LABORATORY *for* LASER ENERGETICS

University of Rochester • Laboratory for Laser Energetics

www.lle.rochester.edu

Mission Statement

The Laboratory for Laser Energetics (LLE) of the University of Rochester is a unique national resource for research and education in science and technology. The Rochester area has a history of innovation and provides a unique setting for LLE within a technologically sophisticated community. Established in 1970 as a center for the investigation of the interaction of intense radiation with matter, the Laboratory has a five-fold mission:

1. to conduct implosion experiments and basic physics experiments in support of the National Inertial Confinement Fusion (ICF) Program;
2. to develop new laser and materials technologies;
3. to provide graduate and undergraduate education in electro-optics, high-power lasers, high-energy-density physics, plasma physics, and nuclear fusion technology;
4. to operate the National Laser Users' Facility (NLUF); and
5. to conduct research and development in advanced technology related to high-energy-density phenomena.

The 2014 LLE Calendar contains information about many of the Laboratory's programs. We hope that you enjoy using your copy of the LLE Calendar and wish you a productive and fulfilling 2014.

LLE is funded by the National Nuclear Security Administration (NNSA) to support its Stockpile Stewardship Missions.

Photography by Eugene Kowaluk

National Nuclear Security Administration

Welcome to 2014

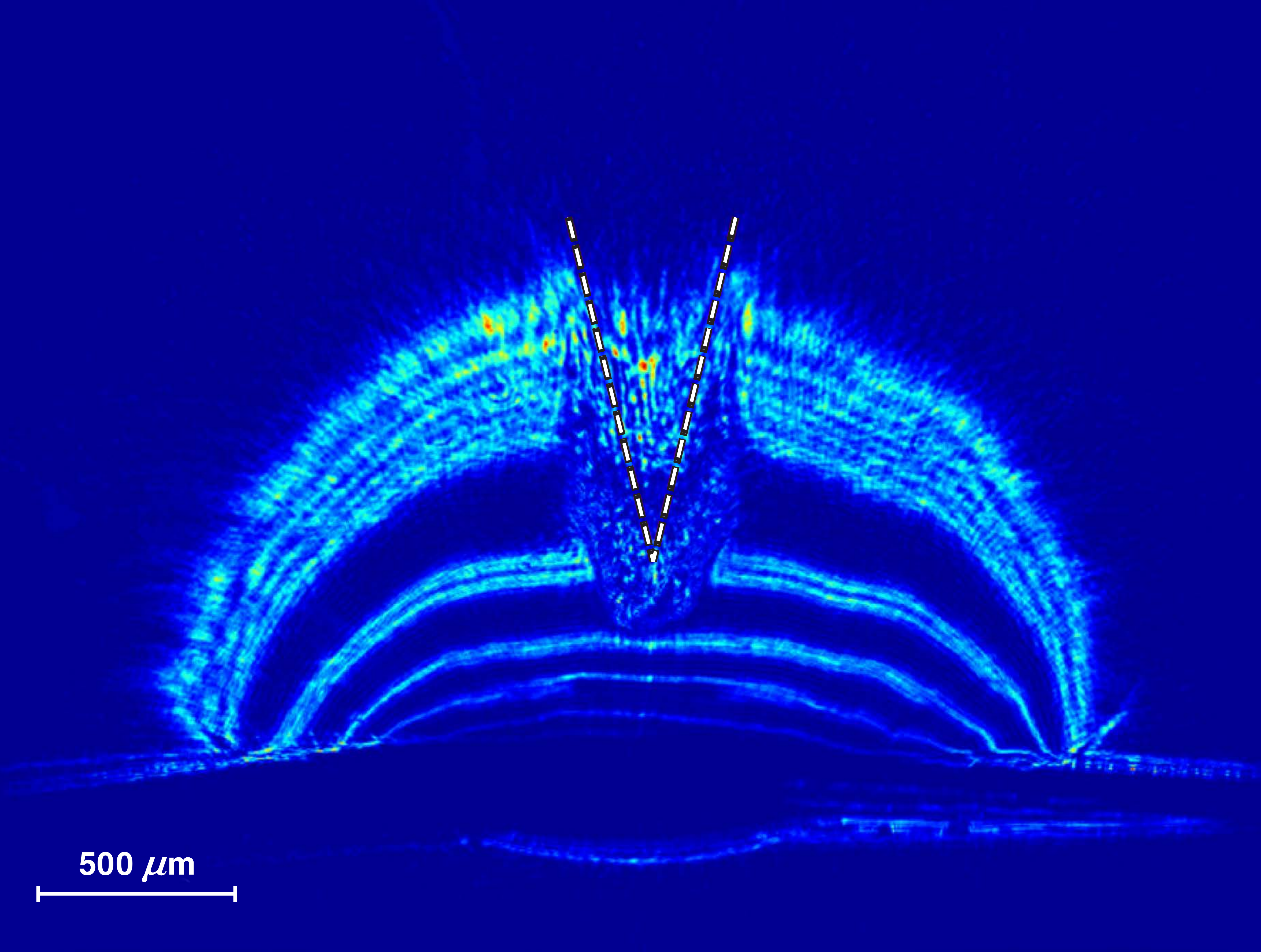
LLE Vision

LLE envisions a secure, environmentally neutral, and inexhaustible energy source for mankind. This future energy source—fusion—is the basis of the sun's energy and is carbon and radioactive-waste free.

<u>2014 will be a year of challenges and opportunities</u>

- Ongoing pursuit of ignition and the development of ignition alternatives
- Polar-drive cryogenic implosions on OMEGA!
- Omega will remain the premier high-energy-density user facility
- Education and training of students (high school through Ph.D.) is a high priority

Prof. Robert L. McCrory
Vice President and Vice Provost, University of Rochester
Director, Laboratory for Laser Energetics


500 μm

OMEGA EP fourth-harmonic probe beam

A channel dug into a preformed plasma with a high-intensity OMEGA EP laser beam (outlined with white dashed lines) is imaged using the new OMEGA EP fourth-harmonic probe and an angular filter refractometer.

DECEMBER 2013

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29	30	31				

FEBRUARY

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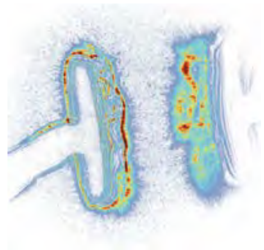

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 New Year's Day University Holiday	2	3	4
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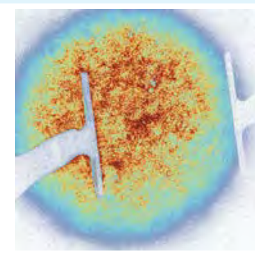
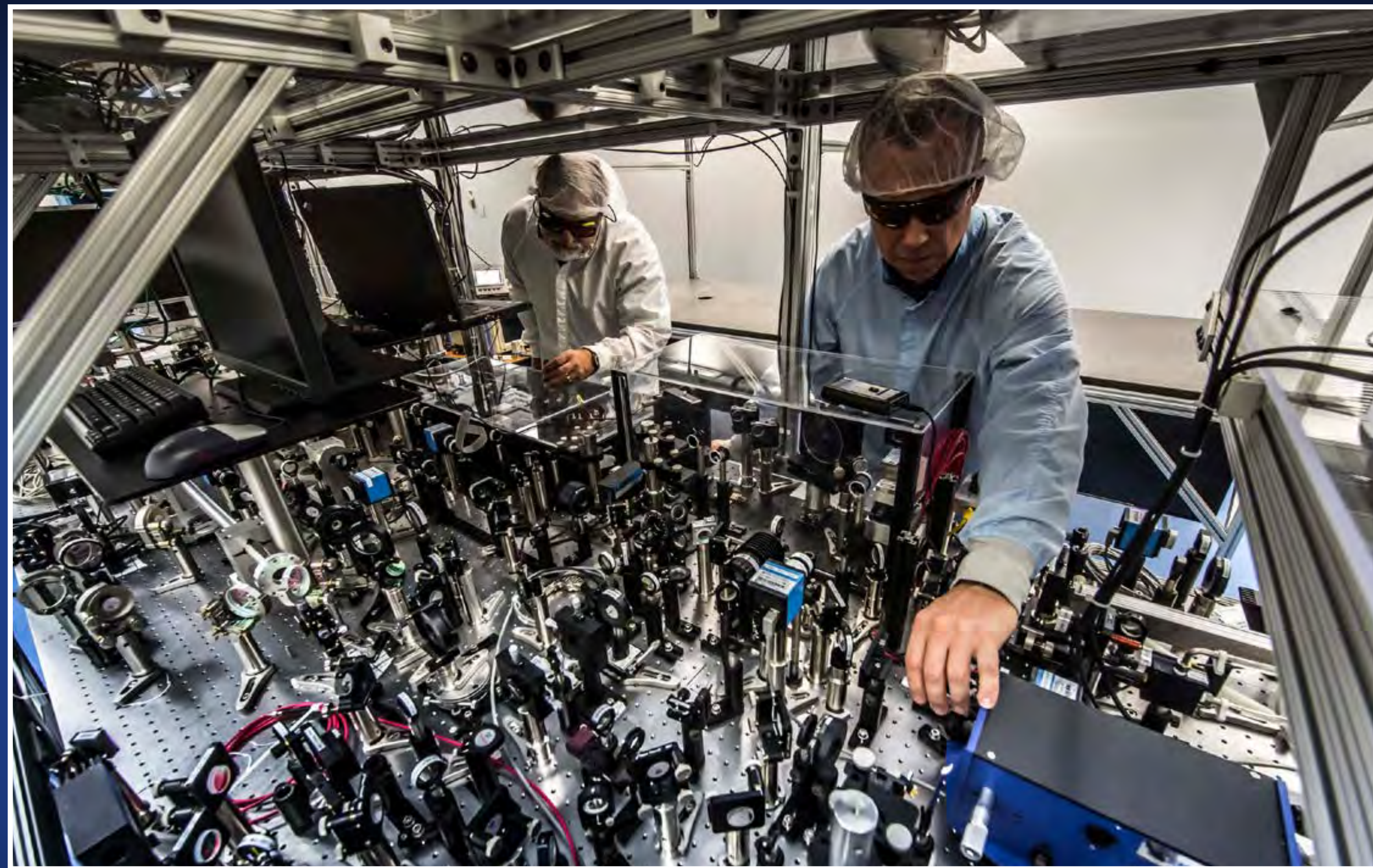
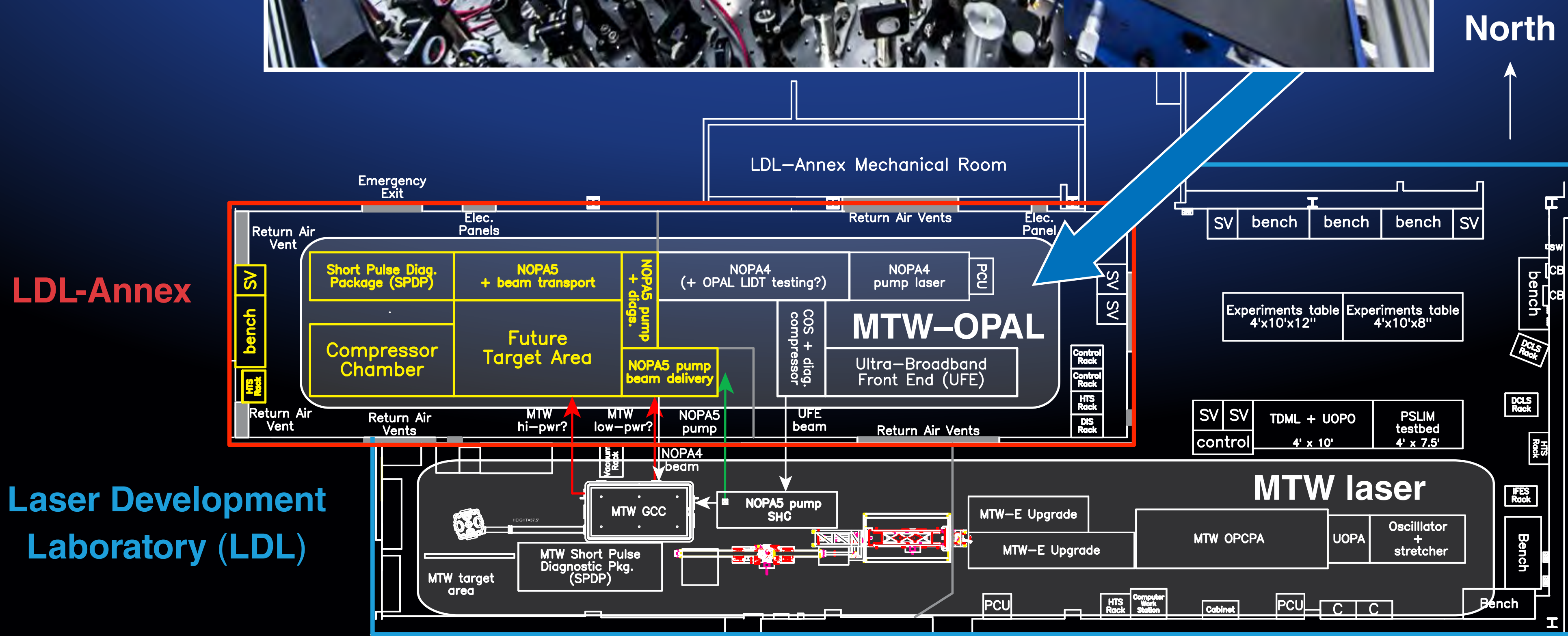


JANUARY 2014





North
LDL-Annex
Laser Development Laboratory (LDL)
LDL–Annex Mechanical Room
Emergency Exit
Elec. Panels
Return Air Vents
Elec. Panel
Return Air Vent
SV
bench
HTS Rack
Short Pulse Diag. Package (SPDP)
NOPA5 + beam transport
NOPA5 pump + diags.
NOPA4 (+ OPAL LIDT testing?)
NOPA4 pump laser
PCU
Compressor Chamber
Future Target Area
NOPA5 pump beam delivery
COS + diag. compressor
MTW–OPAL
Ultra–Broadband Front End (UFE)
Control Rack
HTS Rack
DIS Rack
Return Air Vent
Return Air Vents
MTW hi–pwr?
MTW low–pwr?
NOPA5 pump
UFE beam
Return Air Vents
NOPA4 beam
SV bench bench bench SV
Experiments table 4'x10'x12"
Experiments table 4'x10'x8"
bench
CB
DCLS Rack
SV SV control
TDML + UOPO 4' x 10'
PSLIM testbed 4' x 7.5'
HTS Rack
IFES Rack
MTW laser
MTW GCC
NOPA5 pump SHG
MTW–E Upgrade
MTW–E Upgrade
MTW OPCPA
UOPA
Oscilllator + stretcher
Bench
MTW target area
MTW Short Pulse Diagnostic Pkg. (SPDP)
PCU
HTS Rack
Computer Work Station
Cabinet
PCU
C C
Bench

Multi-Terawatt (MTW) laser upgrade

Jake Bromage and Rick Roides align an ultra-broadband front end developed for an upgrade to the MTW Laser Facility that will advance high-energy-density plasma physics and ultrafast laser science.

JANUARY

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MARCH

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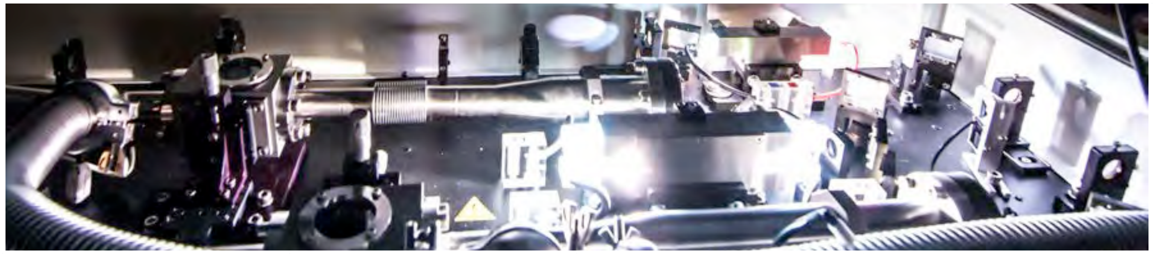
30	31					



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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16	17 President's Day	18	19	20	21	22
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FEBRUARY 2014

Sydor framing camera

A new generation of x-ray framing cameras developed by Sydor Instruments of Rochester, NY is being used on OMEGA. Ray Bahr is shown assembling the Sydor x-ray framing camera (SFC) prior to its first use.

FEBRUARY

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APRIL

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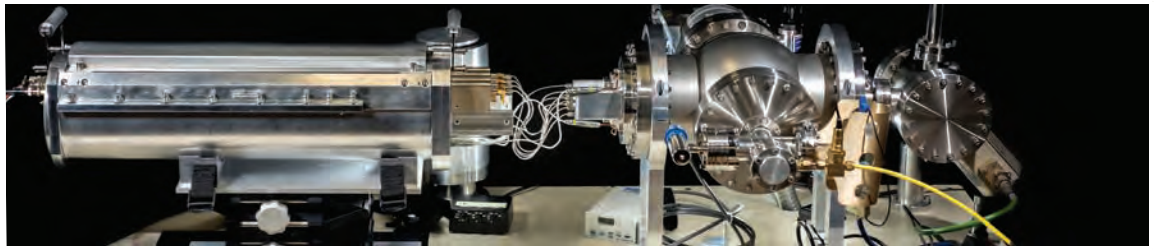
27	28	29	30			



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1
2	3	4	5	6	7	8
9 Daylight Savings Time Begins	10	11	12	13	14	15
16	17	18	19	20 Spring Equinox	21	22
23 / 30	24 / 31	25	26	27	28	29

MARCH 2014






Omega Laser Facility Users Group (OLUG)

The fifth OLUG workshop held on 24–26 April 2013 attracted researchers from all over the world who have an interest in participating in Omega Laser Facility experiments.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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Omega Laser Facility Users Group Workshop at LLE (23–25)

MARCH

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30	31					

MAY

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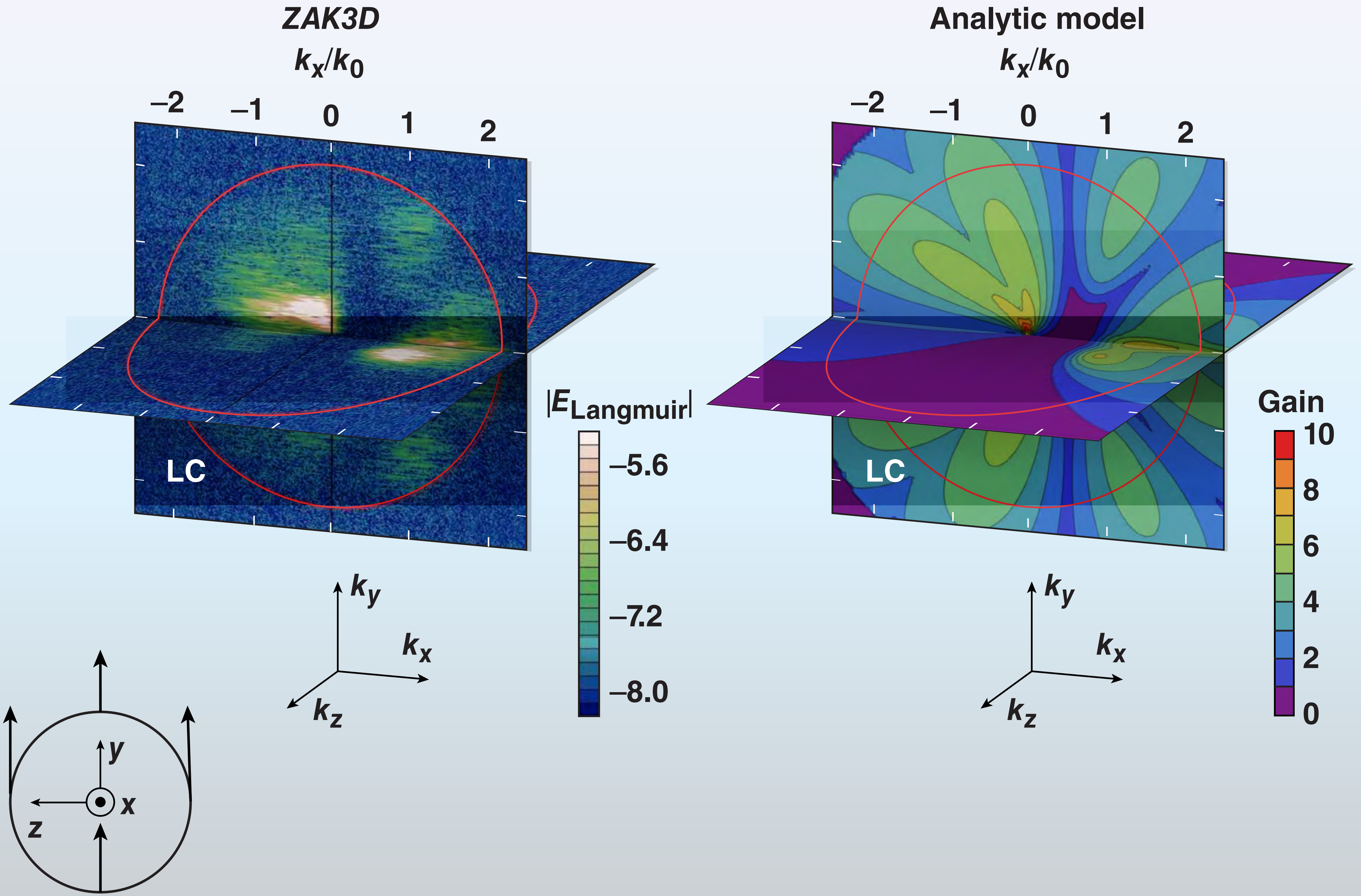
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

APRIL 2014



ZAK3D
Analytic model
k_x/k_0
–2
–1
0
1
2
LC
$|E_{Langmuir}|$
–5.6
–6.4
–7.2
–8.0
Gain
10
8
6
4
2
0
k_y
k_x
k_z
y
x
z

ZAK3D

A snapshot of the Langmuir wave spectrum obtained with the *ZAK3D* code compared with semi-analytic calculations when the growth is still in the linear phase. The Langmuir waves grow as a result of the two-plasmon–decay instability driven by four overlapped laser beams having angles and polarizations consistent with OMEGA EP.

APRIL

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20	21	22	23	24	25	26
27	28	29	30			

JUNE

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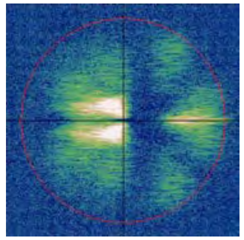
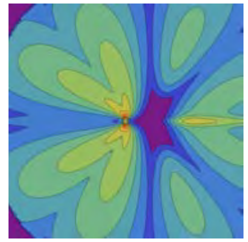
22	23	24	25	26	27	28
29	30					





SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26 Memorial Day University Holiday	27	28	29	30	31

MAY 2014

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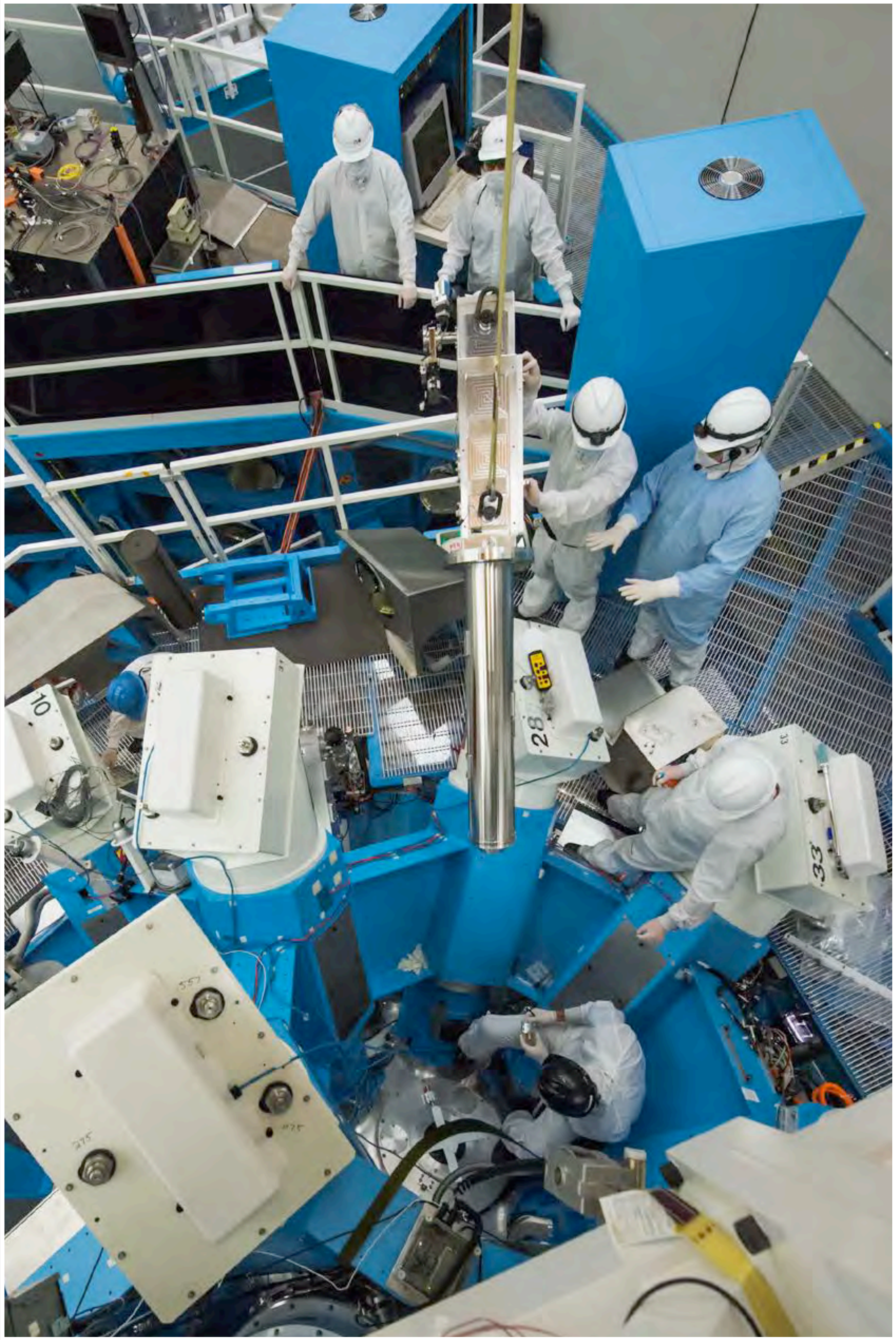
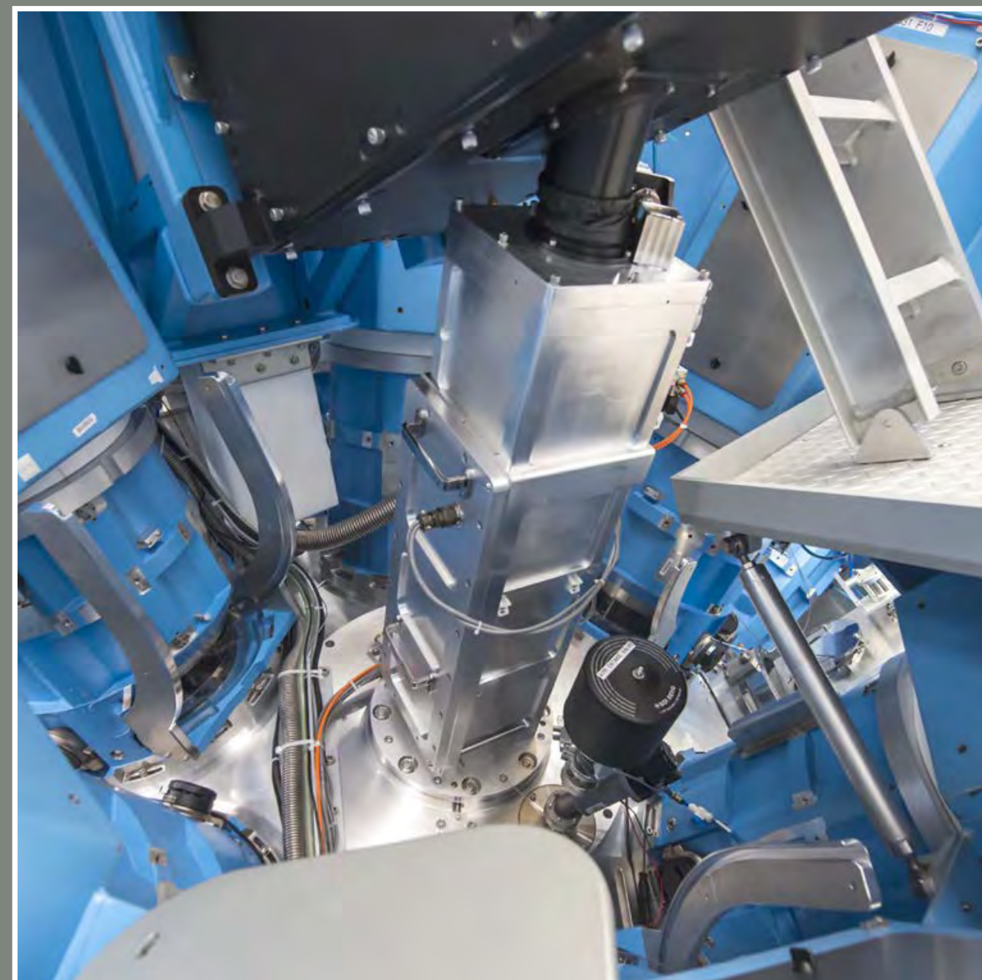
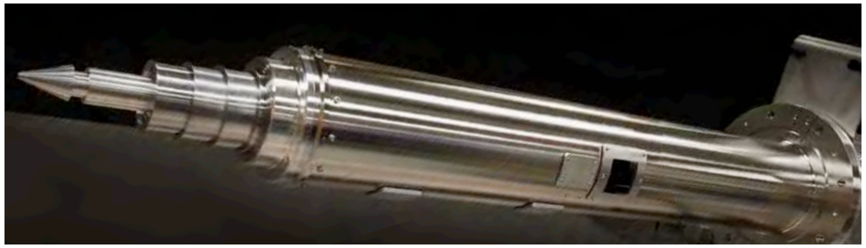

10
28
33



Neutron temporal diagnostic (NTD)

The NTD measures the time history of the neutrons produced in a fusion-target experiment. The photographs show a new high-precision NTD system being installed on OMEGA. The system uses a ROSS Sydor streak camera, replacing the old Nova NTD system.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21 Summer Solstice
22	23	24	25	26	27 LLE Golf Tournament at Blue Heron Hills	28
29	30					



MAY

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18	19	20	21	22	23	24
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JULY

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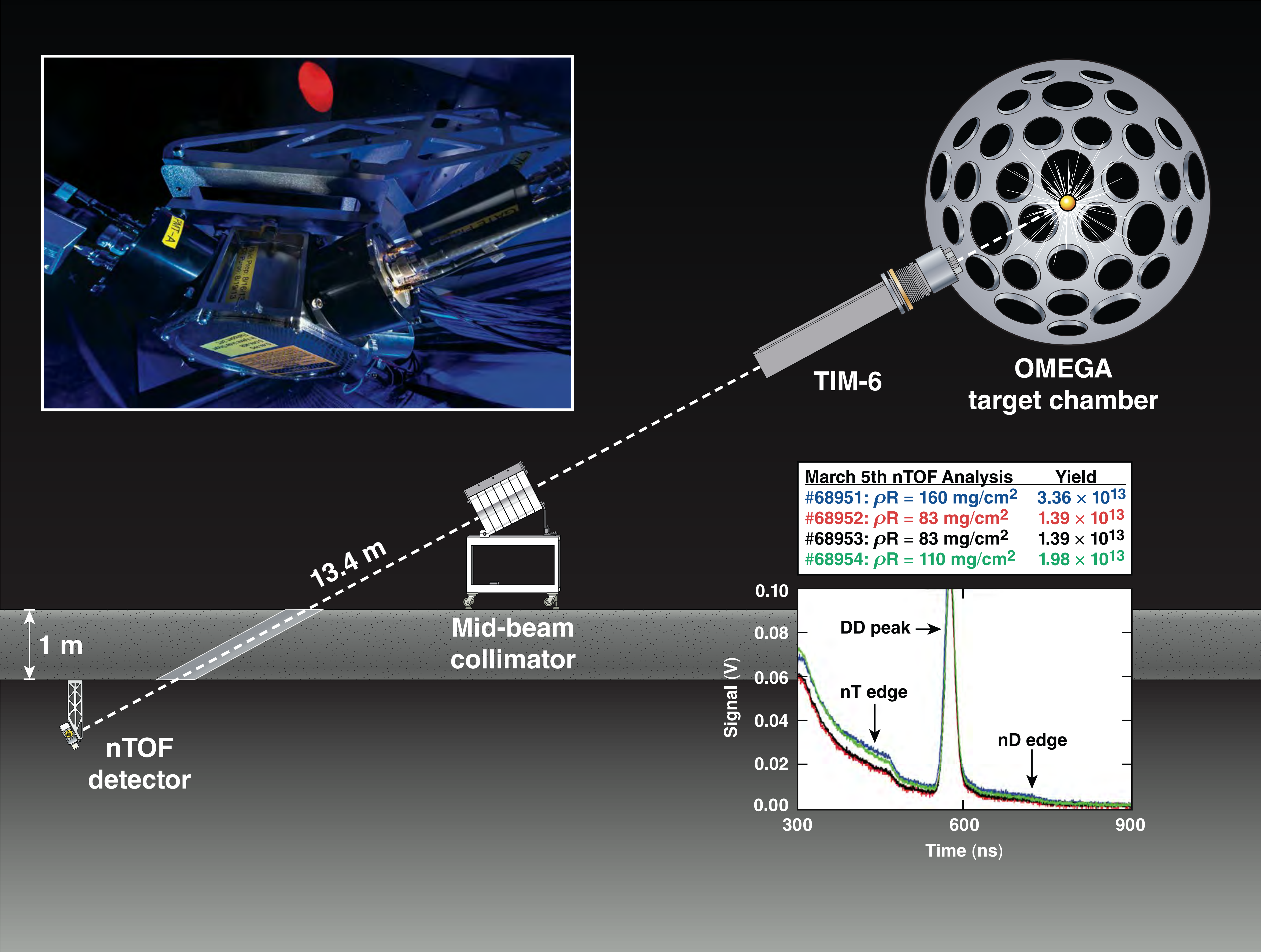
27	28	29	30	31		

JUNE 2014



TIM-6
OMEGA
target chamber
March 5th nTOF Analysis
Yield
#68951: ρR = 160 mg/cm2
3.36 × 1013
#68952: ρR = 83 mg/cm2
1.39 × 1013
#68953: ρR = 83 mg/cm2
1.39 × 1013
#68954: ρR = 110 mg/cm2
1.98 × 1013
13.4 m
1 m
Mid-beam
collimator
nTOF
detector
DD peak
nT edge
nD edge
Signal (V)
Time (ns)
0.10
0.08
0.06
0.04
0.02
0.00
300
600
900

Neutron time-of-flight detector (nTOF)

The nTOF detector measures the neutron spectrum emitted from deuterium–tritium (DT) fusion reactions in cryogenic implosions. Analysis of the spectrum provides important information on the implosion performance, including the compressed shell's areal density.

JUNE

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AUGUST

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31						

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1	2	3	4 Independence Day University Holiday	5
6	7	8	9	10	11	12
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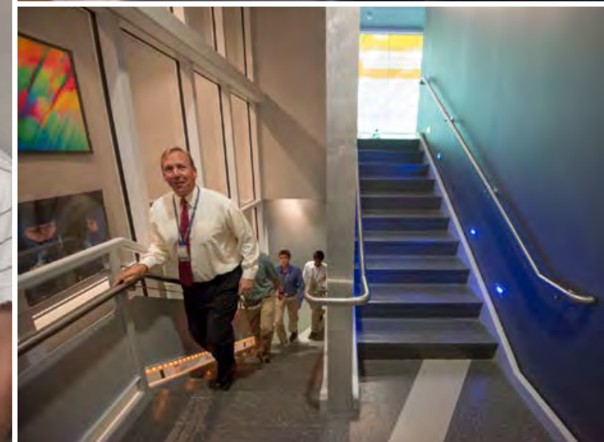
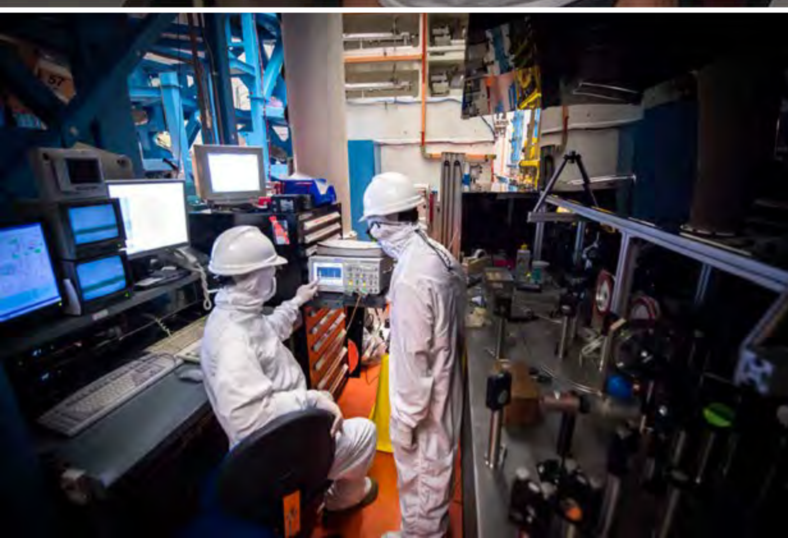
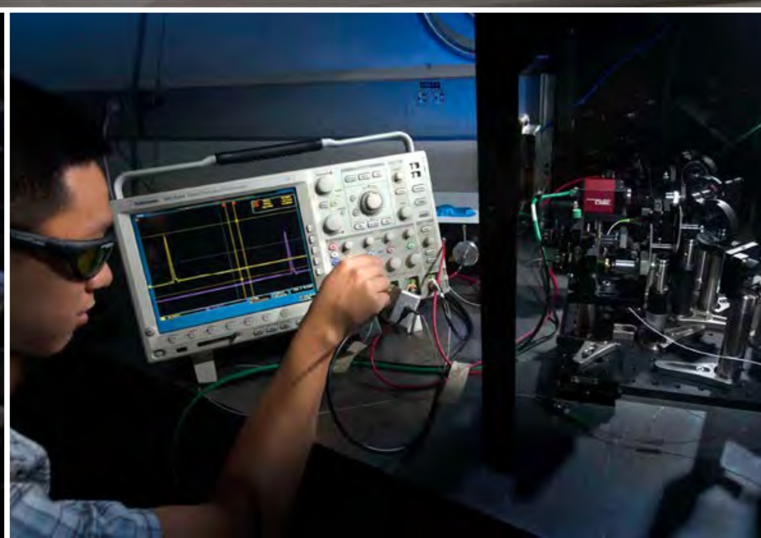
27	28	29	30	31		

JULY 2014


BOYS STATE







Summer High School Research Program

Participants in the 2013 Summer High School Research Program. The program provides unique research opportunities to talented regional high school students. The program director is Dr. Steven Craxton (center).

JULY

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SEPTEMBER

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28	29	30				

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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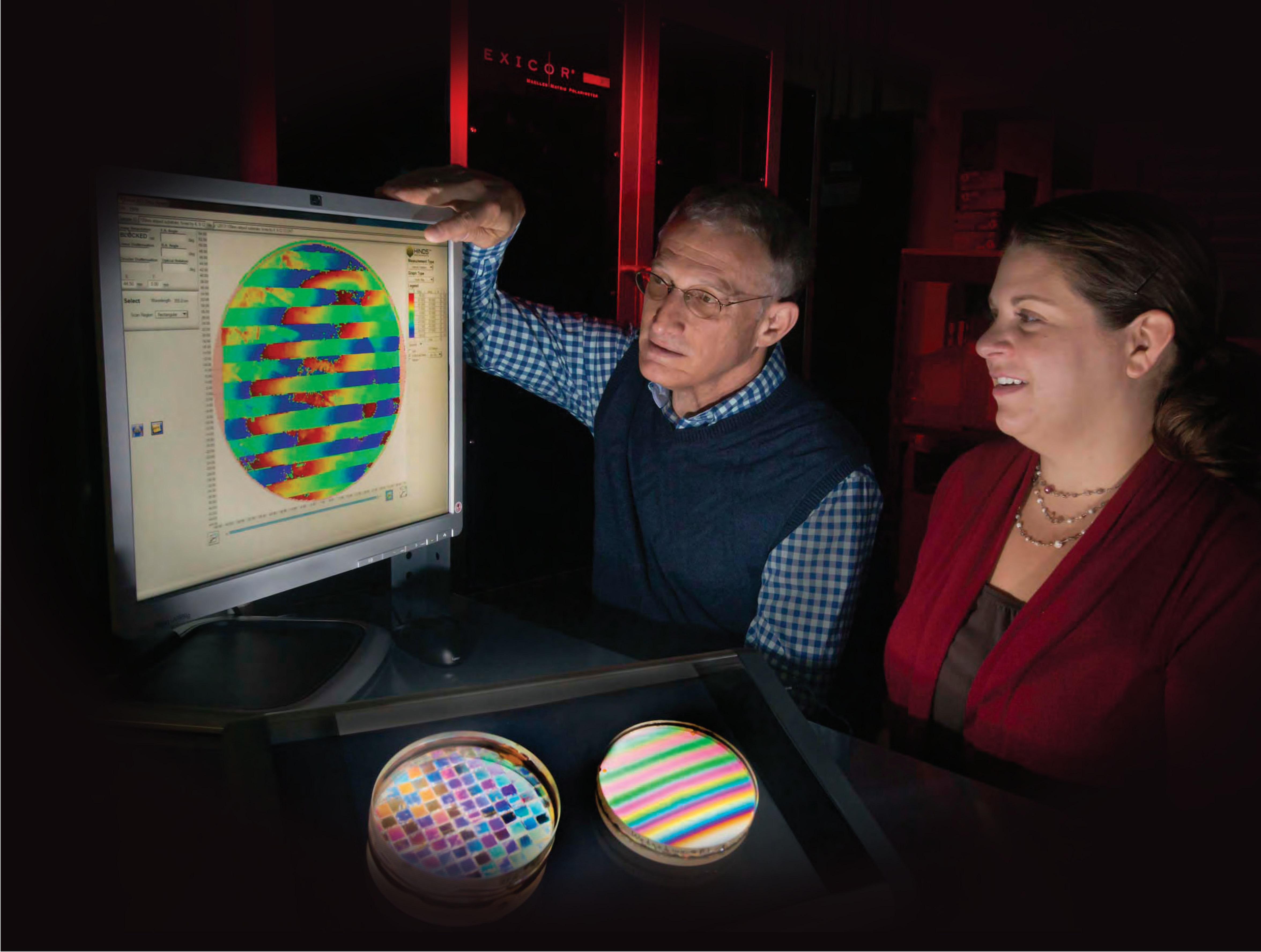
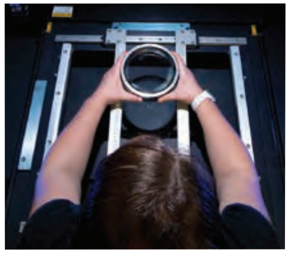
17	18	19	20	21	22	23
24 / 31	25	26	27	28	29	30

AUGUST 2014


EXICOR
HINDS
Select

Distributed polarization rotator

Steve Jacobs and Brittany Taylor examine a color-coded amplitude map of optical rotatory power taken of a striped distributed polarization rotator. The device consists of a liquid crystal fluid confined between 100-mm-diam glass substrates.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 Labor Day University Holiday	2	3	4	5 LLE Golf Tournament at Bristol Harbour	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23 Autumnal Equinox	24	25	26	27
28	29	30				

AUGUST

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31						

OCTOBER

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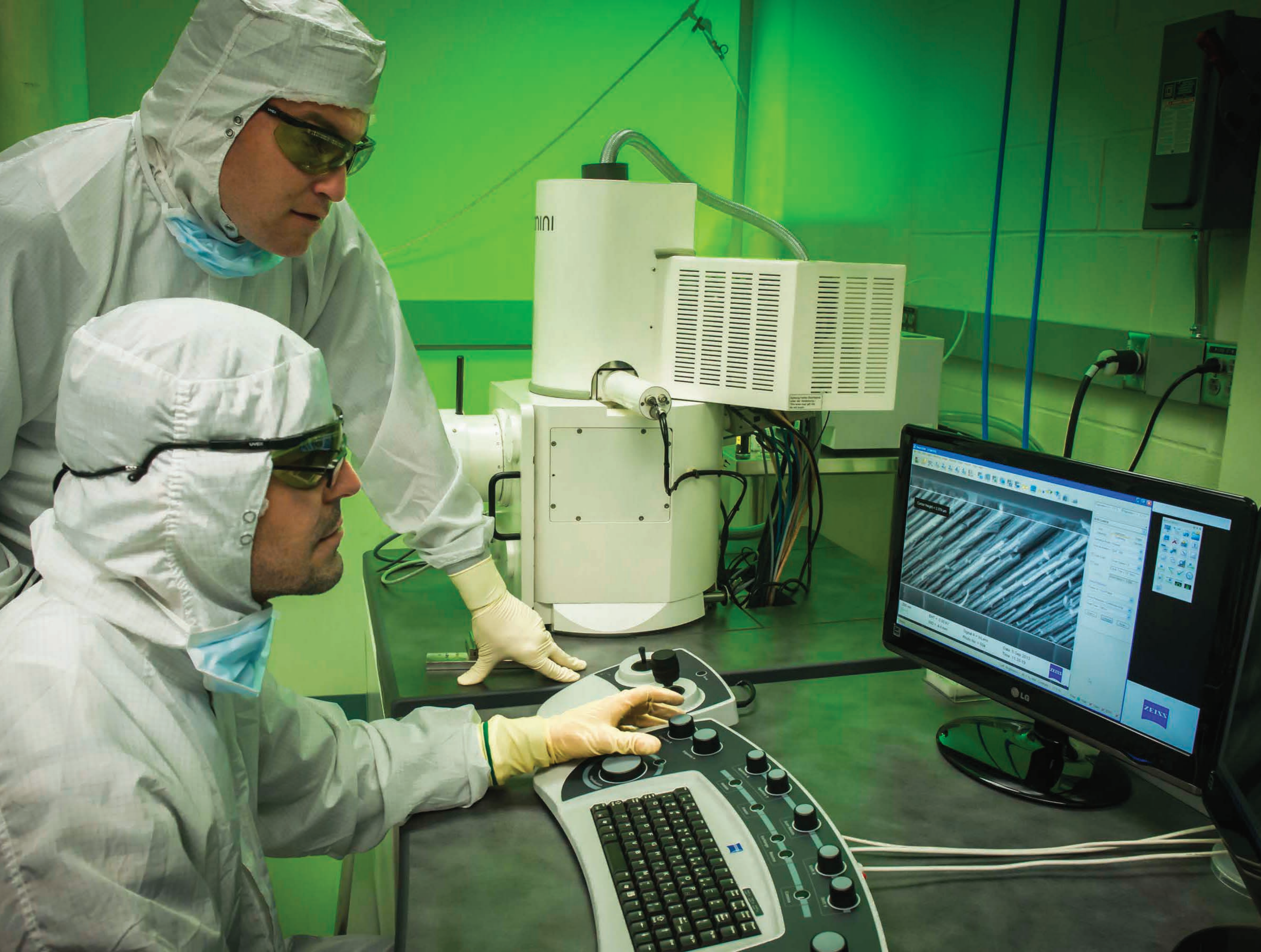
SEPTEMBER 2014


LG
ZEISS

Glancing-angle–deposited (GLAD) coatings

Glancing-angle–deposited (GLAD) films are evaluated on a Zeiss 1530 scanning electron microscope by Jim Oliver and Chris Smith. The birefringent film structure created by the GLAD process enables the vacuum deposition of wave-plate coatings.

SEPTEMBER

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NOVEMBER

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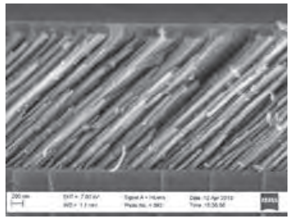

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1	2	3	4
5	6	7	8	9	10	11
12	13 Columbus Day	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

56th Annual Meeting of the APS Division of Plasma Physics in New Orleans, LA (October 27–31)

OCTOBER 2014

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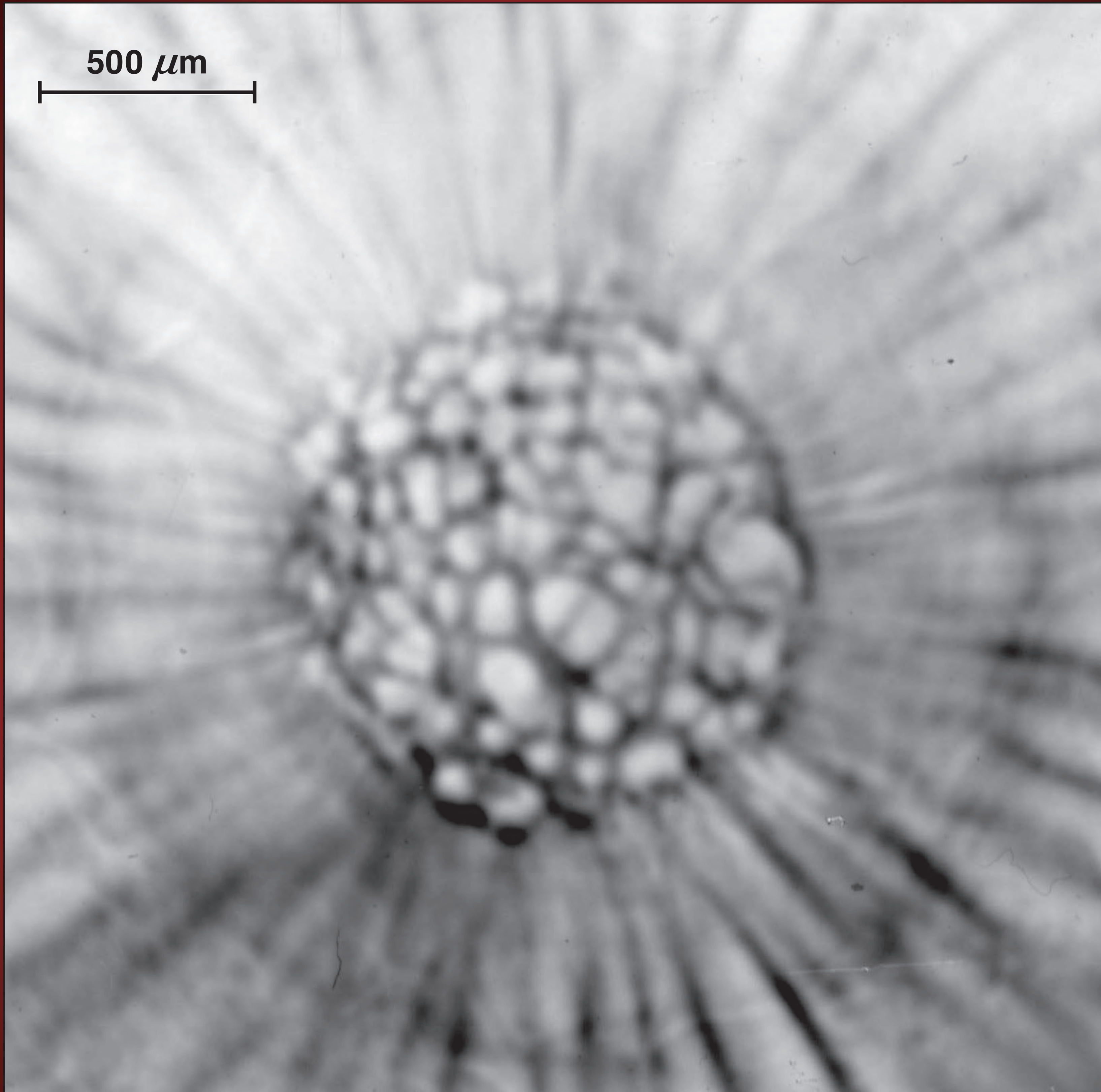
UR LLE


500 μm

Proton radiography

Proton radiography is a powerful diagnostic tool that has been applied on a variety of experimental investigations at the Omega Laser Facility. A face-on proton radiographic image of a driven foil shows magnetic fields generated by the nonlinear stage of the Rayleigh–Taylor instability.

OCTOBER

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DECEMBER

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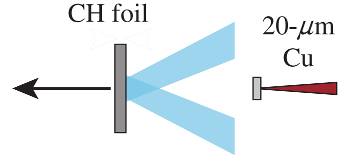
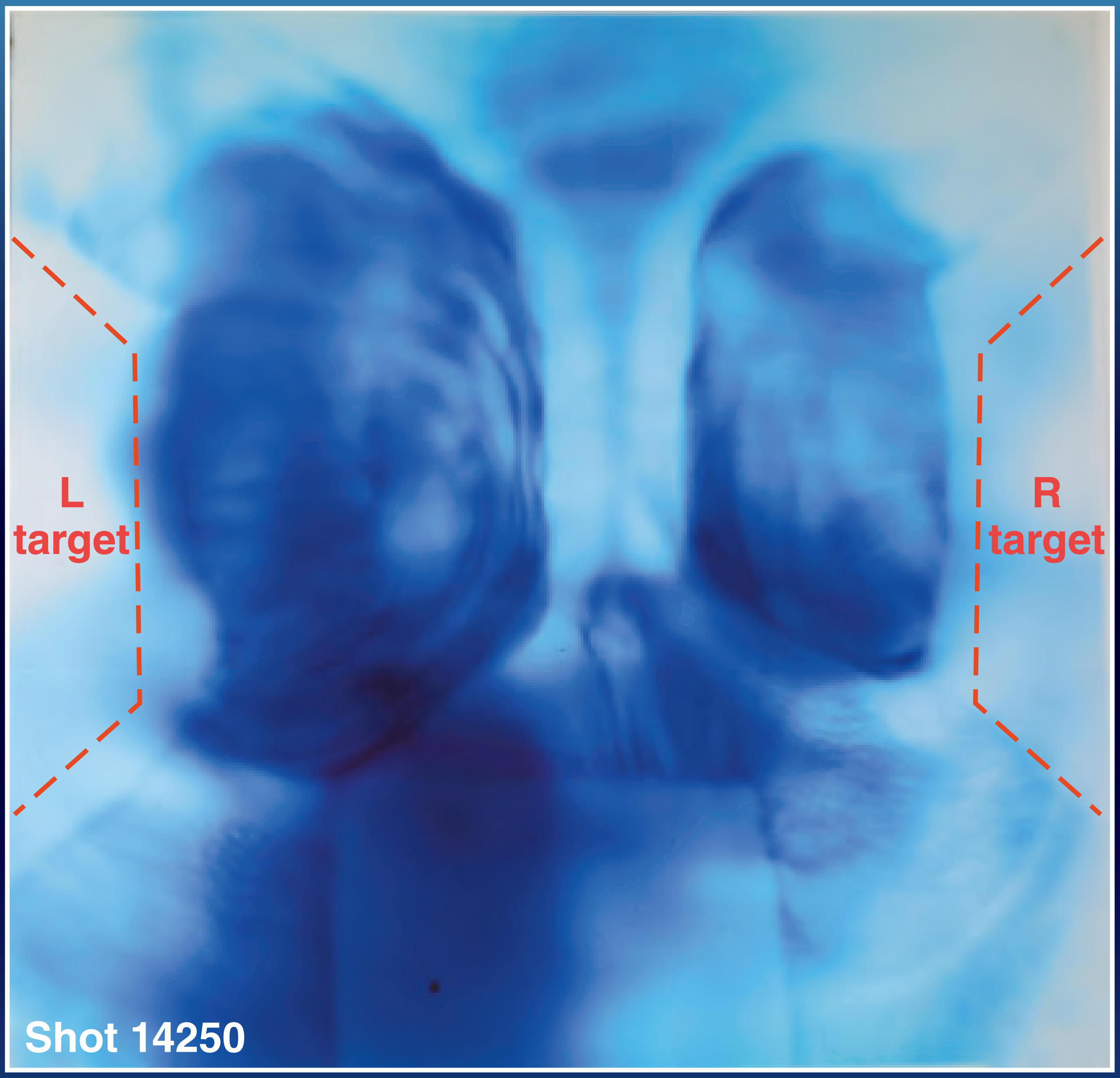
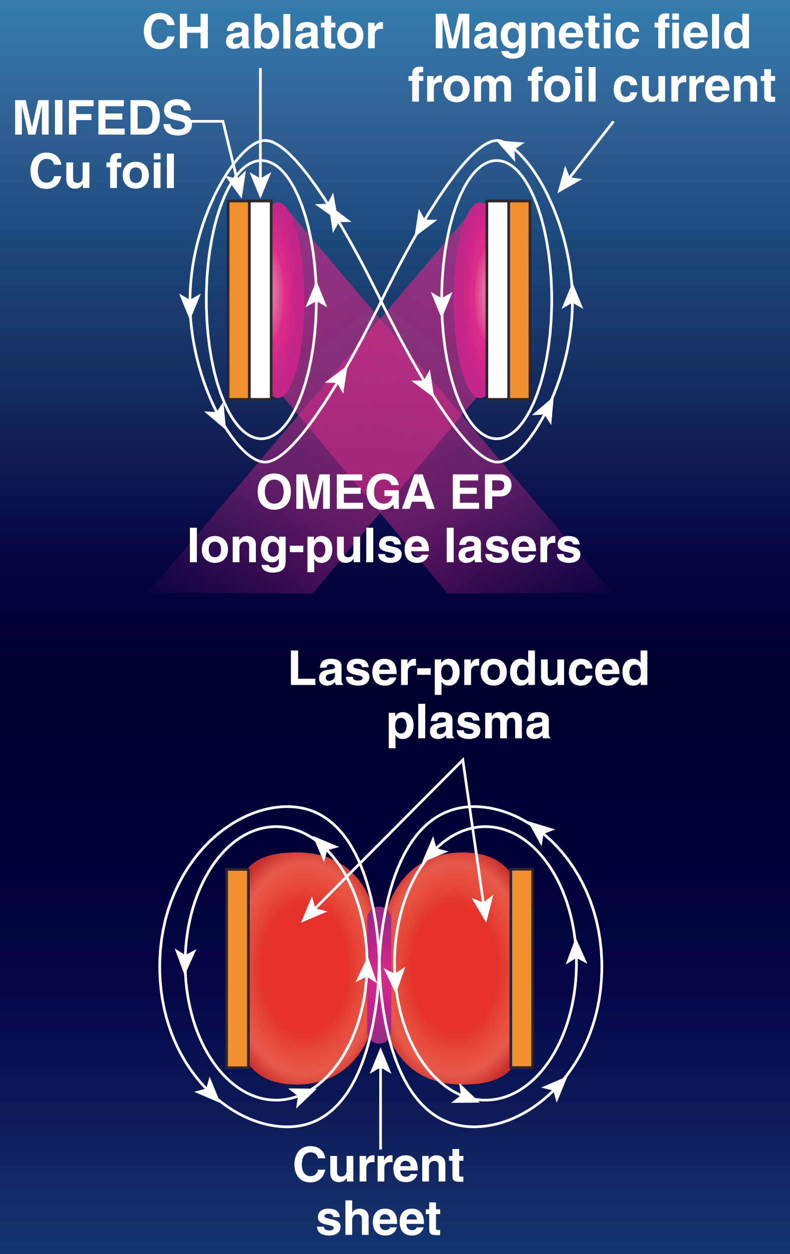
28	29	30	31			



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1
2 Daylight Savings Time Ends	3	4	5	6	7	8
9	10	11 Veterans Day	12	13	14	15
16	17	18	19	20	21	22
23 / 30	24	25	26	27 Thanksgiving Day University Holiday	28 University Holiday	29

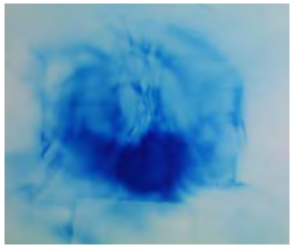
NOVEMBER 2014


L
target
R
target
Shot 14250


CH ablator
Magnetic field from foil current
MIFEDS Cu foil
OMEGA EP long-pulse lasers
Laser-produced plasma
Current sheet

Collision of counter-streaming magnetized plasmas

Proton radiographic image of a magnetized counter-streaming plasma from an NLUF experiment led by W. Fox of the University of New Hampshire.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21 Winter Solstice	22	23	24	25 Christmas Day University Holiday	26 University Holiday	27
28	29	30	31			

NOVEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

JANUARY 2015

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

DECEMBER 2014

2015

JANUARY

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

FEBRUARY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

MARCH

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

APRIL

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

MAY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

JUNE

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

JULY

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

AUGUST

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

SEPTEMBER

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

OCTOBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

NOVEMBER

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

DECEMBER

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

2016

JANUARY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

FEBRUARY

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29					

MARCH

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

APRIL

S	M	T	W	T	F	S
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3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

MAY

S	M	T	W	T	F	S
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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

JUNE

S	M	T	W	T	F	S
			1	2	3	4
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12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

JULY

S	M	T	W	T	F	S
					1	2
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17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

AUGUST

S	M	T	W	T	F	S
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14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

SEPTEMBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

OCTOBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
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23	24	25	26	27	28	29
30	31					

NOVEMBER

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
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20	21	22	23	24	25	26
27	28	29	30			

DECEMBER

S	M	T	W	T	F	S
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18	19	20	21	22	23	24
25	26	27	28	29	30	31

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