's name, and, if related to LLE direct-drive experimental program, which category (i.e., ISE, RTI, etc.) the experiment falls under, and planned shot dates.

Title: X-ray Backlighter Development
PI: Jonathan Workman
Date: January 20, 2000

- Summary of the experiment's objectives.

The X-ray Backlighter Development shots will have as their objective measurements of x-ray yield at high x-ray energies. In particular, the yield of 6.7 keV x-ray emission from iron disk targets will be measured as a function of laser intensity. In addition, we will study the yield of 10.3 keV x-ray emission from Ge disk targets at high laser irradiance.

- Laser conditions required for the experiment:

  - Pulse shape *SG1011 (1 ns square)*
  - SSD, DPP, and DPR conditions *No phase plates, No SSD (use Main Driver)*
  - Power/energy balance *nominal 450 J/beam*
  - Number of beamlines and target pointing summary requirements *12 beams should be configured in two cones around H7 all pointed to TCC.*
  - Backlighting requirements and beam timing delays *None. Main beams will be used for target illumination.*
  - Special laser conditions *None.*

4) Diagnostics required and target chamber port assignments (indicate any non-LLE-provided diagnostics).

TIM#1:	XRFC2@6X
TIM#2:	LAPC@2X (Los Alamos Pinhole Camera) non-LLE, previously used on OMEGA in July '99.
TIM#3:	Empty
TIM#4:	Empty
TIM#5:	XRFC4@12X and @6X
TIM#6:	SSCA

In addition:

P2B	Henway Spectrometer
	All XRPHCs
	P510s
	Plasma calorimeters

5) Type and number of targets including number of spares (this section must be completed even if using non-LLE-provided targets). NOTE: if special targets are required, they must be specified more than two months in advance. Additionally, special target geometries may require metrology prior to delivery to LLE and verification after arrival at LLE using LLE's Powel scope.

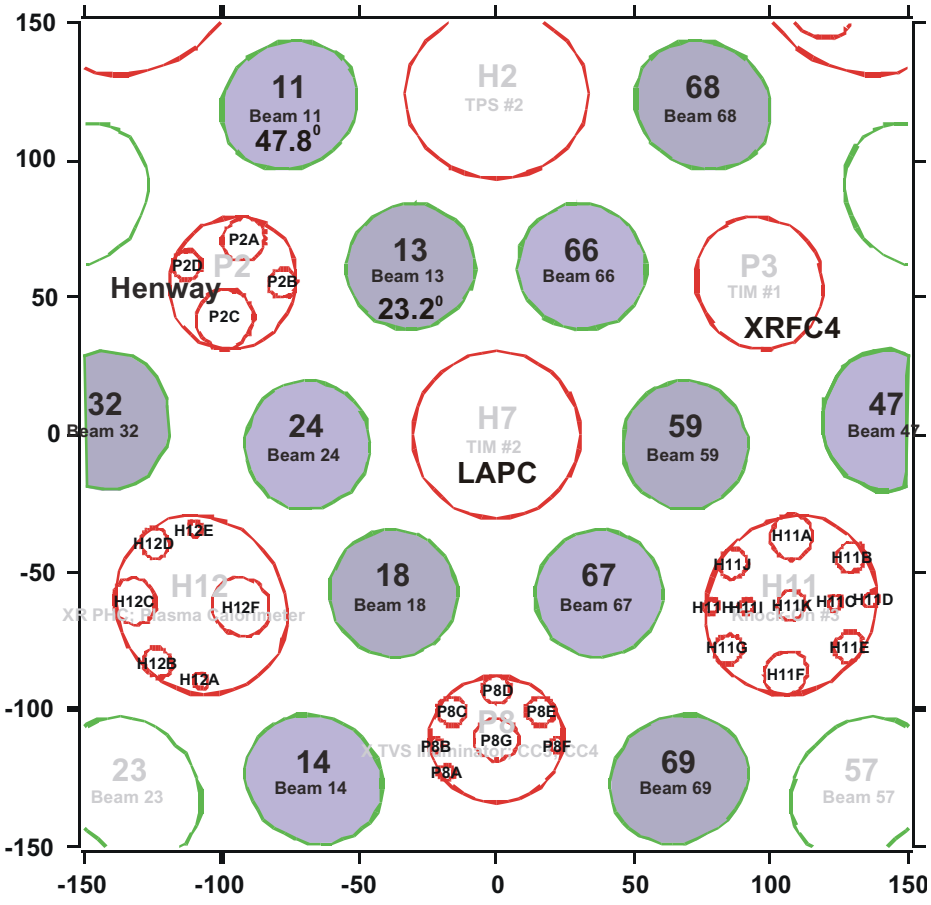
All targets will be provided by LANL. 20 disk targets will be constructed for the 12 laser shots. 12 of these targets will be 1 mm disks with alignment flags, either Fe or Ge. 6 targets will consist of 3 mm Fe disks with a half-circle of Au used for MTF measurements. The remaining targets are 3 mm Ti disks. All targets will be of thickness 0.5 to 3.0 mil. Targets will be oriented normal and centered with the H7-H14 axis.

6) Number of required laser shots.

12 laser shots will be required. This experiment has been allotted 1 full day.

7) Special shot schedule considerations associated with experiment.

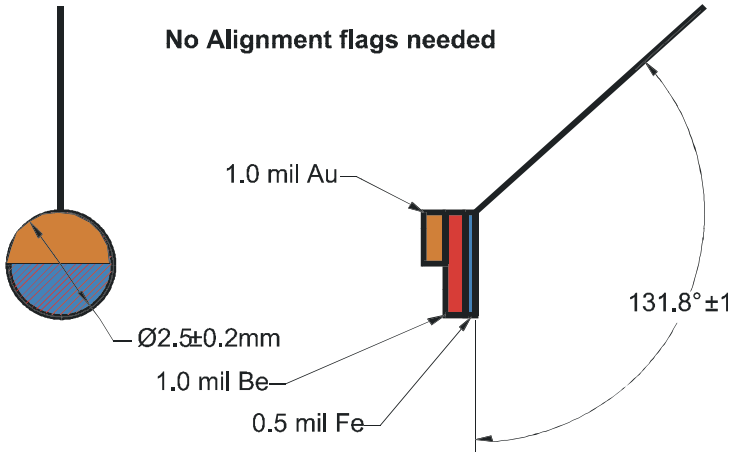
There will not be any diagnostic port changes during this day of shots. There will be at most 2 filter and diagnostic snout changes during the day. As shown in the summary, XRFC4 changes from 12X to 6X before and during shot 5. In addition, there will be a filter change and SSC snout change at this time (shot 5). Finally there will be a filter change after shot 11.



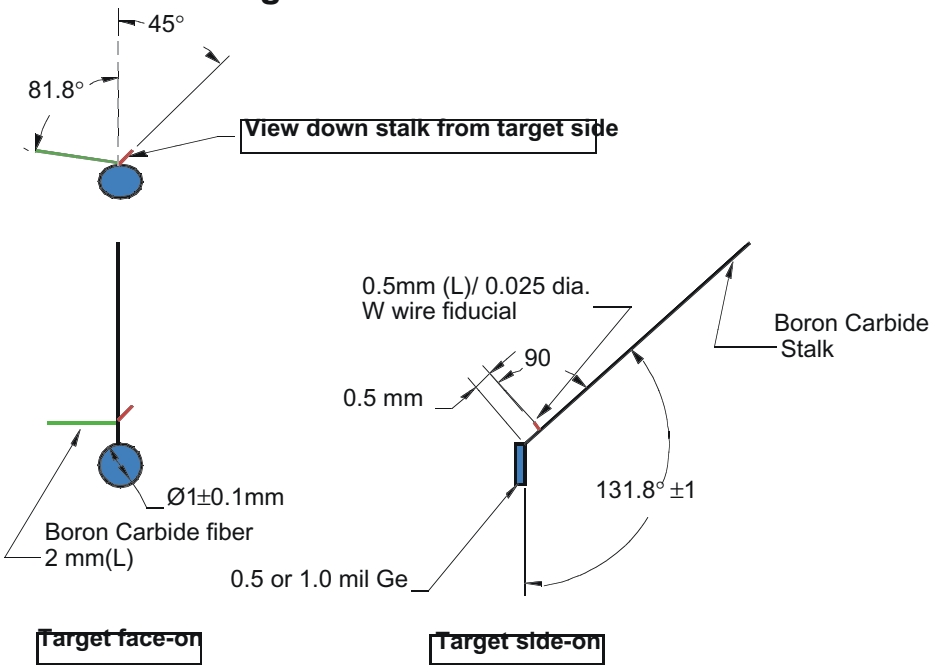
Beams Used for Backlighter Studies

TARGETS

Fe targets with MTF edge for OMEGA Jan.FY'00



Ge targets for OMEGA Jan.FY'00

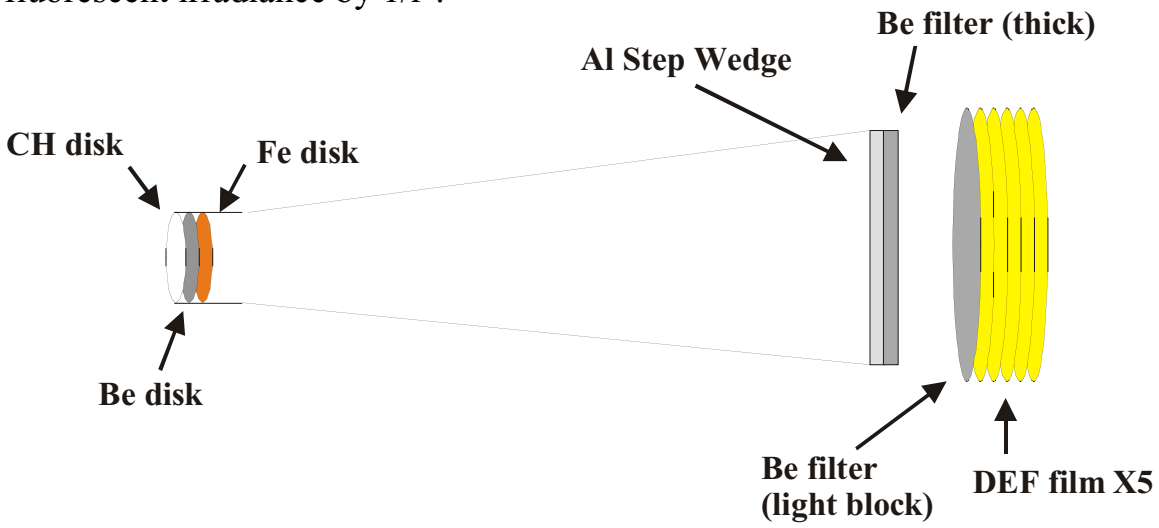


Construction Type	Quantity Needed	Already Available
Fe disk (2.5 mm) with MTF	6	NO
Fe disk (1.0 mm) with flags	3	NO
Ge disk (1.0 mm) with flags	9	NO
Ti disk (3 mm)	2	YES

Configuration for LAPC
for the week of 1-17-00 on OMEGA

The LAPC will be used on OMEGA to measure absolute x-ray yield. In order to make these measurements we will use an x-ray step wedge in front of the film pack. Below will be described the various thickness of materials as well as the pre and post filters used to minimize fluorescence. The LAPC is being used in a *non-standard* configuration. There will be no pinhole/ collimator array at the front of the device rather an open snout with filter materials. We use the 2X nosecone as a pre-filter holder located at some distance from the main filter array.

Below is sketched the general configuration of the LAPC. The first filter in the 2x nosecone is a piece of plastic. This will help mitigate hot-electrons and is designed to be 100 μm thick. The next filter element is a thick piece of Be (20 mil) used as a blast shield but also as an attenuator for low energy x-rays (<2.0 keV). The final element in the nosecone is an Fe filter (this should be Ti for Ti emission) which will be used both for Fe and Ge emission. This filter helps select the He-like emission from Fe and helps eliminate moderate energy emission from Ge. This high-Z filter is placed in the nosecone with the consideration that the fluorescence will be significant. Because the fluorescent emission goes into 4π the distance from the DEF film will reduce the fluorescent irradiance by $1/r^2$.



The Al step wedge comes next. This is comprised of 16 channels with varying attenuation for the emission of interest. Al has been chosen over Ti due to the much lower fluorescent yield. This, however, leads to large thicknesses of Al in order to have an appropriate dynamic range of transmission. Another

thick Be filter is placed behind the Al step wedge. This Be filter reduces any fluorescence from the Al filter wedge. A 10 mil piece of Be will reduce the Al K_β at 1.557 keV by a factor of 1500 and will reduce the K_α at 1.486 keV by a factor of 5300. A separate 1 mil piece of Be is used simply as a light-tight filter for the DEF film. Finally, 5 pieces of DEF film will be stacked in the film holder. In the July '99 shots (as well as previous work in Zn by Chrien et. Al) this film stacking was found to reduce fluorescence significantly.

In the tables below are listed the thicknesses of Al to be used in the step wedges and alongside the transmissions of the energies of interest. The array for Ge is essentially the same as for Fe with an additional 8 mil of Al over the entire array. The array for Ti will need to be separate as the thicknesses required are significantly less.

Fe emission array

4	8	12	16	mil Al
12	16	20	24	
20	24	28	32	
28	32	36	40	

Transmission @6.7 keV Fe

1.12E-01	1.24E-02	1.39E-03	1.55E-04
1.39E-03	1.55E-04	1.72E-05	1.92E-06
1.72E-05	1.92E-06	2.14E-07	2.39E-08
2.14E-07	2.39E-08	2.67E-09	2.97E-10

Ge emission array

12	16	20	24	mil Al
20	24	28	32	
28	32	36	40	
36	40	44	48	

Transmission @10.35 keV Ge

1.54E-01	8.28E-02	4.44E-02	2.38E-02
4.44E-02	2.38E-02	1.28E-02	6.85E-03
1.28E-02	6.85E-03	3.67E-03	1.97E-03
3.67E-03	1.97E-03	1.06E-03	5.67E-04

Ti emission array

1	2	3	4	mil Al
3	4	5	6	
5	6	7	8	
7	8	9	10	

Transmission @4.75 keV Ti

2.28E-01	5.20E-02	1.18E-02	2.70E-03
1.18E-02	2.70E-03	6.16E-04	1.40E-04
6.16E-04	1.40E-04	3.20E-05	7.29E-06
3.20E-05	7.29E-06	1.66E-06	3.79E-07

Materials and thicknesses to be used in LAPC Jan 2000 on OMEGA

Target	CH prefilter	Be prefilter	Other Prefilter	Wedge	Rear Be filter
Fe	100 μm	20.0 mil	Fe 0.5 mil	Al 4 mil steps	20 mil
Ge	100 μm	20.0 mil	Fe 0.5 mil	Al 4 mil steps +8	20 mil
Ti	100 μm	20.0 mil	Ti 0.5 mil	Al 1 mil steps	20 mil

Configuration for HENWAY Spectrometer
for the week of 1-17-00 on OMEGA v2.2

As far as I am aware the Henway has been left in the configuration below:

Channel	Prefilter	Crystal Mount	Crystal
A	Be 1mil	A	RAP
B	Al 6um	A	PET
C	Al 6um	P	KAP
D	Be 1mil	Q	KAP

I would like the configuration changed as follows:

Channel	Prefilter	Crystal Mount	Crystal	Spectra
A	Be 1mil	A	RAP	Ti
B	Al 6um	A	PET	Ti+Fe
C	Al 6um	Q	PET	Ti+?Fe
D	Be 1mil	A	Si<111>	Ge

The A and B channels remain unchanged while the C and D channels require new crystal mounts. The Q/PET crystal to go into channel C is out at Rochester. The A/Si crystal is being mounted by LANL and will be brought out for installation on Friday or Monday.

There will be additional prefilters in order to increase the dynamic range of the instrument. The additional prefilters will consist of three equal size channels oriented along the width of the crystal. The first channel will be open.

Henway channel	Filter channel #1	Filter channel #2	Filter channel #3
A	Open	1.5 mil Al	3.0 mil Al
B	Open	4.0 mil Al	9.5 mil Al
C	Open	1.5 mil Al	3.0 mil Al
D	Open	2.0 mil Ti	4.0 mil Ti

The filter holder is 3/4”x1/2”. Therefore, each filter channel should be ~1/4”x1/2”.

Transmissions for the various filters

at Ti, Fe and Ge He-like emission energies

Filter	Ti trans (4.75)	Fe trans (6.70)	Ge trans (10.28)
1.5 mil Al	.112	.444	
2.0 mil Al	5.20e-2	.334	
3.0 mil Al	1.25e-2	.197	
4.0 mil Al	2.70e-3	.112	
4.5 mil Al			
5.0 mil Al	6.16e-4	6.44e-2	
8.0 mil Al		1.24e-2	
9.5 mil Al		5.51e-3	
10.0 mil Al	3.79e-7	4.15e-3	0.211
2.0 mil Ti		4.56e-4	9.11e-2
4.0 mil Ti		2.08e-7	8.31e-3

Summary of Shot Schedule and Diagnostics

Shot Schedule for FY'00 Backlighter Development on OMEGA v2.1

Shot #	Target	beamlines	Focus	Pulse	Res Targ	Purpose	Laser Intensity X10^{15}W/cm^2	Diagnostics
1	Fe	13,18,24, 59,66,67	defocused to 600 μm	1 ns	MTF	Intensity scaling, spatial resolution	0.94	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@12X
Check film and diagnostics (pointing,timing,filtration)								
2	Fe	13,18, 66,67	defocused to 600 μm	1 ns	MTF	Intensity scaling, spatial resolution	0.63	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@12X
3	Fe	13,67	defocused to 600 μm	1 ns	MTF	Intensity scaling, spatial resolution	0.32	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@12X
4	Fe	13,18,24, 59,66,67	defocused to 300 μm	1 ns	MTF	Intensity scaling, spatial resolution	3.8	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@12X
XRFC4 change from 12X to 6X (low priority: before and during shot 5)								
5	Fe	13,18,24, 59,66,67	tight focus-overlaped	1 ns		Intensity scaling, energy scaling, spatial resolution	54	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@6X
Streak snout change during shot #6, filter changes between shots								
Shot #	**Target**	**No. beams**	**Focus**	**Pulse**	**Res Targ**	**Purpose**	**Laser Intensity X10^{15}W/cm^2**	**Diagnostics**
6	Ge	13,18,24, 59,66,67, 11,14,32, 47,68,69	tight focus-overlaped	1 ns		Intensity scaling, high-energy	107.0	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@6X
7	Ge	13,18,24, 59,66,67	tight focus-overlaped	1 ns		Intensity scaling, high-energy	53.7	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@6X
8	Ge	13,18,24, 59,66,67, 11,14,32, 47,68,69	tight focus-overlaped	1 ns		Intensity scaling, high-energy	107.0	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@6X
9	Ge	13,18,24, 59,66,67	tight focus-overlaped	1 ns		Intensity scaling, energy scaling, high-energy	53.7	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@6X
10	Ge	13,67	tight focus-overlaped	1 ns		Intensity scaling, high-energy	17.9	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@6X
11	Ge	13	tight focus-overlaped	1 ns		Intensity scaling, high-energy	9.0	LAPC,Henway,SSCA, XRFC2@6X,XRFC4@6X
Filter changes---Not running SSC								
12	Ti	13	defocused to 300 μm	1 ns		Compare to Trident 2ω vs 3ω	6.4x10^{14}W/cm^2	LAPC,Henway, XRFC2@6X,XRFC4@6X

TIM Setup Sheets

Ω XOPS TIM Setup Sheet

V 2.0 10/7/00

TIM # 6 *Shots 1-5*

Payload: SSC A

Date: 1/20/00

Previous Shot #

Campaign: LANL Backlighter Development

Optics:

Nosecone S/N		
Tune for	**Fe**	
Blast Shield	0.004" Be	
Photocathode Assy. #		
Photocathode Type	**Au**	
Photocathode Slit	**250**	μm
Rear Filter Carrier S/N		
Rear Filter	0.001" Be	

Internal Settings:

Sweep Speed Setting	**1**
Deflection Plates	**ON**
MCP Power	**ON**
Electron Optics Power	**ON**

Gain **High**

External Settings:

Steering TCC

TO BL1

ϕ =
θ =
T =

Power Supply

Voltage:	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T-0	nS

Monitor Output

Scope # TDS 684 GPIB 2	Channel #
Input Attenuation:	

Authorized by G. Pien Confirmed by:

X-ray Streak Camera Configuration Request

Date _____

request # _____ For official use only

Date needed	1/20/99 Morning					
Requester	Jonathan Workman					
Campaign	X-ray Backlighters					
Purpose of Diagnostic	Time History of Fe backlighter emission					
Streak Camera	**SSC1**	**SSC4**	**SSCA**	**LXS**		
TIM#	6					
Pointing	TCC					
Photocathode						
substrate	paralene	.5 mil Be	1 mil Be	other: _____		
material	Au	CsI	KBr	other: _____		
fluffy	Y	N	available only for CsI and KBr			
fiducial	Y	N	not available with 5000 µm slit			
slit width	250 µm	330 µm	500 µm	1500 µm	5000 µm	
grid (1.5 mm spacing)	none	50 µm	75 µm			
Imager	Y	N	fiducial not available with Imagers			
SMP	10x	20x				
other requirements	_____					
Spectrometer	Y	N				
Preferred Spectrometer	Ar	Xe	Cl	Al-1	LXS-1	don't care
				Al-2	LXS-2	
Preferred Crystal	RbAP	ADP	PET	Quartz	other: _____	
						don't care
Desired Range:	Min.	center	Max.			
	_____	6.7	_____	keV		
	_____	_____	_____	Angstroms		
Blast Shield						
Material	Be	other:	_____	_____	_____	
Thickness	.004"	other:	_____	_____	_____	
Filtering						
Material	Be	Al	Fe	Ti	other:	_____
Thickness	.001"	.002"	.0005"	9µm	other:	_____
Intensifier Gain	max					
Sweep Speed	1					
Timing wrt T0	___0.5___	ns	centered			

X-ray Streak Camera Configuration Request (cont.)

Date _____

request # _____ For official use only

To be completed by assembler:

Photocathode installed	__/__/__	___:___	_____			
Photocathode ID #	_____					
comments	_____					
Fiducial fiber installed	__/__/__	___:___	_____			
comments	_____					
Spectrometer complete	__/__/__	___:___	_____			
spectrometer name	Ar	Xe	Cl	Al-1	LXS-1	
				Al-2	LXS-2	
crystal	RbAP	ADP	PET	Quartz	other:	_____
expected range:	Min.	center	Max.			
	_____	_____	_____	keV		
	_____	_____	_____	Angstroms		
comments	_____					
Imager complete	__/__/__	___:___	_____			
comments	_____					

Front end attached to streak camera with minimum of 3 screws?					Y	N
Fiducial fiber secured within limits of TIM boat?					Y	N
Sweep Speed set to:	1	2	3	4	5	
Switches set? (electron optics on, bias on, intensifier on, gain set)					Y	N
Streak Camera delivered	__/__/__	___:___	_____			
comments	_____					

Ω XOPS TIM Setup Sheet

V 2.0 10/7/00

TIM # 6 *Shots 6-11*

Payload: SSC A

Date: 1/20/00

Previous Shot #

Campaign: LANL Backlighter Development

Optics:

Nosecone S/N		
Tune for	**Ge**	
Blast Shield	0.004" Be	
Photocathode Assy. #		
Photocathode Type	**Au**	
Photocathode Slit	**250**	μm
Rear Filter Carrier S/N		
Rear Filter	0.001" Be	

Internal Settings:

Sweep Speed Setting	**1**
Deflection Plates	**ON**
MCP Power	**ON**
Electron Optics Power	**ON**

Gain **High**

External Settings:

Steering TCC

TO BL1

ϕ =
θ =
T =

Power Supply

Voltage:	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T-0	nS

Monitor Output

Scope # TDS 684 GPIB 2	Channel #
Input Attenuation:	

Authorized by G. Pien Confirmed by:

X-ray Streak Camera Configuration Request

Date _____

request # _____ For official use only

Date needed	1/20/99 Afternoon					
Requester	Jonathan Workman					
Campaign	X-ray Backlighters					
Purpose of Diagnostic	Time History of Ge backlighter emission					
Streak Camera	**SSC1**	**SSC4**	**SSCA**	**LXS**		
TIM#	6					
Pointing	TCC					
Photocathode						
substrate	paralene	.5 mil Be	1 mil Be	other: _____		
material	Au	CsI	KBr	other: _____		
fluffy	Y	N	available only for CsI and KBr			
fiducial	Y	N	not available with 5000 µm slit			
slit width	250 µm	330 µm	500 µm	1500 µm	5000 µm	
grid (1.5 mm spacing)	none	50 µm	75 µm			
Imager	Y	N	fiducial not available with Imagers			
SMP	10x	20x				
other requirements	_____					
Spectrometer	Y	N				
Preferred Spectrometer	Ar	Xe	Cl	Al-1	LXS-1	don't care
				Al-2	LXS-2	
Preferred Crystal	RbAP	ADP	PET	Quartz	other:	_____
						don't care
Desired Range:	Min.	center	Max.			
	9.8	10.3	10.8	keV		
	_____	_____	_____	Angstroms		
Blast Shield						
Material	Be	other:	_____	_____	_____	
Thickness	.004"	other:	_____	_____	_____	
Filtering						
Material	Be	Al	Fe	Ti	other:	_____
Thickness	.001"	.002"	.0005"	9µm	other:	_____
Intensifier Gain	max					
Sweep Speed	1					
Timing wrt T0	___0.5___	ns	centered			

X-ray Streak Camera Configuration Request (cont.)

Date _____

request # _____ For official use only

To be completed by assembler:

Photocathode installed	__/__/__	___:___	_____			
Photocathode ID #	_____					
comments	_____					
Fiducial fiber installed	__/__/__	___:___	_____			
comments	_____					
Spectrometer complete	__/__/__	___:___	_____			
spectrometer name	Ar	Xe	Cl	Al-1	LXS-1	
				Al-2	LXS-2	
crystal	RbAP	ADP	PET	Quartz	other:	_____
expected range:	Min.	center	Max.			
	_____	_____	_____	keV		
	_____	_____	_____	Angstroms		
comments	_____					
Imager complete	__/__/__	___:___	_____			
comments	_____					

Front end attached to streak camera with minimum of 3 screws?					Y	N
Fiducial fiber secured within limits of TIM boat?					Y	N
Sweep Speed set to:	1	2	3	4	5	
Switches set? (electron optics on, bias on, intensifier on, gain set)					Y	N
Streak Camera delivered	__/__/__	___:___	_____			
comments	_____					

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 1 Shots 1-5

Payload: XRF #2 **Date:** 1/20/00

Previous Shot #

Campaign LANL Backlighter Development

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**6**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N	**any**	
Rear Filter	**12 μm Fe**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1	**00**	0 nS
2	**00**	0.4 nS
3	**00**	0.8 nS
4	**00**	1.2 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	**15** VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T-0.1	nS

Monitor Output

Scope #	Channel #	Atten: db

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet

V 2.0 10/7/00

TIM # 1 Shots 6-11

Payload: XRF #2

Date: 1/20/00

Previous Shot #

Campaign LANL Backlighter Development

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**6**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N	**any**	
Rear Filter	**12 μm Fe**	
Film Back S/N		
Pinhole Substrate	5 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1	**00**	0 nS
2	**00**	0.4 nS
3	**00**	0.8 nS
4	**00**	1.2 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	**15** VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T-0.1	nS

Monitor Output

Scope #	Channel #	Atten: db

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 1 Shot 12

Payload: XRF #2 **Date:** 1/20/00

Previous Shot #

Campaign LANL Backlighter Development

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**6**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N	**any**	
Rear Filter	**12 μm Ti**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1		0 nS
2		0.4 nS
3		0.8 nS
4		1.2 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	**15**	VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T-0.1	nS

Monitor Output

Scope #	Channel #	Atten: db

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 5 Shots 1-4

Payload: XRF #4 **Date:** 1/20/00

Previous Shot #

Campaign LANL Backlighter Development

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**12**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N	**any**	
Rear Filter	**12 μm Fe**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1	**00**	0 nS
2	**00**	0.4 nS
3	**00**	0.8 nS
4	**00**	1.2 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	**15** VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T-0.1	nS

Monitor Output

Scope #	Channel #	Atten: db

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 5 Shot 5

Payload: XRF #4 **Date:** 1/20/00

Previous Shot #

Campaign LANL Backlighter Development

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**6**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N	**any**	
Rear Filter	**12 μm Fe**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1	**00**	0 nS
2	**00**	0.4 nS
3	**00**	0.8 nS
4	**00**	1.2 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	**15** VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T-0.1	nS

Monitor Output

Scope #	Channel #	Atten: db

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 5 Shots 6-11

Payload: XRF #4 **Date:** 1/20/00

Previous Shot #

Campaign LANL Backlighter Development

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**6**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N	**any**	
Rear Filter	**12 μm Fe**	
Film Back S/N		
Pinhole Substrate	5 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1	**00**	0 nS
2	**00**	0.4 nS
3	**00**	0.8 nS
4	**00**	1.2 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	**15** VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T-0.1	nS

Monitor Output

Scope #	Channel #	Atten: db

Authorized by G. Pien Confirmed by:

Ω XOPS TIM Setup Sheet V 2.0 10/7/00

TIM # 5 Shot 12

Payload: XRF #4 **Date:** 1/20/00

Previous Shot #

Campaign LANL Backlighter Development

Optics:

Unimount Type	**LLE std.**	
Nosecone S/N		
Magnification	**6**	X
Pinhole Size	**10**	μm
Blast Shield	**0.010" Be**	
Rear Filter Carrier S/N	**any**	
Rear Filter	**12 μm Ti**	
Film Back S/N		
Pinhole Substrate	2 mil Ta LANL	
Frame	**LLE std.**	

Internal Settings:

Output 1 (Phosphor):		kV
Output 2		V
Output 3 (Reverse Bias):	**100**	
Output 4 (PCD Bias):		V
Reverse Bias Range		V
PFN Type		ps

Bias Offset:

Strip 1	
Strip 2	
Strip 3	
Strip 4	

Interstrip Timing:

Strip #	Setting	Delay
1		0 nS
2		0.4 nS
3		0.8 nS
4		1.2 nS

Steering

Points to:	**TCC**
ϕ =	
θ =	
T =	

Power Supply

Voltage:	**15** VDC

Timing:

Channel:		
Inserted Delay:		nS
ΔT to fiducial		nS
Timed at	T-0.1	nS

Monitor Output

Scope #	Channel #	Atten: db

Authorized by G. Pien Confirmed by:

Film and Development

Film to be used at OMEGA 1-18/19-00

Diagnostic	Film	Format	Developer	Time	Temp
XRFC/SSC	TMAX	35mm	LLE	LLE*	LLE*
XRPHC	DEF	LLE	LLE	LLE*	LLE*
LAPC	DEF	2” diam	GBX	5 min	68 F
Henway	DEF	35mm	GBX	5 min	68 F

The LAPC and Henway will be ride-alongs on these two days for a few shots.

There will not be any 2484 run on Tuesday and Wednesday.

Film to be used at OMEGA 1-20-00

Diagnostic	Film	Format	Developer	Time	Temp
XRFC/SSC	2484	35mm	D19	7 min	75 F
XRPHC	DEF	LLE	LLE	LLE*	LLE*
LAPC	DEF	2” diam	GBX	5 min	68 F
Henway	DEF	35mm	GBX	5 min	68 F

2484 will be provided by LANL and will be wedged at LANL.
2” diameter DEF will also be provided by LANL.

*It is my understanding from a conversation with Eugene (1/10/00) that the standard LLE process for TMAX3200 is 24 deg C (75 deg F) for 7.5 min. The standard process for DEF at LLE is 20 deg C (68 deg F) for 5 min.

Although the standard LLE development for DEF is the same as I have specified for other DEF processes I am explicitly specifying these values so that there is no confusion.

Film personnel:

Eugene Kowaluk
Stephanie Dent
Steve Zipeto

Contact List of Key Personnel

LLE (716)275-5101

War Room -8360
WarRmComputers -7663
Ray Bahr -9443
Tom Boehly -0254
David Bradley -5769
Paul Jaanamagi-5515
Jim Knauer -2074
Pat McKenty -3865
Sam Morse -9672
Greg Pien -5848
Wolf Seka -3815
John Soures -3866
Jean Steve -5286
Keith Thorp -7603

Marriott Courtyard Brighton (716)292-1000

Cris Barnes pager 12-3598 (Exp. Div. Visitor)
Steve Batha pager: (505)996-1824 1841547@pagemart.net cell: (505)670-2851
Scott Evans cell: (505)699-1581
Kett Gifford
Rich Holmes
Steve Rothman
Tom Sedillo pager: (505)996-3004
John Scott
Pete Walsh pager: (505)996-3696 1813419@pagemart.net
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Marriott Residence Inn (716)272-8850

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