Optical Diagnostics

Thomas Tsang

BROOKHAVEN NATIONAL LABORATORY
Instrumentation Division Ultrafast Laser Laboratory

- tight environment
- high radiation area
- non-serviceable area
- passive components
- optics only, no active electronics
- back illuminated with a single fiber laser - pulsed laser
- transmit image through flexible fiber bundle

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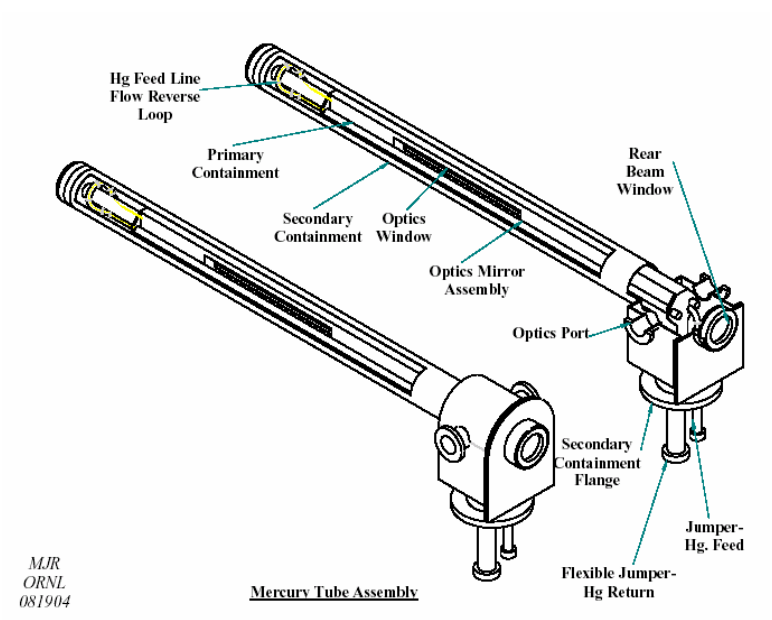

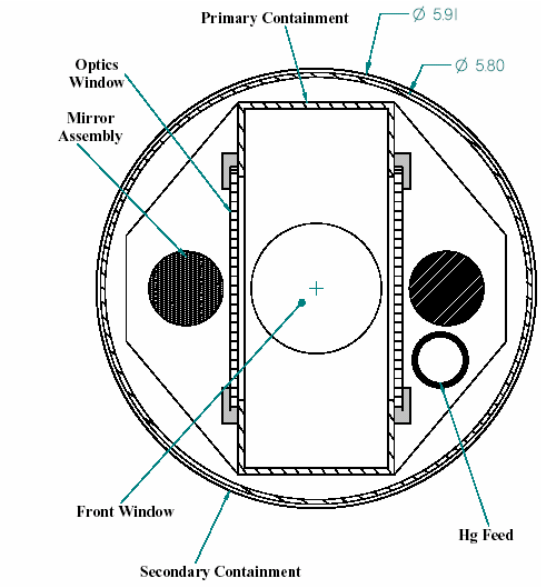

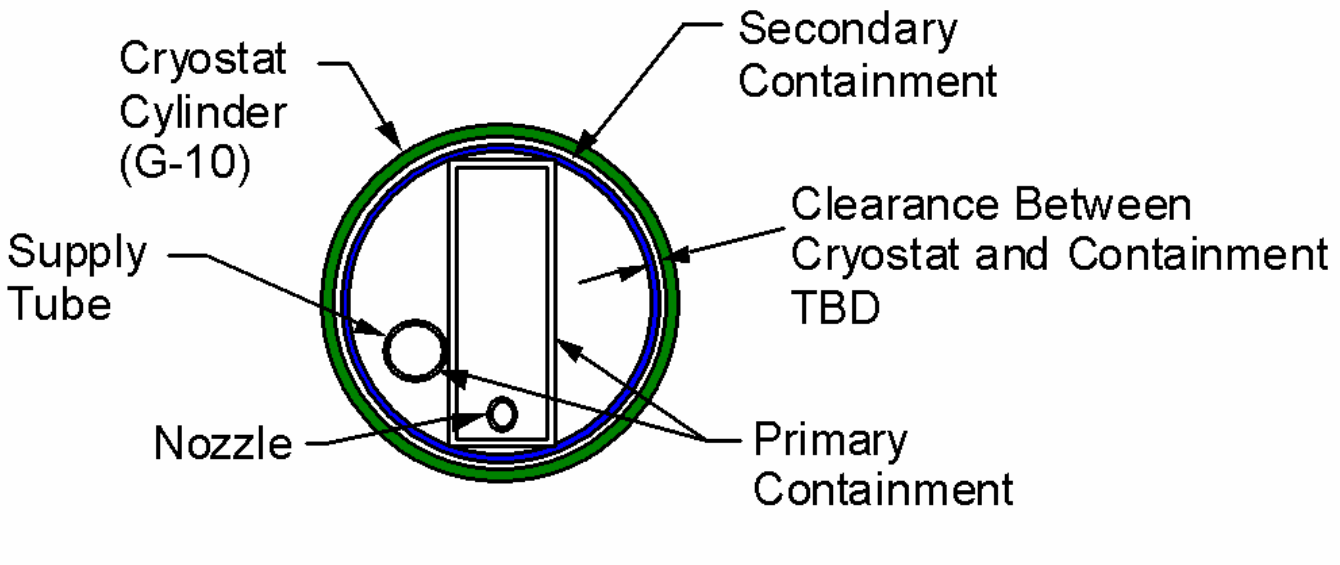

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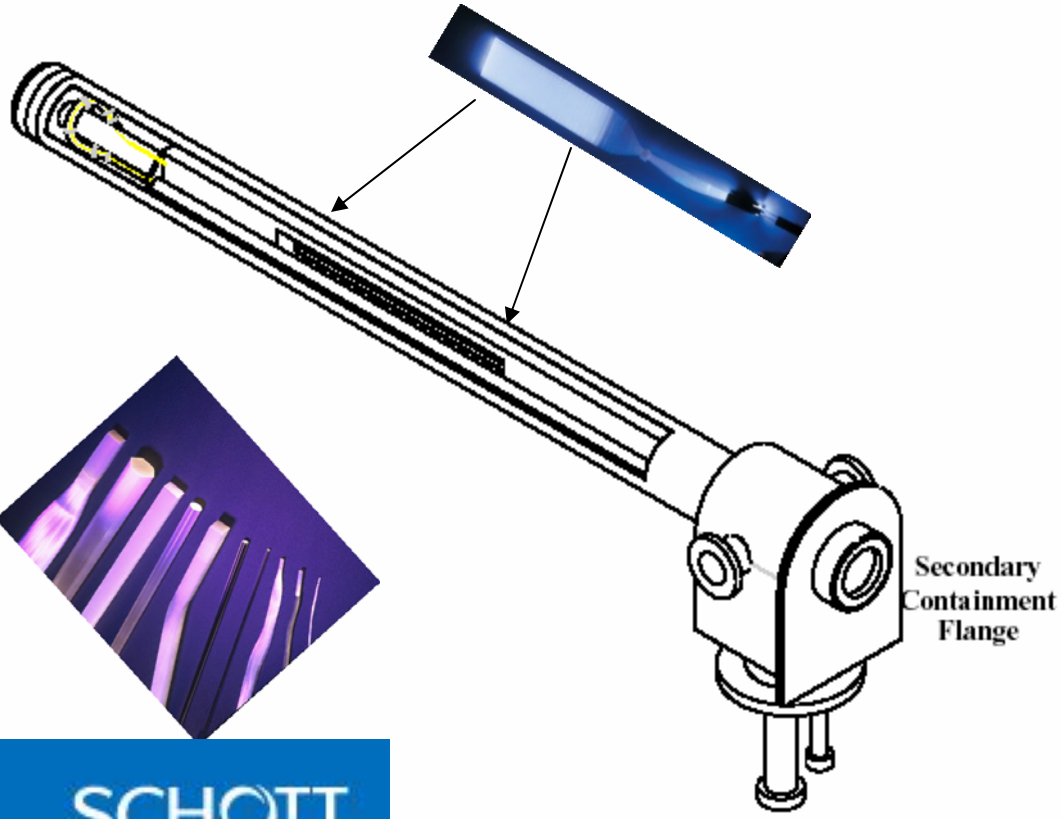
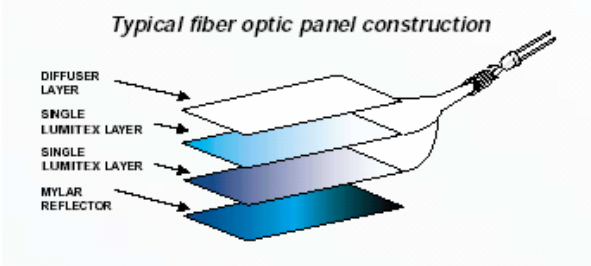
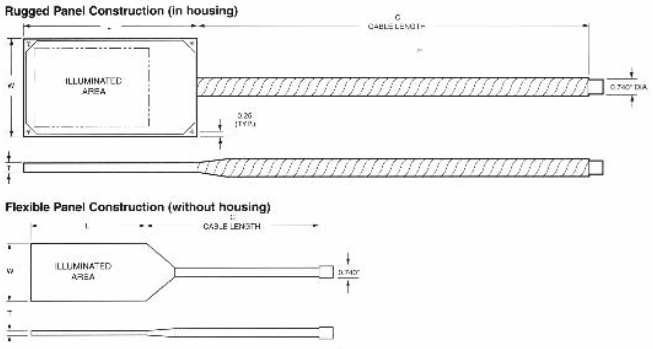
Lumitex® Inc.



SCHOTT
glass made of ideas





Type	Part #	W	L	C	T	Active Area	Qty 1	Qty 2-4	Qty 5-9	Qty 10+
Rugged	004081	3.00	4.50	36	.500	2 x 2	$375	$358	$327	$314
Rugged	004083	5.00	7.00	36	.500	4 x 4	$456	$430	$398	$349
Rugged	004084	5.00	9.00	36	.500	4 x 6	$498	$480	$443	$401
Flexible	003102	2.00	2.00	36	.225	2 x 2	$225	$209	$164	$132
Flexible	003103	3.00	3.00	36	.225	3 x 3	$262	$246	$184	$149
Flexible	003104	4.00	4.00	36	.225	4 x 4	$299	$275	$219	$181
Flexible	003105	4.00	6.00	36	.225	4 x 6	$334	$319	$235	$195
Flexible	003106	7.00	8.00	36	.170	7 x 8	$412	$389	$288	$239

Notes: All Dimensions in inches, Prices subject to change without notice.

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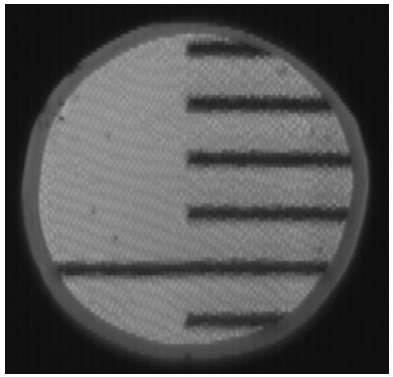
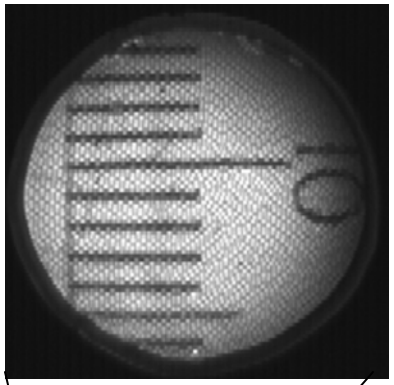
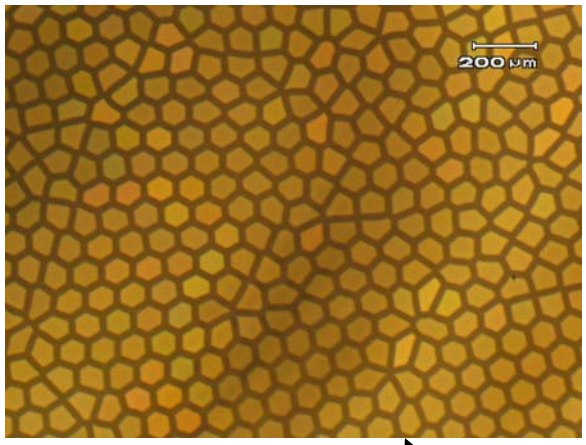
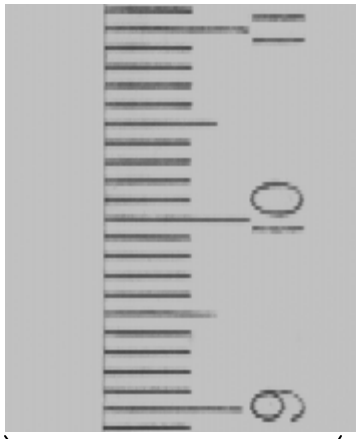


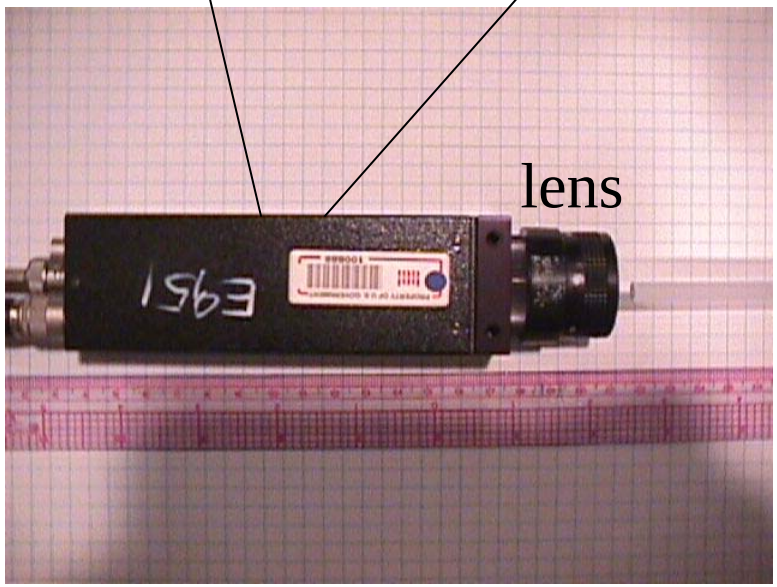
image

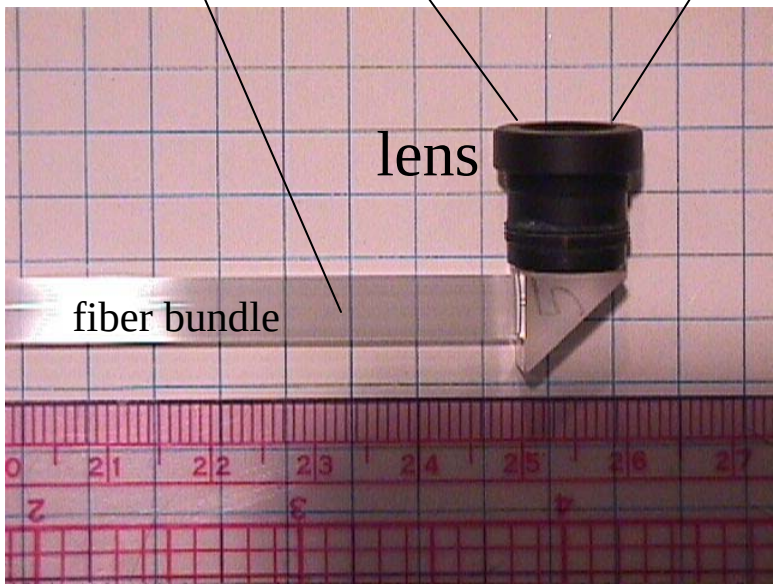




object







E951 – Hg jet results

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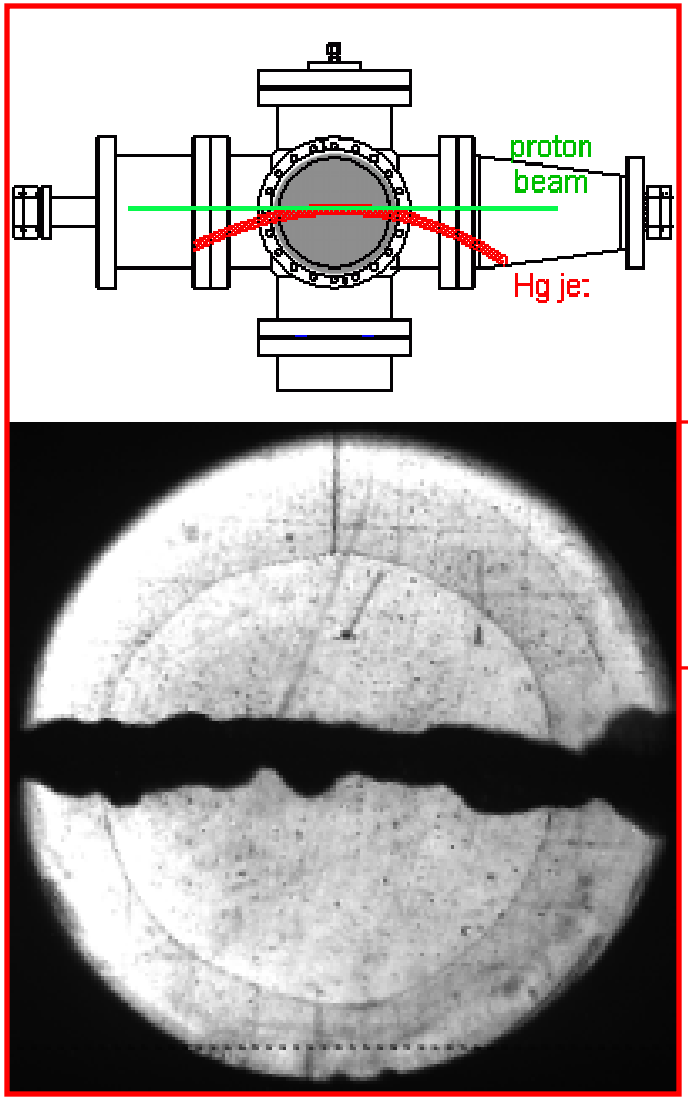


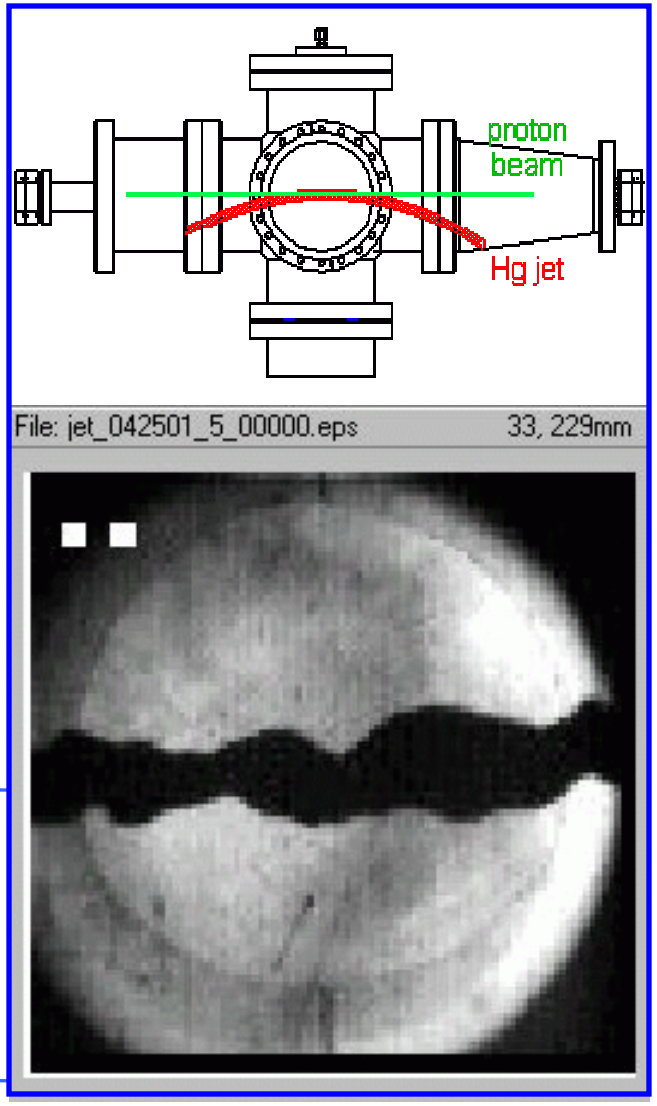
Hg jet target

The diameter of the mercury jet is ~1 cm traveling to the right in a speed of ~2.5 m/s with an interaction length of ~12 cm. The light illumination is in a diameter of ~10 cm.

BNL data @ 3.8 TP
16 frames, at 1 ms/frame,
0.15 μs exposure time
pulsed by a NIR laser
8 W peak power

field of view ~10 cm diameter

CERN data
0, 0.75, 2, 7, and 18 ms frames. The electronic shutter speed is 25 μs
Illuminated by a 3 mW CW red laser



The maximum dispersal velocity of the mercury drops is ~ 10 m/s

E951 – more Hg jet results

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E951 Mercury jet run 4-27-2001

file name: jet-4-27-01-13-movie.gif

grid size: 1 cm
field of view: 4.2 cm x 4.2 cm

frame rate: 100 microsecond
exposure time: 150 ns

proton energy: 24 GeV
# of particles: 3.7 TP

100 µs

E951 Mercury jet run 4-27-2001

file name: jet-4-27-01-20-movie.gif

grid size: 1 cm
field of view: 4.2 cm x 4.2 cm

frame rate: 10 microsecond
exposure time: 150 ns

proton energy: 24 GeV
# of particles: 3.7 TP

10 µs

E951 Mercury jet run 4-27-2001

file name: jet-4-27-01-28-movie.gif

grid size: 1 cm
field of view: 4.2 cm x 4.2 cm

frame rate: 1 microsecond
exposure time: 150 ns

proton energy: 24 GeV
# of particles: 3.3 TP

1 µs

- No evident of back propagating to the nozzle
- Hg break up ~40 us after proton impact

E951 – more Hg jet results

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E951 Mercury jet run 4-27-2001

file name: jet-4-27-01-14-movie.gif

grid size: 1 cm
field of view: 4.2 cm x 4.2 cm

frame rate: 100 microsecond
exposure time: 150 ns

proton energy: 24 GeV
# of particles: 1.0 TP

1 TP

E951 Mercury jet run 4-27-2001

file name: jet-4-27-01-12-movie.gif

grid size: 1 cm
field of view: 4.2 cm x 4.2 cm

frame rate: 100 microsecond
exposure time: 150 ns

proton energy: 24 GeV
# of particles: 2.6 TP

2.6 TP

E951 Mercury jet run 4-27-2001

file name: jet-4-27-01-13-movie.gif

grid size: 1 cm
field of view: 4.2 cm x 4.2 cm

frame rate: 100 microsecond
exposure time: 150 ns

proton energy: 24 GeV
# of particles: 3.7 TP

3.7 TP

- Hg droplets velocities increase roughly with proton beam energy