

19100

Excimer Log

FMG ~~101~~ MSC

60 SHEETS • 5 x 5 QUAD
10 1/8 x 7 1/8 • 53-108

10/85

9/95



NATIONAL BLANK BOOK COMPANY, INC.
Holyoke, Massachusetts 01040 • Made in USA

16 Oct 1985

In preparation for EXCIMER LASER use

- ① hooked up lines + HCl pressure ^{regulator} ~~gauge~~ (diaphragm is OKAY now)
- ② purged all lines (all but rare gas line had been open to air) (several times) - HCl 3 times ≈ 100 mbar in 1000 mbar He
- ③ NEW FILL (XeCl)

standard NEON fill.

$P \approx 237$ mJ
then down to 198 mJ after a minute at 20 Hz

18 Oct 1985

$P \approx 170$ mJ meter registered ≈ 440 mV (calibration factor is?)
2.59 V/J

will let run at $\frac{10}{6}$ Hz for \times hrs. Time: 1:21 pm

$P \approx 170$ mJ meter registered ≈ 440 mV
turned off at 6 pm.

23 Oct.

Installed new trigger generator card via directions sent. (In Excimer folder w/ manual)

frequency display works
manual firing works
ext. triggering works

$P \approx 434$ mV = 165 mJ rep rate ≈ 2

2/10/86

New fill XeCl (Standard Norm)

Rep rate 1 Hz

P_{min} = 213 mJ

Fill # 2

purged twice w/ He to ~650 mbar

2/19/86

P_{min} = 216 mJ

at 1 Hz

3/8/86

Run ~ 3 hrs @ 6 Hz

Laser stopped suddenly, without warning or noticeable anomalies.

Power supply interlock light tripped. Pressed reset, light went out.

When voltage turned above ~12 kV, irregular firing & apparent arcing in supply - sounds bad.

Shut down - asked André to call X on Monday.

-E S

3/18

HV box replaced by Lambda due to oil leak - laser returned to normal operation, ~ 200 mJ and 8 W @ 49 Hz!

3/26

new fill, standard fill #3

power at 200 mJ @ 1 Hz

~~3/18~~

5/90

Delaware

Replaced all 3 solenoid valves. Negligible leaking overnight from 2600 mbar He fill.

Passivate for 24 hours @ 2600 mbar HCl mix, 800 mbar He.

pump out, repeat for 48 hours more.

Hook up other gas tanks, purge several times @ He.

Fill: 180 ± 9 mJ using pyroelectric & 4.8 mV/mJ calibration into 1 MΩ on DSA 602 scope.

Upgrade: On April 13th 1992

Excimer: 120mJ, pressure 2200 ubar

I'm going to put a new fill in.

9/26/92 Replaced capacitor on oil pump for thyratron cooling. Used paper caps to make .75 μ F combination, in place of an actual motor-starting capacitor.

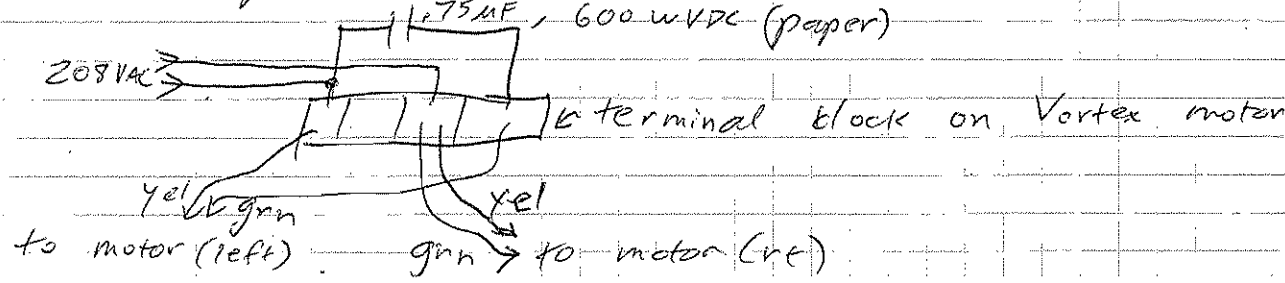
9/2/93 Sudden failure of excimer reported, with "Laser Head" light illuminated. Apparently no explosion/leaks/smoke/surges or other excitement of this sort.

Searched for an Allen wrench for cover screws (ball driver won't grip well enough.) Finally found a 3mm wrench.

D₁ switch in control unit is OK. So it's not the circulatory fan.

Took off cover. After a little confusion (interlocks are 7VAC, not 24VDC!), found the oil pump quit again.

Could it be the capacitors? -- the replacements weren't really AC units.



Yes. Caps failed to a dead short. It was a // ~~easy~~ combination of two 600 WVDC caps. The .25 μ F one was OK.

Are windings of motor still OK? Ohmmeter suggests yes. Put in .25 μ F cap. alone. No good, but that's not surprising or definitive.

Found an old μ F, 850V 60~ capacitor in room 27. Hooked it up with clip leads.

Yes! Oil flow came on right away. So this will do as a quick fix. Need to get a .75 μ F, 400+V motor starting capacitor, eventually.

From motor supplier? Wholesale Electronics?

Anyhow, will reassemble tomorrow with the big old metal capacitor; seems OK for now. Can't finish now since first lecture is at 9:05 AM.

Should never have trusted the electronics shop and used DC paper capacitors -- I suspected at the time we might have trouble.

Maybe would be OK with higher ratings -- measured $\sqrt{2} \approx 350$ VAC across capacitor, so P-P excursion is actually well over 600V.

Reassembled 9/3 AM. 450 mV \approx

9/4 Unplugged & reseated control cards in control units (suggested by a Physic on phone.) Doesn't affect HV instability.

Next, tried disconnecting HV bayonet to head again, this time with rep rate $\neq 0$. Still no 'open circuit' light. Also, HV is erratic -- shouldn't be according to a Physic.

So apparently problem is in HV supply, not head.

Next -- should pull out HV module and check for arcing or dirt that could be drawing current from output. Also should check all 3 phases of 208 V to HV box. (Will do later on 9/4 or on 9/5.)

Did so. Just has single-phase power; OK at 207 VAC. No obvious arcing or dirt. Also replaced ribbon cable between control unit & HV supply -- no effect when another cable substituted.

So, must be:

- (1) Problem in head (thyatron oil??), and test indicating problem in HV unit is misleading
- (2) Control voltage to HV supply is erratic, or peak-reading line to meter is erratic, or
- (3) HV supply itself has (partially) failed.

Since this problem coincided with the other repair, explis (1) or (2) seem logically simplest. So next time, check head again and look at actual control line voltages going in & out of control unit. Also check "end of charge" line.

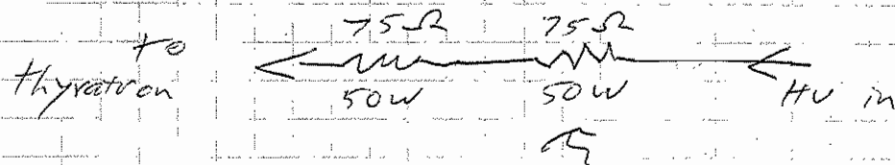
9/5

Yet more diagnostics. Looked at head again.

1) inspected all capacitors & preionization pins -- look OK

2) changed thyatron cooling oil. No large effect, though perhaps some change in time constants

→ 3) Found a problem, probably not the problem, though:



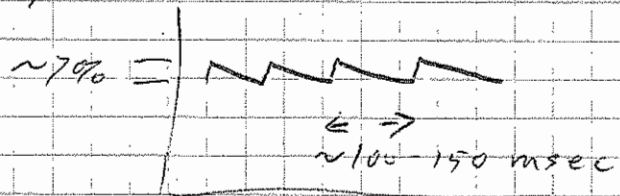
This resistor is badly cracked, and reads $\sim 125\Omega$. Looks more like mechanical damage than overheating. Seems stable, but clearly should be replaced.

Also, at some point gas processor switch was set to fluorine -- put it back on chlorine. Should help with fill lifetime.

Next time -- look at voltages in control unit closely.

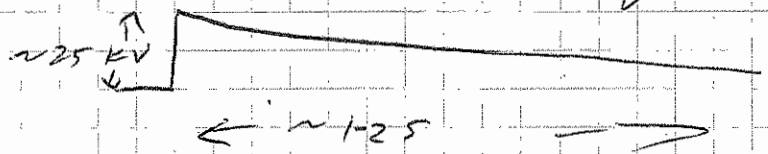
9/6

Checked control unit. All 208 V lines are OK. Looked at the peak-detect HV signal fed to the meter. It's dropping by $\sim 70\%$ between charging pulses:



This circuit has a 1.5s time constant, so it implies HV is dropping quite quickly.

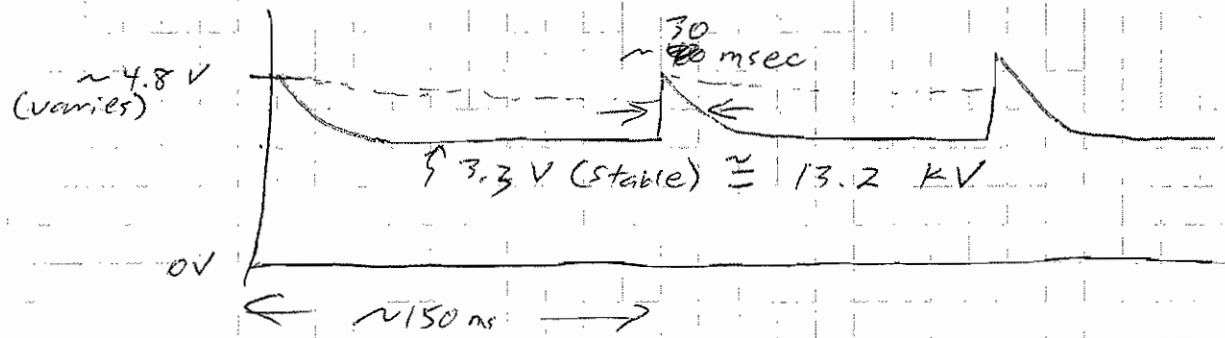
With HV bayonet to head removed, expect something similar, but because of intrinsic 0.5 τ time constant of power supply alone. That's exactly what is seen from a single charging pulse,



So it seems likely something in head is pulling supply down - probably capacitor bank or thyatron, could also be in HV supply itself, but I now doubt this. Next will look at HV sense directly (in HV unit) to check this out.

9/7/93

I looked at HV sense line directly. What I see is somewhat different than expected.



At ~ 20 kV (on meter)

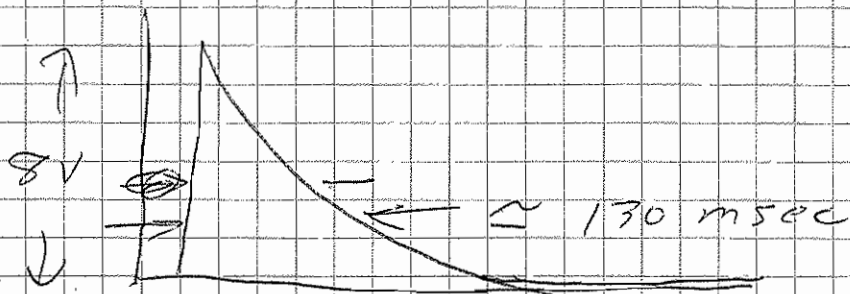
What gives this changing time constant? Looks like series resistance with

$$RC = 3 \times 10^{-2} \text{ s}$$

What is C? probably of order 1 nF (checks!)

$$\text{So } R \approx \frac{3 \times 10^{-2}}{10^{-9}} = 30 \text{ M} !$$

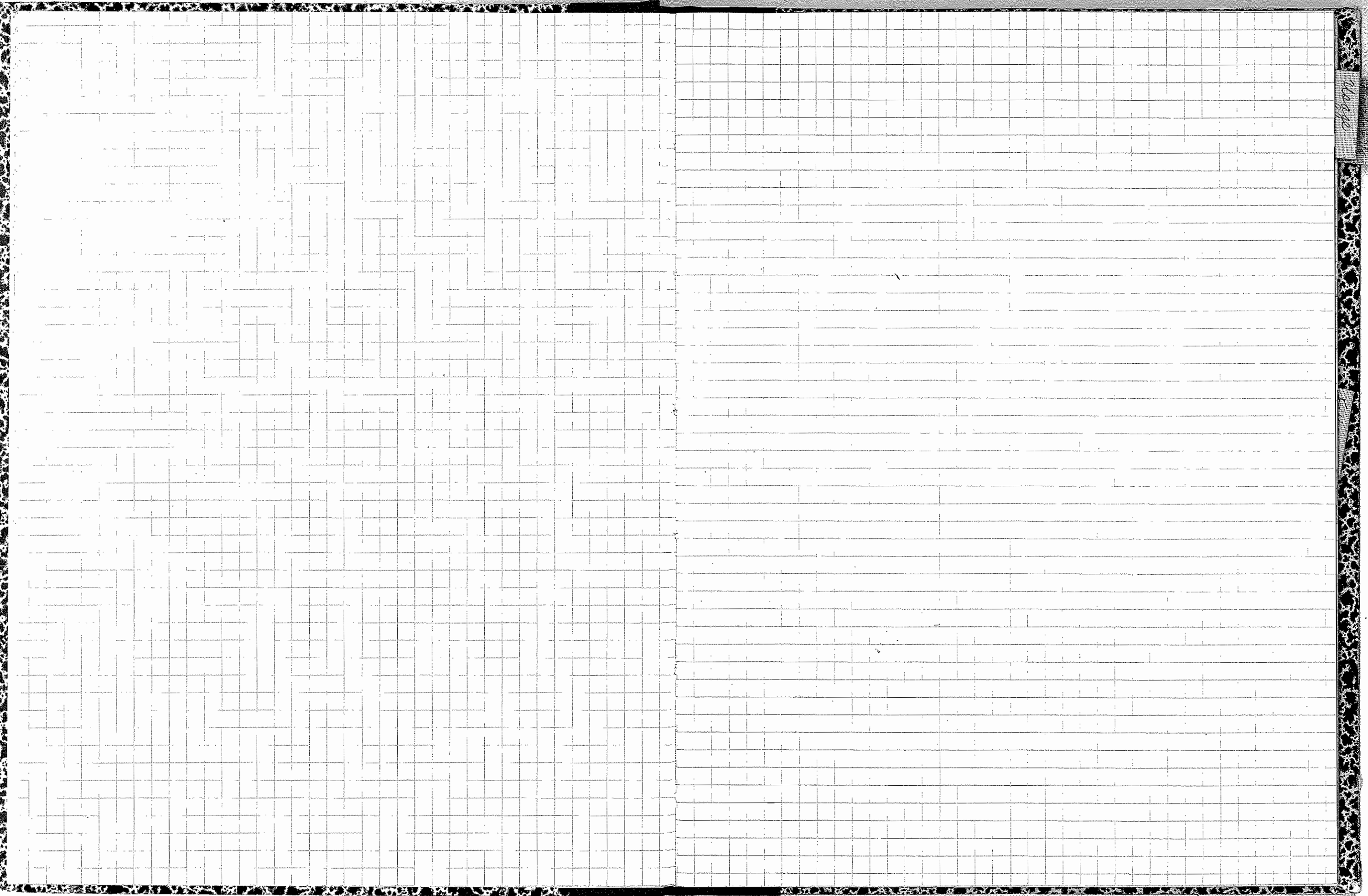
With head disconnected, I see,



This is just what I expect. So, it looks like the laser is charging through a high impedance. Broken wire?

Yes -- HV wire broken inside center conductor of the laser bayonet connector. Found a reasonably good way to splice it back together in about 1 hr.

All back to normal now. ~ 480 mV on pyroelectric meter at 20.5 kV, roughly 150 mJ.



Usage Log

3/8/86	4 hrs @ 6 Hz	E^3
3/20	6 hrs @ 3 Hz ≈ 200 mJ	E^3
3/22	6 hrs @ 2 Hz < 200 mJ (21.5 KV)	E^3
3/24	1 hr @ 2-20 Hz, ≈ 175 mJ	E^3
3/31	1/2 hr @ 2 Hz	PTB
4/1	4 hrs @ 5 Hz ≈ 148 mJ	PTB
4/6	2 hrs @ 3 Hz	E^3
4/7	2 hrs @ 3 Hz	"
4/8	4 hrs @ 3-6 Hz	"
4/9	MJ 26 hrs @ 3-20 Hz ≈ 145 mJ	PTB
4/11	370 V = 143 mJ	PTB
4/15	360 mV ≈ 140 mJ 2 1/2 hrs @ 2-3 Hz	E^3
4/25	320 mV ≈ 123 mJ 3 hrs	E^3 , EM
4/26	new field 510 mV = 197 mJ ^{10 Hz}	EM + AN
5/7	run for 3 hrs 10-20 Hz	EM
5/8	run for 4 hrs " "	EM
5/10	6 hrs, 7 Hz (some time @ 10 Hz)	E^3
5/12	3 hrs, ≈ 10 Hz	E^3
5/15	" 560 mV = " 216 mJ 4 HRS	AN
	using uncalibrated scope - response is apparently accurate, now though.	

5/16 4 HRS 8 Hz

5/21 7 hr 3 Hz E³

5/22 438 mV power = 170 mJ
ran 2 hrs @ 7 Hz E³

5/23 ran 8 HRS AT ~ 8 Hz A.N.

5/24 425 mV power = 164 mJ
3 Hz

5/25 ran for 3 hrs EM

5/26 ran for 4 hrs @ 15 Hz 5 mJ

5/28 ran for 10 HRS

5/29 " " 10 HRS.

5/30 135 mJ

5/30 174 mJ (REFILL) A.N.
2 hrs E³

5/31 5 hrs E³

6/16 3 1/2 hrs JG/LM

6/17 5 hrs JG

6/21 5 hrs AN

6/25 3 hrs AN

6/26 7 hrs 197 mJ

6/27 7 hrs

6/28 6 hrs AN

6/29 4 hrs AN

6/30 3 hrs AT 200 mJ AN

7/1 7 hrs AN

7/6 10 hrs. JG

7/8 15 hrs JG

~~7/8~~ 158 mJ (if 2.25 V/T) 4 hrs JG

7/9 16 hrs JG

7/12 318 mV → 122 mJ (2.59 V/T)
→ 141 mJ (2.25 V/T)

7/16 NEWFILL 179.9 mJ (2.59 V/T)

7/18 484 mV = 187 mJ (2.59 V/T) 6 HRS + AN

7/19 484 mV " " " 3.5 hrs

7/21 6 HRS

7/22 7 HRS

7/23 500 mV 193 mJ (2.59 V/T) AFTER 8 hrs
AT 20 Hz A.N.

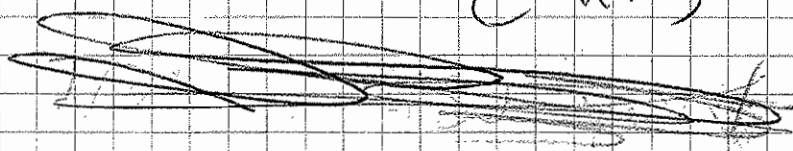
7/25 2 hrs @ 10 Hz E³

7/26 2 hrs " " E³

7/26 4 hrs 470 mV JG

7/27 8 1/2 hrs JG

7/20 482 mV
= 186 mJ (~~2.59 V(5)~~)
2 hrs J6



7/29 4 hrs J6

8/4 419 mV = 160 mJ AN
(2.89 V(5))

8/5 4 hrs 153 mJ AN

8/6 5 hrs AN

8/7 5 hrs AN

8/8 6 hrs AN

8/9 410 mV = 158

8/10 3 hrs J6

8/11 149 mV AN

8/13 1 1/2 hrs for aligning PDA

8/13 6 1/2 hrs running

8/14 started running: 107 mJ
~~filled~~

up to 163 mJ
3 hrs

8/16 4 hrs @ 2 Hz

8/17 155 mJ

8/19 4 hrs at 8 Hz

8/20 159 mJ

8/26 158 mJ (3 hrs EM)

8/27 3 hrs at 10 Hz EM
8/28 3 hrs at 10 Hz EM
8/29 3 hrs P = 167.5 mJ EM

9/1 4 hrs @ 5 Hz E³

9/1 3 hrs at 10 Hz AN

9/5 2 hrs at 10 Hz 170 mJ EM

9/6-9/8 24 hrs at 5 Hz PVB

9/13 174 mJ E³ & AN

9/14 10 hrs at 5 Hz AN

9/15 10 hrs at 5 Hz AN

9/16 10 hrs at 5 Hz AN

9/16 4 hours JG
 9/17 8 hours JG
 9/19 7 hrs @ 2Hz E³
 9/20 166 mJ ; 1 hr @ 2Hz E³

9/25 154 mJ
 9/20-26 73 hours ^{total} run time @ 5 Hz avg DTB
 on 24 Hz \approx 20 hrs @ 20 Hz. P ^{avg} steady \approx 165 mJ

9/27 416 mV = 160.6 mJ
 ran 7 hrs.

9/18 414 mV = 160 mJ
 9 hrs.
 404 mV = 156 mJ

10/3/86 380 mV @ 20.5 KV E³
 1/2 hr @ 3 Hz
 \Rightarrow should be filled soon.
 (166 mJ to PDA) (changed to 200)

354 mV @ 20.5 KV \rightarrow 137 mJ
~~137 mV @ 20.5 KV \rightarrow 137 mJ~~
 199 mV PDA
 768 mJ

10/7/86 360 mV @ 20.5 KV E³
 7 hrs @ 4 Hz

10/6/86 378 mV = 146 mJ AN
 10/10/86 778 mV = 146 mJ LM

10/10/86 - 10/12/86 usage 10 hrs 2m
 10/13 3 hrs 5m

10/19 P \approx 143 mJ
 10/29 P \approx 152 mJ

10/30 151 mJ = 390 mV AN 7 HRS
 10/31 - 10 HRS AN

11/1 143 mJ = ~~143~~³⁷⁴ mV ~~10 HRS AN~~
 11/2 142 mJ 368 mV 10 HRS
 11/3 " " 1 HRS

11/7 444 mV = 171 mJ LM 2 hrs

11/8 388 mV = 150 mJ LM 2 hrs
 11/9 18 mJ going into PDA LM 2 hrs

11/11 NEW FILL 156 mJ AN 8 HRS
 11/12 150 mJ AN 8 HRS

11/13 142 mJ AN 6 HRS
 11/14 142 mJ AN 3 HRS

11/18/
New Fill 11/18

33 mJ
145 mJ => 181 mJ
(AFTER N1 HR AT 10Hz
By L.M.)

11/18
changed heat voltage +1
changed reservoir voltage +2
delay is now ~ 17 ms
with 10ms jitter
(probably due to heating against 60Hz)

11/20-23 P ≈ 145 mJ - remained stable usage ~ 54 hours
11/24-11/26 P ≈ 148 mJ DTB
11/28 P ≈ 135 mJ

11/28/86
Timing has changed again.
Delay has jumped to ~ 20ms
delay is determined by heating
seems to be determined by reservoir
voltage.
I changed reservoir voltage by -1 (4)
changed heat voltage by +2 (6)

1/2/86 P ≈ 110 mJ
New fill P ≈ 169 mJ

12/8/86 430 mV ≈ 166 mJ
heat ran 4 hours @ 3Hz E3

12/11 440 mV E3

12/13 450 mV = 174 mJ

12/14 470 mV = 181 mJ AN
3 hrs @ 20Hz E3

12/14 430 mV ran 5 hrs at 4Hz AN

12/15 430 mV = 166 mJ AN

1/6 420 mV = 162 mJ AN 4 hrs 5 Hz

1/7 392 mV = 151 mJ AN 6 hrs 5 Hz

1/7 8pm - dropped to 360 mV = 140 mJ

1/9 4pm 340 mV = 135 mJ L.M.
AN ran 8 hrs

1/13 137 mJ AN ran 8 hrs

1/14 146 mJ AN 8 hrs

1/15 132 mJ AN 7 hrs

1/16 *KARCI FILL 178 mJ AN

1/22 - 1/29 12 hrs holdy at 135 mJ AN

2/2 1hr @ 2Hz
pur 350 mV = 135 mJ

2/3 4 Hr 45 5Hz AN
2/4 " " " " " "
2/5 " " " " " " 370 mV = 142 mJ

2/11 40 mV output
after 40% 65 + one full minimum
179 mV into PDR

2/15 362 mV EM
2/11 - 2/26 total of 15 hrs CM

2/18 1 hour J6
3/4 ran for 4 hrs EM

3/5 262 mV = 100 mJ EM
142 mV = 55 mJ into PDR

3/10 ~~10~~ 140 mJ J6

3/12 149 10 hrs @ 5Hz AN

3/14 406 mV = 157 mJ J6

3/18 E = 169 mJ (438 mV)

3/17 10 hours usage

3/22 12 hrs usage J6

3/23 6 hrs J6

3/24 11 hrs J6

3/27 424 mV = 163 mJ 3 hours

3/28 416 mV

4/1 396 mV =

4/17 350 mV outside excimer EM
(135)

4/20 328 mV (127 mJ) EM
8 HRS 1 A.N.

5/1 368 mV 142 mJ A.N.
11 HRS

5/2 10 HRS A.S

5/3 10 HRS A.N

5/4 388 mV = 150 mJ (going up!) A.N.

1
153
2.59 | 424
2.59
1.65
1.295
355
254
096
0777
0183

5/11 394 mV = 154 mJ ~~300~~

6/1/82 - 6/10/82 30 hrs
6/10 - $f_{max} = 330 mV = 130 mJ$

6/11/82 360 mV - 140 mJ ~~100~~

6/14 122 mJ J6
3:30 - 1:00 = 8 1/2 hrs.

6/15 1:45 - 9:30 = 8 hrs J6
124 mJ

6/16 2:30 - 11:15 = 8 1/2 hrs J6
115 mJ

6/18 1:00 AM - 2:45 = 1 1/2 hr. J6
346 mV = 134 mJ

6/23 11:15 PM - 1 AM = 2 hrs. J6
404 mV = 156 mJ

6/26 334 mV = 129 mJ
10:00 PM - 3:00 AM = 5 hrs.

6/27 4:35 PM - 9:15 PM J6
354 mV = 137 mJ

6/28 1:45 PM - 7:30 PM J6
360 mV =

7/2 370 mV AN
7/2 - 7/9 Fan ~ 8 HRS each day A.N.

7/9 354 mV = 137 mJ A.N.



7/20 328 mV - 127 mJ TR
11:00 - 11:05 5 min

7/22 3.2 x 11 = 320 mV = 123.5 mJ SW

7/21 - 7/22 30 hrs SW

7/21 340 mV morning AN
300 mV = 115 mJ afternoon SW

7/25 9:30 - 10:15 300 mV 115 mJ TR
1:00 - 3:00 300 mV

3:30 320 mV SW

7/27	10:15	320 mV	TR
7/28	3pm	320 mV	EM
7/29	3:15 pm	350 mV	EM
7/30	12:30 pm	350 mV	EM
7/31	9:00		TR
8/4 - 8/5		345 mV = 133 mJ	10 hrs EM
8/13		345 mV = 133 mJ	2 hrs EM
8/14			7 hrs EM
8/15		382 mV = 148 mJ	7 hrs EM
8/16		388 mV =	8 hrs EM
8/18		336 mV = 130 mJ	A.N.
8/19		ran ~ 8 hrs	
8/20		ran ~ 4 hrs	
8/21		ran ~ 6 hrs	
8/22		128 mJ	A.N.
8/23			
8/24			
8/25 - 9/29		8 hrs	8 hrs/day
8/31		130.5 mJ	A.N.
9/7/87		320 mV = 125 mJ	EM
9/9/87		340 mV = 130 mJ	EM
9/12/87		342 mV = 130 mJ	JG
9/13/87		340 mV = 130 mJ	EM

9/15/87		350 mV / 6 hours	EM
9/17/87		318 mV = 125 mJ	17h CC
9/18/87		330 mV :	CC
9/19/87		315 mV	CC
10/5/87		310 mV = 120 mJ	EM
10/5/87		319 mV	JG
		start 11:02 AM	
10/6/87		315 mV	
		at 7:45 pm	EM
10/9/87		310 mV 2:30 pm	EM
10/12/87		331 mV on 11:45 AM	JG
10/13/87		330 mV	EM
10/16/87		330 mV	CC
10/24/87 (1/2 hour)		320 mV	TR
10/27		334 mV	A.N.
10/28		315 mV	TR & A.N.
10/31/		328 mV	A.N.

11/04/87 320 mV C.C.
 11/1/87 334 mV = 128.95 mJ A.N.
 2600 whan
 11/5/87 330 mV 4pm EW
 11/6/87 350 mV 7pm EW
 11/7/87 350 mV 3pm EW
 Pressure: 2560 whan
 (1074 40 whan
 in 2 days)
 11/10/87 348 mV 9pm EW
 11/15/87 345 mV 2:30 EW
 11/18/87 360 mV 9:30 am EW
 11/22 360 mV 8pm EW
 11/24 350 mV ~~2:00~~ 5:00 pm JG
 11/29 372 mV 11:30 - 5:30 JG
 11/29 320 mV 5:30 pm -
 12/5 315 mV 3:15 - 5:10 pm EW
 12/10 282 mV JG

12/10 FILL
 12/17 380 mV A.N. ran 6 hrs
 12/18 354 mV A.N. ran 8 hrs
 12/19 ran 10 hrs
 12/20 354 mV ran 12 hrs
 12/21 354 mV ran 12 hrs
 There still is a slow leak.
 12/22 338 mV ran 5 hrs A.N.
 12/23 352 mV ran 10 hrs A.N.
 12/24 ran 10 hrs A.N.
 12/28 384 mV in morning
 = 148 mJ. ran 8 hrs A.N.
 12/29/87 382 mV. ran 10 hrs A.N.
 12/30/87 388 mV.
 1/2/88 changed air filter EW
 5:30 pm 392 mV = 150 mJ EW
 after BS:
 150 mV to neutron = 60 mJ
 210 mV to PDA = 80 mJ
 ran 3 1/2 hrs. EW
 1/4/88 380 mV ran for 4 hrs EW
 1/5/88 390 mV ran for 5 hrs EW

12/10
 NEW FILL AFTER CLEANING WINDOW &
 ↑ SANDING OFF CONTAMINATION ON O-RING
 SURFACE. CAUSE LEAK OCCURRED
 HERE.

1/6/88 396 mV (Press = 2450 mbar) run 9:15 AM - 4:00 PM
 1/7/88 406 mV (Press = 2425 mbar) run 10:00 AM -

1/8/88 395 mV run
 1/10/88 406 mV (2475 mbar) 3:30 PM - JG
 1/11/88 390 mV 2:20 pm run
 1/13/88 414 mV (2500 mbar) 9:30 AM JG
 1/14/88 410 mV 11:00 am run
 1/16/88 392 mV 1:30 AM - 3:00 AM JG
 1/19/88 366 mV 2 pm run
 1/22/88 370 mV 2 pm - JG
 1/23/88 386 mV 12:00 pm - JG
 1/24/88 350 mV JG
 1/25/88 346 mV run
 1/26/88 350 mV JG
 1/26/88 335 mV JG
 1/27/88 345 mV CC
 336 mV 5 h
 340 mV 2 h
 2 h 30
 1/30/88 380 mV 10:30 am CC
 1/31/88 400 mV P=2600 run 7:00 pm
 2/1/88 385 mV run

2/1/88 380 mV CC
 2/3/88 380 mV JG
 same in being run
 2/4/88 ex. power 366 mV run
 2/5/88 9 hours 19
 2/4/88 400 mV run
 2/7/88 400 mV / 2 h CC
 2/8/88 425 mV P=2475 mBar 19 6 hrs
 2/9/88 410 mV 8 hrs run
 2/10/88 410 mV 10 hrs CC
 2/11/88 420 mV 2 hours run
 2/13/88 400 mV 2 " CC
 P=2450 mbar
 2/14/88 405 mV / 30 min CC
 P=2410 mbar
 2/20/88 386 mV run
 2/24/88 372 mV run
 2/27/88 320 mV JG
 P had fallen to 2350 mbar
 so I refilled → 440 mV JG
 2/29 380 mV run
 3/1 300 mV JG

3/2 300 mV JG
 3/5 310 mV JG
 3/7 310 mV JG

3/8 New All 465 mV after
 from 2 H₂ for
 a few minutes.
 400 mV a few
 minutes later

3/9 340 mV gm
 still steady

3/11 330 mV cm

3/13 385 mV gm

3/15 350-380 mV gm
 30 mV fluctuations

3/16 ~~350~~ 350-380 mV JG

3/17 360-380 mV - mostly 370 JG

3/18 360-390 mV - mostly 375 JG

3/20 380 mV gm

3/23

3/26

3/27

4/1

4/2

4/4

4/11

4/20

4/21

4/23

4/26

4/27

5/16

5/17

5/18

5/19

5/20

5/23

5/24

5/25

360 mV A.N. ran 6 hrs

368 mV A.N.

375 mV CC

350 mV CC

ran 8 hrs A.N.

340 mV A.N.

325 mV CC

470 mV CC

2 h

425 mV CC 2 h

425 mV 1 h CC

425 mV 2 h

450 mV 3

445 mV 1 hr gm

440 mV 2 h CC

430 mV 1 h gm

455 mV 1 h gm

455 mV 1 h gm

454 mV 1 h gm

440 mV 6 h CC

440 mV 5 h CC

450 mV 4 h

420 mV 4 h

450 mV 5 h

445 mV 6 h

5/26 4.50 mV ✓ CC
 5/28 424 mV JG
 5/29 → 430 mV ~~CC~~
 5/30 → 410 mV - JG

(NOTE: When I switched the power supply on, it was at 20 kV. - could this have damaged it?)
 - No signs of trouble in operation

6/1/88 395 mV 6 hrs ~~CC~~
 6/3/88 6 hrs ~~CC~~
 6/4/88 8 hrs ~~CC~~
 6/5/88 400 mV 6 hrs ~~CC~~
 6/6/88 378 mV 3 hrs JG
 6/8/88 380 mV 1 hr ~~CC~~ CC
 6/10/88 385 mV 10 hrs ~~CC~~
 6/16/88 350 1 hr ~~CC~~
 6/16/88 342
 6/16/88 375 3 hrs
 6/16/88 375 ? André? CC
 6/28/88 370 2 hrs ~~CC~~ CC

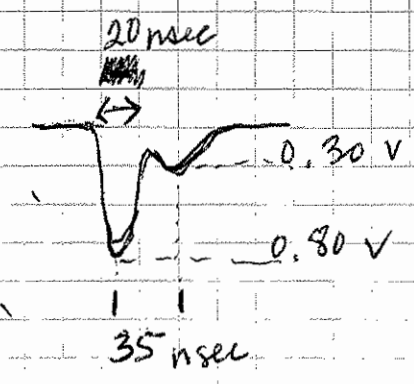
6/29/88 370 mV 2 h CC
 370 mV 4 h
 6/30/88 374 mV JG
 7/2/88 370 mV ~8 hrs JG
 7/3/88 380 mV 10 hrs JG
 7/4/88 380 mV JG
 7/10/88 365 mV ~~CC~~
 7/13/88 385 mV CC
 7/14/88 385 mV 14 h CC
 7/15/88 375 mV 14 h CC
 7/18/88 390 mV 15 h ~~CC~~ JG
 7/19/88 364 mV
 7/20/88 320 mV CC
 360 mV CC
 7/21/88 13 hrs JG
 7/22/88 350 mV
 7/25/88 330 mV / 6 h CC
 7/26/88 315 mV / 3 h
 7/28/88 335 mV ~~CC~~
 7/29/88 330 mV JG
 7/30/88 330 mV JG
 8/2 390 mV JG

8/3	370 mV	5h	CC
8/4	400 mV	5h	J6
8/5	400 mV	5h	J6
8/6	410 mV	5h	J6
8/7	410 mV	5h	J6
8/8	410 mV	5h	J6
8/9	410 mV	5h	CC
8/10	375 mV	5h	J6
8/16	390 mV	6h	CC
	375 mV	2h	
8/17	375 mV	6h	CC
8/18	360 mV	5h	CC
8/20	370 mV	5h	
	350 mV	12h	
8/23	360 mV	5h	CC
8/24	310 mV	5h	A.N.
8/28	320 mV	5h	CC
	320 mV	5h	
9/1	320 mV	5h	CC

09/02/88	320 mV / 3h	CC
	315 mV	
9/11/88	322 mV	A.N.
	run every day 10 hrs	
9/14/88	305 mV	A.N.
	9 hrs/day	
9/21/	290 mV	A.N.
9/25	278 mV	A.N.
9/26	390 mV - New Fill	A.N.
	later: from N 340 mV	
9/27	375 mV	A.N.
10/3	325 mV	A.N.
	(pressure has drifted up to 2900	
10/9	320 mV	A.N.
	15 x 10 ³ shots	
	Pressure went up to 3000 in br	
	the last head interlock tripped off.	
	Apparently, I had the nitrogen tank open & there	
	was a leak in the valve Solenoid	
	Valve.	
10/11	A.F.W. New Fill + 1 day (running)	300 mV
10/24	326 mV	A.N.

11/6/88	340 mV		EM
11/30/88	315 mV		EM
12/5/88	300 mV		EM
12/8/88	430 mV	4 hrs	E ³
12/9/88 12/9/88	415 mV		E ³
12/10/88	405 mV	2 hrs	EM
12/12/88	415 mV	1 hr + Bob Lipart's time (6 hrs)	E ³
12/13/88	416 mV	5 hrs	BJL
12/15/88	408 mV	7 hrs	BJL
12/16/88	408 mV	10 hrs	BJL
12/17/88	415 mV	9 hrs	BJL
12/20	390 mV	7 hrs	BJL
12/22	390 mV		EM
12/27	388 mV	3 hrs	EM
12/28	375 mV	3 hrs	EM
12/29	375 mV	2 hrs	EM

Examiner pulse



w/ P ~ 2400 mbar and
a Neom, Xe, Xe w/ Hydrogen
fill

and 360 mV
of output:

EM

1/2/89	360 mV	1 hr	EM
1/3/89	370 mV		EM
	P _{in} = 2500 mbar		
1/3/89	evening 340 mV		EM
	P ~ 2450 mbar		
	new fill:		
	initially 450 mV		
	at end of evening (1 hr later) 390 mV		EM
1/4/89	390 mV	5 hrs	EM
	2000 mbar		
1/5/89	395 mV	5 hrs	EM
	2550 mbar		
1/6/89	395 mV	6 hrs	EM

1/9/89 $P_r = 2500$ mbar
400 mV 6 hrs EM

1/11/89 370 mV at 20.4 kV EM

405 mV at 21 kV EM

1/12/89 395 mV at 21 kV EM

1/13/89 405 at 21 kV EM

1/15 400 mV at 21 kV EM
Shrs

$P = 2650$ mbar when turning on
 $P = 2550$ mbar before leaving

1/16 370 mV at 20.5 kV
 $P = 2600$ mbar
410 mV at 21.1 kV
6 hrs EM

1/18 21 kV, 390 mV
Pressure 2600 mbar

1/20 21 kV 410 mV EM
Pressure 2550 Shrs

1/23 21 kV 390 mV EM
 $P_r = 2500$ Shrs

1/24 21 kV 390 mV EM
 $P_r = 2500$ mbar 1/2 hrs

1/28 21 kV 360 mV
Pressure: 2500 mbar.
new fill:
initially 480 mV
420 mV after 10 min

1/29 20.4 kV $P_r = 2600$ mbar

410 mV

2/2/89 20.5 kV 410 mV

2/3 Pr 2530 mbar
20.4 keV 390 mV

3/17/89

390 mV at 20.4 keV
- 2 hrs
EM

2/7 21 kV 410 mV
Pr = ~~2530~~
2500 mbar EM
Thrs

3/21 at 20.5 keV 390 mV EM

3/24/89 at 20.4 keV 3 hrs.
EM

3/11/89 Pr. 2300 mbar
P_{neu} = 335 mV
(at 20.4 keV)
ran for 4 hrs. EM

3/27/89 at 20.4 keV 395 mV
Pr. 2500 mbar EM

4/7/89 Pr = 2400 mbar
at 20.4 keV 375 mV
3 hrs EM

3/15/89 new fill
initially: 455 mV at 20.4 keV
later 425 mV at 20.5 keV.
ran for 5 hrs. EM

4/10

Pr ~ 2350 354 mV.
AN

⇒ add Neon buffer to 2600 mbar.
+ still power reads 354 mV - NO
change.

ran for 8 hrs EM.

4/11/89

(before: Power is 370mV)
New ~~fill~~ fill
initially 460mV
Settled in at 380mV

4/12/89

380 mV

4/15/89

380 mV

Ellen

D hrs

6/8

380 mV

Felix

run for 5 hrs

6/9

~~380 mV~~

run for 6 hrs

Felix

6/13

290 mV

$$\frac{2.90}{2.59} (\text{mJ}) = 1.12 \text{ mJ}$$

run for

Felix

7/15

280 mV

Felix

9/23

at 20.5 kV ~245 mV
need more Fe.

new fill 440mV initially.

after 1/2 hour 390mV

9/24-

9/25 - low head into lock empty after 15 min at ~2 Hz.
resets itself after about 1 min.
Changed air filters. no help.

✓ water flow 14/10 sec - 6 l/min > 4 l/min recommended.

3 hrs later power at 360mV
still tripping into lock after 15 min.
(HV must be on and power firing to trip into lock)

need to: check fan motor, and then call.

- trip point on ~~lock~~ circulation fan motor protection relay was set to 2.1 amps (changed from 1.8 amps)

- 380 mV at 20.5 kV run for 4 hrs.

10/7

- 350 mV @ 20.5 kV → 135 mJ

10/18

- 304 mV @ 20.5 kV → 118 mJ

11/6 452 mV (new fill)

11/7 456 mV Press down to 2550 mbar

11/10 Press steady @ 2250 mbar
410 mV

11/20 ~~400~~ 390 mV

11/21 386 mV

11/22 385 mV

11/25 385 mV

11/27 380 mV

11/30 370 mV

12/4 360 mV

12/5 360 mV

12/6 350 mV

12/7 350 mV

12/9 350 mV

12/10 330 mV

12/11 315 mV

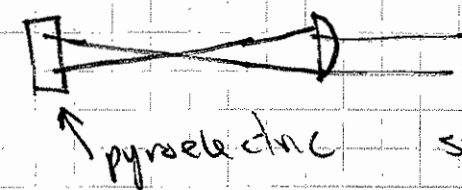
5/2/90

Set up excimer in Deland
Maintenance (see maintenance sec.)

1 fill : ~~150 mJ~~
182 ± 9 mJ

Tuned rear mirror : 195 ± 10 mJ

→ I wasn't as centered as I'd thought on
the element. Focus slightly with
6" cylindrical lens



spot size on
element
~ 1 x 3 cm
→ << 100 MW/cm²

~ 140 mJ/pulse

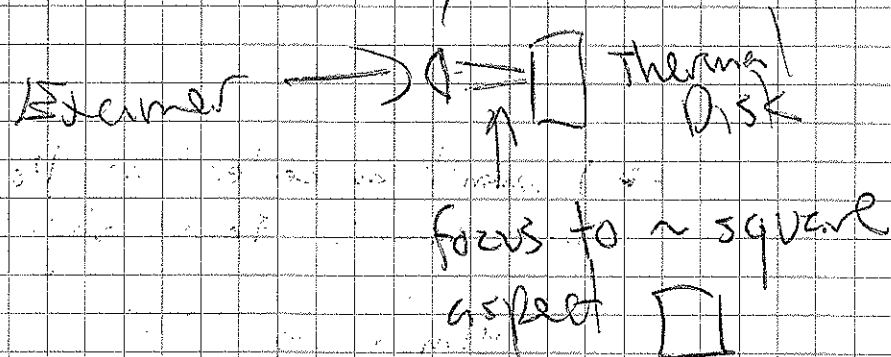
Mode off mirrors is nice and
filled in rectangle.

5/16/90 : 148 mJ (500 mV Pyroelectric)

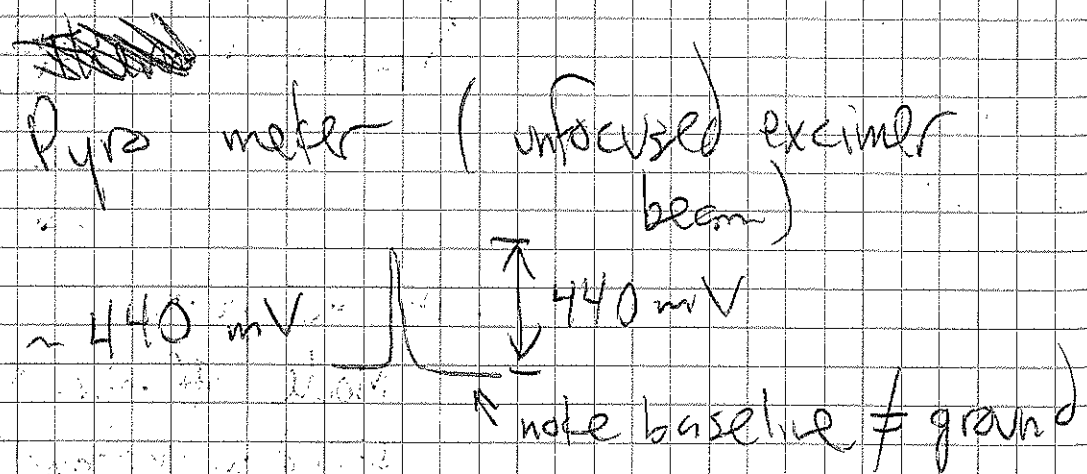
7/6/90 : 530 mV Pyroelectric → ~ 157 mJ
Late evening 400 mV = 118 mJ

7/13/90 cleaned windows
passivate over night

2/14 Calibrate pyro:
5.00 Hz Thermal meter



$$5.00 \text{ Hz} \rightarrow 550 \text{ mV} = 110 \text{ mJ}$$

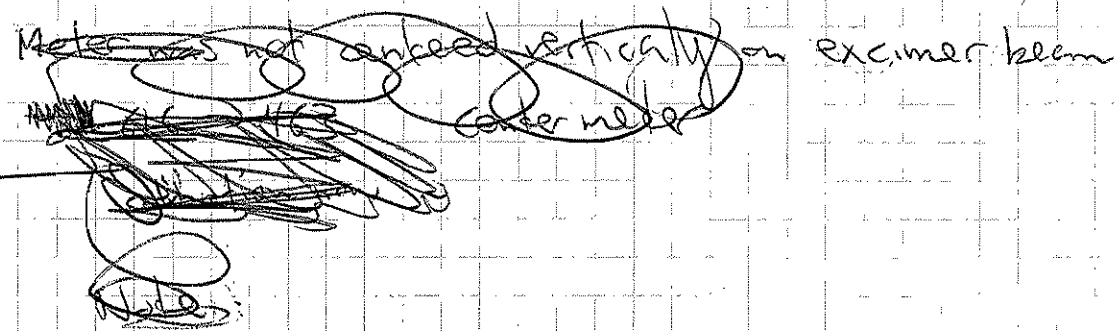


$$440 \text{ mV} = 110 \text{ mJ}$$

~~4 mV/mJ~~ 4 mV/mJ

$$\text{Track Rear mirror: } 616 \text{ mV} = 155 \text{ mJ}$$

(Previous calibration: 3.4 mV/mJ)



$$7/18 \quad 532 \text{ mV} = 156 \text{ mJ}$$

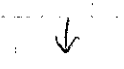
$$7/19 \quad 472 \text{ mV} = 139 \text{ mJ}$$

$$7/20 \quad 469 \text{ mV}$$

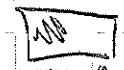
Bad "mode" most of energy on one side of beam
Energy down to 255 mV

$$\text{New R// } 448 \text{ mV}$$

Profile



bright dim



realign

$$7/21$$

$$7/31 \quad 402 \text{ mV}$$

$$8/1 \quad 362 \text{ mV} \quad \text{output window fogged}$$

8/1 clean window, fill

518 mV

8/3 442 mV

8/4 500 mV

8/10 440 mV

after ~ 1/2 hour down to 340 mV
≈ ~~80~~ 80 mJ

Refill 550 mV = 125 mJ

after ~ 1 hour down to 358 mV
= 90 mJ

after ~ 1/2 hour down to
90 mJ again

~~refill~~ refill

618 mV = 155 mJ

8/13 630 mV = 158 mJ

8/14 600 mV = 150 mJ

8/16 520 mV = 130

8/17 500 mV = 125 mJ

8/ 500

8/20 500 mV = 125 mJ

8/21 550 mV ≈ ~~130~~ 140 mJ

8/25 600 mV ≈ 125 mJ

8/26 550 mV 140 mJ

8/30 530 mV 132 mJ

~~8/31~~

9/3 500 mV 125 mJ

9/4 530 mV 132 mJ

9/5 510 mV 128 mJ

2/4/91 Only new fill 330 mV. Gave laser (pure Ne, probably a mistake!)

Now ~ 514 mV. But, meter has been damaged with Nd:YAG laser. So what is the calibration now??

Use 6" lens to focus to square spot on 210 meter. (Can't do often or far long; can hear slight ablation!)

5 Hz ⇒ ~ 680 mW

$$P = \frac{136}{5/680}$$

136 mJ. But lose ~ 10% on lens (or a little more).

$$\text{Thus } P \approx 1.1 \times 136 = 150 \text{ mJ}$$

Pyroelectric, carefully centered: 470 mV
repeat: 475 mV.

$$\frac{136}{1.1} = 123.6$$

Thus, $\boxed{4.75 \text{ mV} = 150 \text{ mJ}}$

(down from ~ 600 originally!)

New calibration: $\frac{317}{3} \overline{)950}$

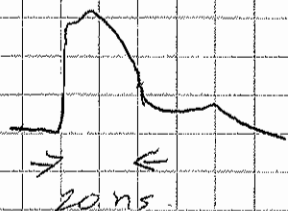
$\boxed{3.17 \text{ mV} = 1 \text{ mJ}}$

Note that centering of height on aperture plate is crucial!

Alignment into pulsed amp. looks OK.
Ext. trigger also looks OK.

Firing delay: $\approx 1.3 \mu\text{sec}$

Shape:



jitter $\approx 1 \text{ ns}$ rms

(never shifts by $> 4 \text{ nsec}$ on so)

(For this, trigger scope on ext.)

Firing line coming in to excimer supply.)

After a few minutes, timing stability got worse, then improved again.

Still, temporal overlap with 5 nsec pulse should be easy!

P-P timing jitter is 8 nsec max.

So, work 6-7 ms into pulse when synchronizing with Nd:YAG laser.

After 1 hr at 5-10 Hz,

$P \approx 440 \text{ mV}$. Still OK, but

suggests gas lines were contaminated as I feared. Well see how it holds out.

-E³

(Note - $P = 2590 \text{ mbar}$ - watch for leak rate)

2/7 460 mV ; $P = \frac{2570}{2570} \text{ mbar}$

run 1/2 hr @ 4 Hz

2/8 About 3 hrs @ 5 Hz

500-520 mV ! $P = 2570 \text{ mbar}$

02/18/91 At 20.5 kV, 5 Hz up rate

Timeouts work: $460 \text{ mV} \approx 145 \text{ mJ}$

$P = 2480 \text{ mbar}$

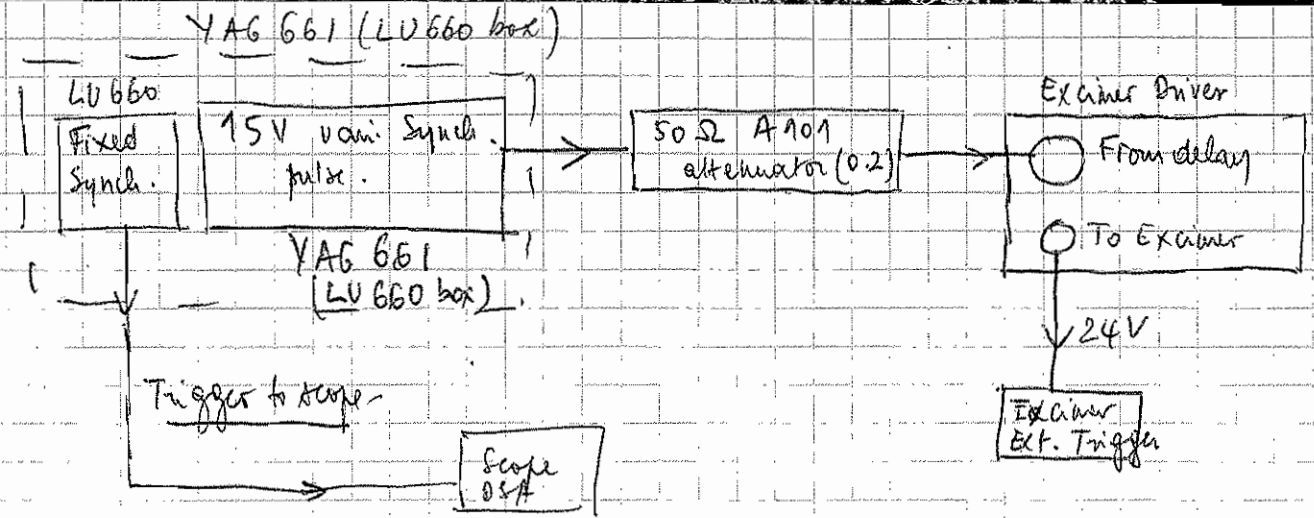
Run for about 1 hour -

02/19/91 At 20.5 kV, 5 Hz up rate

480 mV $\approx 150 \text{ mJ}$ $P = 2480 \text{ mbar}$

Run for ~ 3 hours

Tried and succeeded in triggering the excimer from excimer driver pulse generated at the LUGBO (var. synth. output).



By varying the VAR sync. screw and observing both the pulses from the YAG 661 (any 204nm after tripling scheme ~~etc~~ + 306 nm doubled light were chosen) & the Excimer pumped P.D.A., the two pulses were successfully synchronised to ± 4 ns.

The pulse widths were measured to be:
 YAG (tripling scheme) $\approx (9 \pm 1)$ ns
 Excimer pumped PDA (cw ring) $\approx (12 \pm 2)$ ns.

02/20/91 At 20.5 kV, 455 mV = 164 mJ P = 2480 mbar.

03/26/91 At 20.5 kV, 250 mV = 77 mJ P = 2300 mbar.

vac. needs new refill

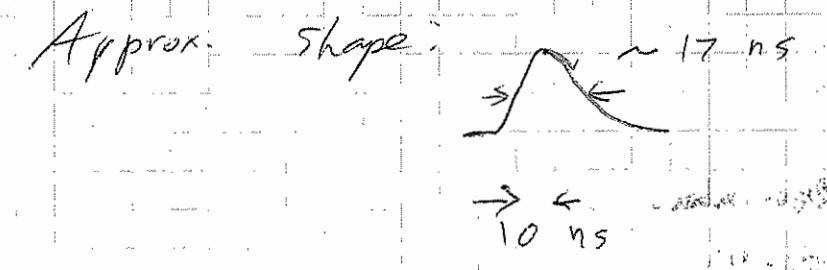
3/29/91 New fill, tried 50% Ne, 50% ~~He~~ He
 A little leaky on HCl. (about 95 mbar)

filled to exactly 2600 mbar.

~~342~~ 342 mV = 108 mJ

So we do lose pwr compared w/ using more neon.

Need to look at width, too.



3/30/91
 340 mV = 108 mJ
 Pressure: 2595 mbar

04/01/91
 340 mV
 Pressure 2550 mbar

04/05/91
 330 mV
 Pressure 2500 mbar
 Run for about 3 hours.

04/06/91
 330 mV
 Pressure 2500 mbar
 run for ~ 1 hour

04/10/91
 320 mV
 Pressure 2480 mbar

04/11/91
 323 mV
 Pressure 2460 mbar

After about 15 minutes of operation, energy dropped to ~~300 mV~~ 300 mV.

Oops - Take that back, it is due to misalignment of photometer.

04/12/91:
 324 mV
 Pressure 2430 mbar.

04/13/91
322 mV = 101 mJ
pressure 2400 mbar

04/15/91
322 mV
pressure 2400 mbar

04/16/91 (Aid of filter !!)
318 mV
pressure 2400 mbar

05/22/91
310 mV
pressure 2100 mbar

laser needs another filling. will do it asap

05/29/91
280 mV = 82 mJ
pressure 2000 mbar

New fill definitely required.

Purged line twice with He

New fill:

Xe (New bottle installed) 1250 mbar
Ne (old) 1250 mbar
He = 100 mbar

No lasing! There must be S.F. wrong with the mix (see pg)

Too much Xe. When the note mentions (3/29/91 previous page) 50% Ne & 50% Xe I think it means 50% Ne & 50% He. What a disaster! I've to somehow solve the Xe in the chamber. For these atoms/molecules,

the mean free path is ~ 8-11 μm. So we are in the viscous flow regime. Will therefore try to get one more go with this awfully expensive fill.

New fill (kept 100 mbar of Xe)

100 mbar of Xe
80 mbar of He
240 mbar of Ne

Total 2600 mbar

15.3% energy: 576 mV 180 mJ Pressure 2600 mbar

06/01/91 energy 560 mV 176 mJ

06/02/91 Energy 540 mV 170 mJ Pressure 2600 mbar

04 June 91: 530 mV (168 mJ) pressure 2600

05 June 91 508 mV pressure 2600

15 June 91 528 mV pressure 2540

16 June 91 525 mV pressure 2540

17 June 91 532 mV pressure 2520

8/2/91 336 mV (106 mJ) pressure 2400 mbar
[calib: 3.17 mV/mJ]

~ 3 hrs operation @ ~ 3 Hz rep rate

14 August 91 at 20.5 kV signal: 246 mV pressure 2350 mbar
= 77 mJ < 100 mJ 77 mJ

The excimer needs a refill.

Not enough Ne for next fill?
Ne on order (see Fluorapat)

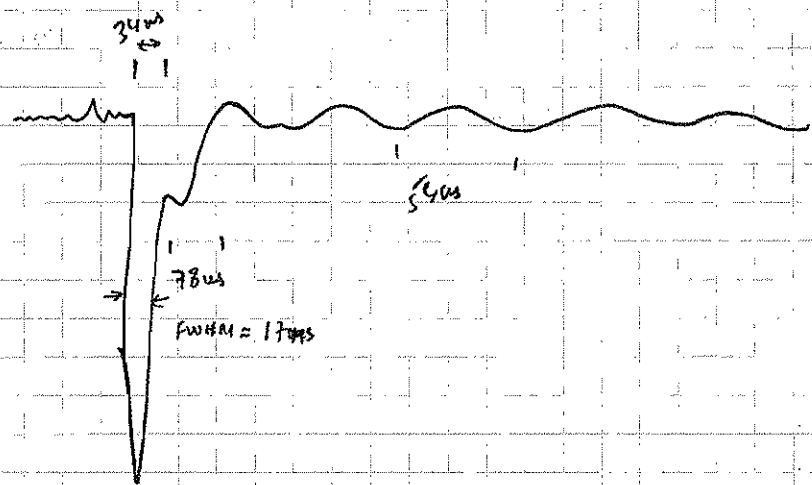
New fill:

- 100 mbar of Xe ✓
- 80 mbar of He ✓
- 2420 mbar of neon ✓
- 2600 mbar total

ORDER A NEW BOTTLE OF Ne. (see Shubagot Spectra Gas.)

Energy 570 mV / 3.17 = 179.8 mJ

8/20



1-2ms photodiode into Son (scattering off a dark paper)

↳ too large a value for the pulse width - am I seeing fluorescence effects of the scattering material?

8/27 367 mV, Only ~~and~~ run about 3 hrs at 10 Hz since last fill, plus whatever was used for Shubagot's runs! (and a few hrs at 1 Hz)

P = 2580 mbar

8/28, 8/29 5 hrs, mostly at 5 Hz

8/31 125 mJ 5 hrs, ~ 5 Hz

09/01 366 mV i.e. 115 mJ pressure = 2510 mbar

The Neon bottle is still not here!

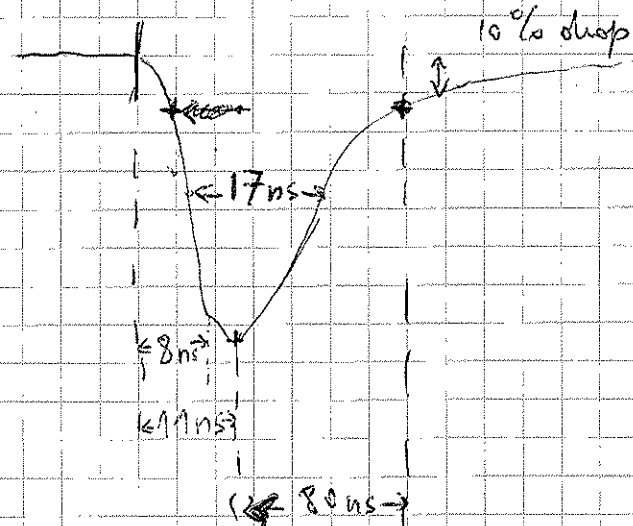
Run for ~ 5 hours at ~ 2 Hz mostly.

09/11/91 160 mV i.e. 50 mJ !!

Desperately need a refill. See Ne order tomorrow.

09/13/91 New fill (70% Ne, 30% He) 110 mJ, ps = 2600 mbar

Pulse looks like



So, FWHM ≈ 17ms

• slow decay (100% - 10%) ~ 80ms

• Shape single pulse with a touch of a shoulder at the peak.

02/06/92 New fill (70% Ne, 30% He) i.e.

- 100 mbar Xe
- 80 mbar He
- 720 mbar He
- 1700 mbar Ne
- 2600 mbar = Total

New fill gives: 486 mV / 3.17 = 150 mJ

06/09/92

Fills

4/27 PUMPED OUT GASES. ADDED 1) 100 MB XE, 2) 2420 NEON, AN. + L.M.
 2) 80 MB HCL. TOTAL = 2600
 ORDER: XE, HCL, NEON (BUFFER) 1 HCL HALOGEN MIX

SHOULD HAVE CLEANED EXHAUST WINDOW & FLUSHED GAS LINES. ANY AIR INSIDE EXHAUST LINES IN WHEN MIXED WITH XE, HCL.

- 1) XE NOBLE
 2) HCL HALOGEN MIX prop. order.
 3) NEON BUFFER
- 1) HALOGEN
 2) NOBLE
 3) BUFFER

5/30 NEW FILL

A.N.
E.M.

125 FILLS BEFORE CHANGING HALOGEN FILTERS.
 VACUUM PUMP OIL SHOULD BE CHANGED ~ 1/YEAR

NUMBERS VARY YEARS

7/15 CLEANED WINDOW + MIRROR (TINOXIDE WORKS WELL)

7/16 - NEW FILL 179.9 mJ AT 20.5 KV
 + 2.59 V/T (NOTE: MAX = 22 KV)

7/18

8/14 cleaned windows, new fill
 164 mJ at 20.5 KV, 2.59 V/T = 3
 Calibration.

Windows were very dirty, but cleaned up easily with MeOH done.
 Mylar gasket missing from front window.

10/15 cleaned windows + new fill
 154 mJ at 20.5 KV
 mylar gasket back in place.

11/6 REALIGNED CAVITY BY BACK REFLECTING HE-NE BEAM ONTO ITSELF FROM EXIT WINDOW AND MIRROR.

CLARITY LINE BEING. FIRST, I CENTERED THE HE-NE BEAM THROUGH EXIT + BACK APERTURE (TWO DEFINING THE CAVITY AXIS), AT THE SAME TIME FLUSHING THE SYSTEM WITH HE TO PREVENT MOISTURE FROM ENTERING. THEN I PASSIVATED THE SYSTEM W. 200MB XCELL + 800MG IE OVERNIGHT. THE NEXT DAY THE POWER WAS 193 mJ FOR 1ST 30 SHOTS => IT DROPPED SLOWLY DOWN. ANDRE

11/11 I PASSIVATED THE CAVITY OVERNIGHT. THEN GAVE A NEW FILL.

486 mV = 188 mJ

5 minutes later at 2 Hz dropped: 414 mV = 110 mJ

10 " " " " " " 406 mV = 156 mJ

11/18 NEW FILL
1st few shots 176 mJ
=> settled down to ~145 mJ

11/20 NEW FILL
SAME TYPE OF BEHAVIOR!
1st shots ~198 mJ => dropped
to 148 mJ after 10 minutes at 10 Hz

1/2/80 New fill P₂ = 169 mJ
after — P₂

1/7 new fill 440 mV after = 170 mJ A.M. fan ~ 6 hrs 5 Hz

1/8 power dropped to ~100 mJ for no apparent reason. so I refilled it
=> BACK to 424 mV = 164 mJ

1/15 new fill before 130 mJ
after 178 mJ

2/27 new fill before 120
after ~170 mJ A.M.

3/5/87 new fill before E ≈ 100 mJ
after E ≈ 181 mJ

let run for 5 min at 10 Hz
E ≈ 153 mJ

4/21 new fill before 127 mJ A.M.
after 156 mJ
=> dropped to ~100 mJ

4/23 143 mJ after a few hours of running 2 HRS A.M.
=> 137 mJ after ~3 more HRS.

4/24 => 143 after ~6 HRS fan total of 10 HRS

4/25 146 mJ A.M.

6/18 before 115 mJ
after 154 mJ JG

10/10

6/24
 PUT IN NEW TANK OF HCL. MIRRORS AND
 WINDOW WERE CRACKED & REPLACED
 THE MAGFL WINDOW WITH A CAPFL
 WINDOW (8290 VS 8900), BUT I KEPT THE
 EAST WINDOW IN PLACE TO SEE IF IT
 REALLY LEAKS. FOR 4 HOURS I PASSED THE TANK
 WITH HCL. FOR 4 HOURS \Rightarrow I
 GOT OUT ~ 160 mJ AT FIRST
 (AFTER REALIGNMENT)

6/25
 426 mJ = 164 mJ after first few shots

7/23 412 mV = 159 mJ JG

7/24 has dropped to 115 mJ
 refilled: 410 mV 9M

7/25 dropped to 300 mV
 refilled: 410 mV JG

7/30 330 mV 3pm 9M
 350 9:30 pm 9M

8/19/87 New FILL 390 mV after fill

9/30/87 New fill. Not enough Xe for 100 mJ
 (~ 90 mJ) Power = 330 mV = 105 mJ
 JG.

10/1/87 New fill + clean windows
 Power = 350 mV

10/2/87 325 mV / 2.5 hours

10/24/87 There was a leak at the ~~East~~ mirror &
 window, with ~~also~~ corrosion due to HCL on both.
 We cleaned them, put in new O-rings &
~~got~~ realigned the laser using a He-
 Ne laser. We got powers of ~ 310 mV
 throughout the week (There still may be a
 slight leak though). The lower powers ~~are~~ are
 understandable due to air getting in during alignment.

12/10/87 cleaned windows, passivated.

12/11/87 found leak. windows not tightened sufficiently. Tightened them
 filled laser - 432 mV. for the first few shots (167 mJ)

11/03/87

New Xe bottle 600 psi
After fill: 30 psi on the line
300 mV!

11/04/87 New Fill

12/17 New Fill A.N. (380 mV after several shots)

1/29/88 Filled using 100% Ne instead of 70%

Energy = 150 mV ~

refilled: Energy = 177 mV

Let sit for a few hours to see if that helps:
Before (5:35) P is a little below 2000 mB
After (11:00) P unchanged

filled for 3rd time, but with Ne-70
Energy = 450 mV first few shots

1/30/88

385 mV after at 10 min warmup at 2 Hz. gm

(initially 434 mV)

15 min 385 mV

2/27/88 440 mV first few shots 06

3/8/88 ~ 600 mV first few shots
465 mV after a minute or so.

3/9/88 340 mV nice and steady still gm

4/19/88 ³ Passivation
550 mV first shots
460 mV after v 5 min at 2 Hz
Steady 450 mV cc

6/14/88 500 mV 1st shots
370 steady
6/16/88 Only 300 mV → passivation

+ new fill
505 mV first shots
5 min later, 2 Hz, 420 mV cc

7/28/88 Passivation
480 mV 1st shots
330 mV steady / 10 min 2 Hz
2nd fill
510 mV 1st shots
390 mV steady

7/28 380 mV 9:45 a.m. gm
335 mV 11:00 a.m. gm

7/29 300 mV

26

~~dropped 5~~

8/22 Fill ~ 400 mV => dropped after several shots to ~ 250 mV !!
Pressure before fill was ~ 2200 mbar
though the power was ~ 350 mV,

8/23 Filled again

4/26 New tank of 50L Xenon put in + excimer laser passivated over night -
New regulator put in as well (Matheson).
High pressure 400 psi / low pressure 10 psi
390 mV after four minutes

5/10 neon tank p = 3000 mbar. The neon tank was open to ~ 60 psi, + it apparently leaked in side the excimer. New solenoid must be ordered. - new fill to 2600 mbar. Excimer now behaving normal.

12/10 Put new tank of HCL (w/ H₂ added) in place of HCL tank that had no H₂ in it. Also I cleaned the front window of the excimer. I also changed the leaky solenoid valve connected to the argon line.

THE TANK OF HCL-H₂ MIX CONTAINS 10% H₂. SINCE THE FILL REQUIRES 80 mb HCL MIX, THE FRACTION OF H₂ IN THE EXCIMER TANK IS

$$\frac{0.8 \text{ mb}}{2600 \text{ mb}}$$

12/7 New fill power 163 mJ or 426 mV w/ HCL-H₂ mix.
Higher power than normal so far, although fluctuates about 40 mV / 426 mV ~ 10%.

1/3/89 new fill:
Pressure was 2400 mbar, power was 340 mV.
initially 450 mV after fill
after 1 hr. 390 mV at 20.5 kV

1/29/83 new fill
initially : 480 mV at 20.4 kV

3/15/89 new fill
initially 455 mV at 20.4 kV

4/11/89 new fill
initially 460 mV at 20.4 kV
later 380 mV

6/8 New fill
380 mV = 147 mJ

6/16 New fill
380 mV = 147 mJ

6/29 New tank of NEON
(UHP) 380 mV after
fill - possibly some air
contamination in neon regulator
when changing tanks.

7/19 New fill 400 mV

9/23 at 20.5 kV 243 mV
~~new fill~~: need more Xe.

440 mV ~~initially~~ initially

10/23 at 20 New fill: 450 mV initially
= 173 mJ

11/4 390 mV =

ran for ~ 3 minutes, then laser
tripped off. Pressure in head = pinned
at ~~max~~ max > 4 atm. What

happened. Pumped out to 2600.
Don't know what happened.

Pumped out the rest of the way
(what was in there?)

Xe & HCL tanks closed off
securely. Ne tank open (40 PSI)
That must have done it. I must check
whether solenoid ~~s broken~~ valves are
leaking.

Leave He line ~~AND~~ pressurized
① 30 PSIG, (Close valve to
primary stage. Pressure ~ 100 PSIG
primary) Excimer ~~is~~ = 2000
mbar. 3000 mbar \approx 45 PSIA
= 30 PSIG. Thus there is
no danger of overpressuring
in event of a leak.

After 3 hours, no change: I
conclude that there is no problem.

11/5 Return after ~ 24 hours.

He regulator primary is drained,
press in excimer from 2000
to (2100) mbar. Definitely leak
closer to 2050,
bt definitely in the solenoid valve
up.

11/6 Spoke to a tech ~~service~~ service: Easy to replace
stem ~~gasket~~ & gasket for solenoid valve. (~45⁰⁰)
No risk to excimer due to overpressure.

Jmg

Filled. 452 mV

12/17 New Fill

March 19 '90

New fill of oil for vacuum pump
changed Halogen filter

March 28 '90

Replaced the stems of Solenoid valves
of buffer and noble gases.

Mixed fills
and log info

5/2/90 New Fill (1st in De) ~~1520 mJ~~ ^{1520 mJ}

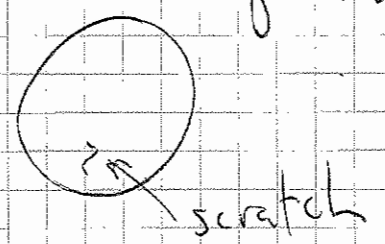
2/13/90 cleaned window & mirror
Left Passivating over night

7/92 New fill

~~7/21/92 402 mV~~

8/1 cleaned window & mirror
new fill

518 mV
small scratch in output coupler
~~occurred~~ occurred in removing ~~mirror~~
it for cleaning



8/10 energy 110 mJ at start (440 mV)
dropped to 390 (<100) after 1/2 hour
refill 550 mV = ~~1300 mJ~~
125 mJ

Drops to 90 mJ in 30 min
windows are not fogged

Must be contamination
refill 600 mV = 150 mJ
618 mV = 155 mJ

holds energy now. (2 hours later it's
still ~ 610 mV)

2/4/91 New fill - used pure Ne

3/29/91 New fill 50% Ne ; 50% He

5/29/91 Unrecorded fill 100% Ne

8/14/91 Unrecorded fill 100% Ne
09/13 New fill 70% Ne, 30% He

2/6/92 Ne 70 fill:

150 mbar Xe
80 mbar He
726 mbar He } 30% He
1694 mbar Ne } 70% Ne
2650 mbar total

2/28/92 ~ 80 mJ

New Ne 70 fill - same composition as
above.

145 mJ

3/19/92 145 mJ pulse energy consistently

total hours of operation since 2/28 is ~ 50 hrs

04/13/92 energy down to 90 mJ, pressure 2200 mbar.

New fill: 70% Ne as 2/06/92. Got 130 mJ

06/10/92

Measured 90 mJ - pressure 2100 mbar
New fill: 100 mbar of Xe, 80 mbar He & 2420 mbar of Ne

607 565 / 3.17 = 178 mJ

607 ~~565 / 3.17 = 178 mJ~~ 6-18-92
NOT calibrating machine

492 mV / 3.17 = 155 mJ 6-18-92

23/06/92 (23rd June) 488 mV / 3.17 = 154 mJ
pressure = 2510 mbar

25/06/92 450 mV / 3.17 = 142 mJ p = 2510 mbar

26/06/92 416 mV / 3.17 = 131 mJ

30/06/92 404 mV = 127 mJ p = 2500 mbar

02/07/92 392 mV = 124 mJ p = 2500 mbar

06/07/92 374 mV = 118 mJ p = 2490 mbar

08/07/92 389 mV = 122 mJ p = 2490 mbar

17/07/92 240 mV / 3.17 = 76 mJ p = 2480 mbar

Needs a refill
New refill: 100 mbar of Xe
80 mbar of HCl
2420 mbar of Ne

→ unds: 420 mV = 132 mJ
p = 2600 mbar

07/26/92 - 400 mV / 3.17 = 126 mJ p = 2520 mbar

07/28/92 360 mV / 3.17 = 113 mJ p = 2510 mbar

07/29/92 375 mV / 3.17 = 118 mJ p = 2505 mbar

7/30/92 326 mV / 3.17 = 103 mJ p = 2505 mbar

7/31/92 366 mV / 3.17 = 115 mJ p = 2500 mbar

8/1/92 362 mV / 3.17 = 114 mJ p = 2495 mbar

08/04/92 310 mV / 3.17 = 97 mJ p = 2495 mbar

08/05/92 280 mV / 3.17 = 88 mJ p = 2495 mbar

Need new fill:
5.11 ring #, 100 mbar of Xe, 80 mbar HCl, 2420 mbar of Ne

452 mV / 3.17 = 142 mJ p = 2800 mbar

08/06/92 364 mV / 3.17 = 114 mJ

08/07/92 380 mV / 3.17 = 120 mJ p = 2600 mbar

9/15/92 Circulating pump for
Thyatron is burned out It's
a vortex RW 150,
ser # 02265116

Call d Physik, 800 262 1100
or 617 263 1100

Spoke to Michael Anderson. Ordered pump
(\$470) and oil (\$21) from Orna,
in order processing. Should
arrive on 9/16. ← wrong part!!

9/26 Measured capacitor on pump motor;
was .37 instead of .75 uF.
Replaced; works OK now!

Reassembled laser. Discharged, but
no output. Is fill OK?
I recall something verbal
about a pure He fill but
there is no record of
anything like this in the log
book! } Yes, the
laser
just
has
it.

Will disassemble again, take off
shields, & look for arcing.

Looks OK to me. Cleaned up
& put back together again.

IF it's an inert gas fill, though,
why isn't it documented? And how
did Nowedine & Subhajat notice the
problem with the laser head light
if they were just clearing a window?

Best bet is to wait until I can ask,
this will avoid potentially wasting more
time by guessing.

9/28/92 New fill

100 mb Xe
80 mb HCl
2420 mb Ne
2600 mb total

~ 435 mV $\xrightarrow{-3.17}$ 137 mJ (average)

~ 450 mV $\xrightarrow{-3.17}$ 142 mJ (peak)

10/3 435 mV \leftrightarrow 137 mJ
~ 3 hrs operation @ 3 Hz

10/4 ~ 2 hrs operation @ 3 Hz
120 mJ

10/5 ~ 5 hrs operation @ 3 Hz
~ 100 mJ - will fill tomorrow

10/7 start: 105 mJ
 \downarrow ~ 10 mJ
95 mJ

New fill 100 mb Xe
80 mb HCl
2420 mb Ne
2600 mb total } \rightarrow 140 mJ

5 hrs operation @ 3 Hz

10/9/92 ~ 120 mJ

~ 3 hrs operation @ 3.0 Hz

10/10 ~ 116 mJ

= 3 hrs operation @ 3.0 Hz

10/11 - 10/14

~ 116 mJ consistently

mostly @ 3.0 Hz

10/23

~ 116 mJ @ 3.0 Hz 5 hrs

10/24

~ 116 mJ @ 3.0 Hz 1 1/2 hrs

10/26

~ 116 mJ @ 3.0 Hz 1 1/2 hrs

10/28

~ 116 mJ @ 5.0 Hz 4 hrs

11/08

~ 105 mJ @ 5.0 Hz 4 hrs
end: 85-90 mJ (needs new fill)

11/13

Ne 70 fill

~ 110 mJ @ 5.0 Hz ~~4 hrs~~

\hookrightarrow new cylinder of Xe & Ne installed

11/15

~ 110 mJ @ 5.0 Hz 3 1/2 hrs

\hookrightarrow down to 100 mJ after 3 1/2 hrs

1/17

~ 88 mJ

↳ because of new ~~to~~ cylinders?

New fill:

80 mb HCl
100 mb Xe
2420 mb Ne
<hr/>
2600 mb total

Initial:

115 mJ

settled to

↓
105 mJ

1/18

112 mJ consistent for 3 hrs. @ 5 Hz

3/25/93

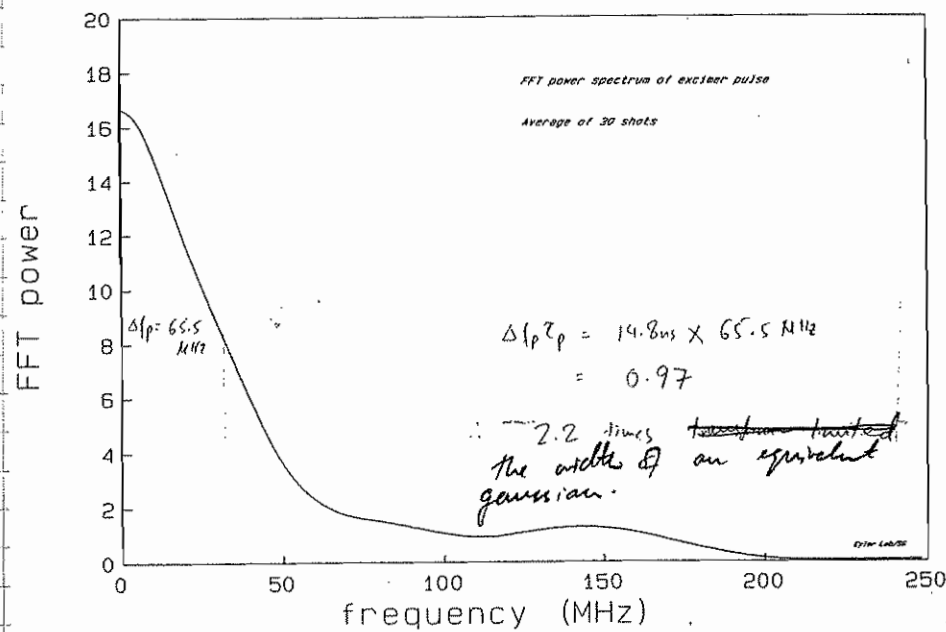
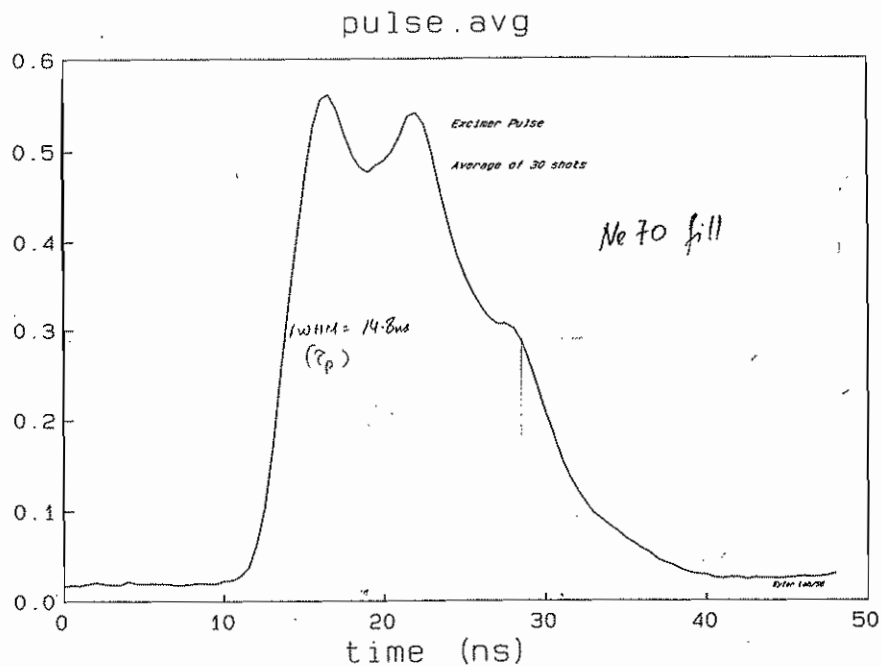
~ 70 mJ *

New fill:

80 mb HCl
100 mb Xe
2420 mb He Ne
<hr/>
2600 mb total


after ~ 5 mins:

100 mJ



8/25/93

- cleaned output coupler & mirror.
- Output coupler was a faint scratch


 outside the beam region.

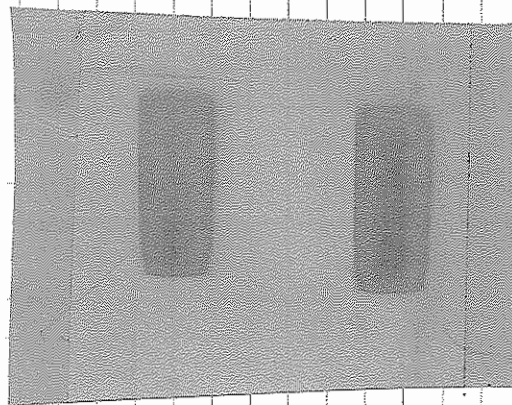
I just found
 a reference
 to this in
 8/1/90's entry

- passivated for an hour

80mb HCl
 100 mb Xe
 2420 mb Ne

 2600 mb total

- 140 mJ (436 mV)
- beam is dipped at top
- \vec{E} aligned the cavity from outside
- Mode is better with 140 mJ sweep pulses.



profile x i

8/28

- 117 mJ @ 20.5 kV -- same fill as of 8/25
- dropped to ~97 mJ after ~1 hr.

80mb HCl
 100 mb Xe
 2420 mb Ne

 2600 mb total

- about 400 mV, or 126 mJ
- re-tweaked the output coupler
- about 142 mJ

8/30

- 120 mJ
- dropped to 102 mJ
- tried to tweak the output coupler -- no good
- put in a little bit of HCl
- no immediate effect
- ~~still~~ may do a new fill tomorrow.

8/31

- 140 mJ

9/1

- 140 mJ
- dropped to 130 mJ

9/2

- 130 mJ

9/3/93 Repaired oil pump capacitor
(see repair log at start of
this book).

450 mV on detector \approx 145 mJ or so.

Actually, HV a little high. More like
475 mV.

High voltage seems somewhat unstable --
fluctuates from 20.3 to 20.7 kV.
We'd better keep an eye on this.

Took out control unit. Nothing
obvious that's wrong.

After ~ 30 min, still fluctuates from
20.1 to 20.7 kV. What's
wrong here? Maybe a small
arc in the head. Will look
inside head again after lunch.

9/4 Doing a few more diagnostics on HV
instability.

- 1) Unplugged & resealed all leads in
control unit
- 2) Unplugged HV bracket to head. When
I did this before, got unstable
HV and no 'open circuit' fault. Is
the latter just because rep rate was ϕ ,
or does it prove problem is in the
HV supply/control? Will check.

Leak in head needs more to. Losing 2050
mbar per day, now 2450 mbar.

9/11/93 Ran \approx 10 hrs at 0.5-10 Hz.
330 mV \Rightarrow should give a fill

9/12/93 New fill: -

80 mb	HCl
100 mb	Ne
2420 mb	Ne
<hr/>	
2600 mb	total

Before fill : 335 mV (after ~ 15 mins of
startup)

After fill : 526 mV or 166 mJ

Note: - We may go w/ a Ne-70 fill next time
because the pulses are smoother (better for
chirp measurements), and we ~~have~~ way have
enough energy now ...

After ~ 2 hrs : 484 mV or 153 mJ

9/14 490 mV at 20.5 kV.

9/15 460 mV @ 20.5 kV

9/18 480 mV

9/19 410 mV

9/23 Dropped to 390 mV
390 mV @ 20.5 kV

9/27 315 mV, will fill. Output window loses ok
except for scratches from recent cleaning \Rightarrow
will not clean it.

Some fill is above. Used last of HCl --
just 10 psi left. Should switch to
new cylinder for next fill.

Inadvertently used He, not Ne! Pumped out
fill & HCl line. Replaced HCl cylinder,
evacuated line, flushed once.

Had to abort Ne part of fill since regulator is defective; limits at ~ 2 atm. So used He for balance:

80 mbar HCl mix
 100 mbar Xe
 1820 mbar Ne (to 2000)
 600 mbar He (to 2600)

So He is $\frac{60}{242} = 24.8\%$ of rare gas
 (75.2% Neon)

Need new Ne regulator!

Energy = 530 mV (~ 170 mJ). Pretty good.

9/28 energy 500 mV (charge run at all -- just passivation, I guess.)

after running 2 hrs at ~ 2 Hz, down to 430 mV.

9/29 energy 410 mV
 9/30 energy 420 mV
 10/2 390 mV
 10/4 400
 10/5 390
 10/6 350 ~~360~~ mV P now at 2300 mbar, added a little HCl. No change.
 10/8 350 mV

10/19 310 mV @ 20.5 kV

10/19 dumped the Ne regulator --

310 mV w/ 2000 mbar

New fill 100% Neon. i.e. 100 mbar Xe
 80 mbar HCl mix
 2420 mbar Ne
 2600 mbar

Note: - new Ne bottle is in
 2. have to order a Xe bottle -

-- there "might" be just enough Xe for one more fill -- pressure is low that does not register in the gauge.

-- Spacial mode looks slightly to left & up -- will align it better next time

-- for now, the energy is 415 mV @ 20.5 kV

Energy dropped to 290 mV @ 20.5 kV! Output window looks o.k. (as usual) and mode looks o.k. (not too bad).

Is it possible that there was some contamination of the gas, which occurred when we switched the Ne regulator? Cannot run like this - Will attempt a new fill and hope that we have enough Xe.

10/20/93 energy 368 mV, p = 2600 mbar - why did we read 292 mV yesterday? Has the output window moved?

After a few minutes (~ 15) energy drops to ~ 295 mV. Touched up output window, optimized mode & energy. Now ~ 305 mV -

10/21 ~ 350 mV, dropped to 320 mV, and stayed stable.

10/22 ~ 340 mV stable -- good boy!!
 - new Xe bottle is here!

10/23 - 10/25 @ 350 mV stable

10/25, energy - dropped to 310 mV, cont'd

- Did a new fill.
- Xe: enough left.
- Ar: ran out of it.

OK, though, got a workable composition:

80 mb	HCl	
100 mb	Xe	
1620 mb	Ne	} 67% Ne
800 mb	He	
<hr/>		
2800 mb	Total	

- pulse looks smooth
(av-averaged)

- 380 mV stable

- Next fill: have to change the Ne bottle AND the Xe bottle.

until

11/7/93

pressure: 330 - 340 mV

pressure dropped to 2350 mbar

need new fill next time.

11/

pressure dropped to 2250 mbar

output: 270 mV

(stop)

new fill.

- changed the Ne & Xe cylinders
- purged whole line (upto the cylinder valves) with He twice.
- used a Ne 70 fill (to be constant)

HCl	80	mbar
Xe	100	mbar
He	726	mbar
Ne	1694	mbar
<hr/>		
2600	mbar	Total

so wegg is 424 mV

11/12/93 energy ~~352~~ 352 mV dropped to 340 mV after few mins.

11/20/93 energy 334 mV p = 2300 mbar.

December 1993

- ↳ ~~#~~ H₂, He, HD runs (v=0)
- ↳ ~~run~~ run consistently, with Ne 70 fill, ≈ 120 mJ.
- ↳ details in the expt. log book.

3/15/94

- pressure @ 1800 mbar --
- Used a Ne 70 fill (don't care about energy much
- want a better temporal structure)
- 360 mV ~~was~~

3/29 Excimer energy dropped during operation to below 100 mJ.

↳ new fill: this time, used the 100% Ne fill:

80 mbar	H ₂
100 mbar	Xe
2420 mbar	Ne
<hr/>	
2600 mbar	total

↳ 436 mV

3/30 + 3/31

Remained stable @ 340 mV

↳ end of 3/31's run → dropped to 300 mV
(pressure OK)

4/27

↳ ~280 mV, 2400 ~~?~~ mbar pressure

↳ new fill

↳ flushed H₂ & Xe line w/ He (twice)

↳ ~410 mV, 2600 mbar → $\left\{ \begin{array}{l} 80 \text{ mb H}_2 \\ 100 \text{ mb Xe} \\ 2420 \text{ mb Ne} \end{array} \right.$

3/60 Energy dropped to ~260 mV (gradually over the days)

↳ new fill -- (same as above)

↳ aligned optics

↳ ~460 mV, 2600 mbar

6/6/94

240 mV

↳ cleared window w/ TiO_2

↳ new fill	80 mb HCl
	100 mb Xe
	2420 mb Ne
	<hr/>
	2600 mb total

↳ after 10 min 400 mV

6/6 - 6/26 : 340 mV

6/26 250 mV, 2450 mbar

(new fill (as above))

340 mV stable after ~1 hr.

4/6/95 pumped out system. Windows look OK. Flushed gas lines with He as best we could.

Filled with	80 mb HCl mix
	100 mb Xe
	2420 mb Ne

No output at all! Discharge sounds pretty much normal. There is some excess noise from the fan, but it does seem to be working. Even pure Ne should give some light -- probably not getting a good discharge, but don't know why.

Xe tank is empty -- will have to order more before we can consider a service call.

Tomorrow I'll take a look with the cover removed, but things aren't very encouraging.

4/7

Took off cover. The discharge electronics seem normal -- no arcs, normal sounds, power supply is being loaded at the usual rate (judging by the frequency of its switching).

Fan is noisy, esp. when turned on at first. No laser output, very little discharge light.

Bad fill?
Fan failure?
Subtle HV problem?

Will probably need to:
1) order new Xe & HCl
2) call λ for suggestions

4/18

After talking to Lambda, decided to re-passivate.

Left at 8:40 PM with
200 mbar HCl/He
1500 mbar He
Don't run laser! (To be sure, I took the key.)

4/20

Filled with pure He. Will try laser tomorrow AM.

4/28

Refilled using new Xe, old HCl

Now 305 mV; much better, though well below normal. Dropped to 250 mV pretty quickly. So, we still need some work, but there's hope.

After 45 min @ 2 Hz, power nearly zero. So we really need to work on passivation/decontamination.

4/29

left laser passivating with ~160 mbar HCl mix, He to bring total to 1550 mbar. Ran HV supply (but did not fire) for a few minutes so circulating fan could distribute gas.

5/6 New Xe & HCl/He mix. Flushed all regulators and gas lines (5 times).

Standard fill: 100 mb Xe
80 " HCl/He
2420 " Ne

First few shots 530 mV, settled at about 510 mV after 10 min. at 2 Hz. Will let it run like this a while; lifetime on this fill could still be a little short. Still, looks good.

After 1.2 hours, ~460 mV. P came up from 2620 → 2650 mb. I've seen this before; apparently operation after a long down time drives off adsorbed gas.

5/9 P down to 2300! (big drop)
Power is 360 mV = 114 mJ

So the leak is really fairly severe -- will need ~ 1 fill/week until it's found and fixed.

Note: HCl line is at 32 psi -- I'm almost sure it was left set to 5-10 psi. If gauge is accurate, $P_{tot} = 32 + 14 = 46$ psi? To see if laser leaks into line, stop firing & press halogen fill button for a moment --

HCl pressure dropped a little → we are not seeing a leak from excimer into HCl line.

Finding the leak will be easiest when the new leak detector arrives.

5/26 down to 1800

5/30 pressure = 1700 mbar

We cleaned the water line and now we put He to test if there is any leak. All the gases have been pumped out.

5:23 p First put 30psi (relative indication on the He gauge) in the water line ^{about 3 atm}

5:33 put 60psi (relative pressure, about 5 atm) to see if any change happens in the chamber pressure.

6:21 p No change in the pressure gauge on the Excimer

7:35 p No change in the pressure

Fill the laser with He. and leave it overnight.

6/4 Pump down the water line for about 2 days. Looks like there is a leak since the ~~pressure~~ pressure didn't go down more than 500 mTorr. on the gauge.

Do another test now. I pressurized the water line with He. I put 40psi ≈ 3.5 atm. Check for leak on the external lines, no leaks at all. but there is a leak internally in the water line because 1st the pressure on the He tank regulator drops and 2nd the pressure in the chamber goes up.

We live 500ubar in the chamber

at 2:38p put 30psi (~3atm) in the water line
in chamber 500ubar of He
↑ 12min
at 2:50p with 30psi in water line, chamber: 520ubar
↓ 12min
at 3:02p with 30psi, chamber: 540ubar

Do again the test with 500ubar in the chamber and
45psi in the water line.

at 3:06p. put 45psi (~4atm) in the water line
↑ 12min
at 3:18 with 45psi in water line, chamber: ~535ubar
↓ 12min
3:30 " " " " " chamber: ~570ubar

Do the same test with open water line (1atm)

Start at 3:33p with 1atm in water line and chamber: 500
↑
3:45p chamber ~505ubar.
↓
3:57

I forgot to mention that during the pumping down of the
water line over the weekend, the pressure in the chamber
was down to ~600ubar.
So this is a clear indication that there is a leak

through the water line.

Pump down the water line and fill the chamber with
1400ubar of He, leave it overnight.

7/12/95

1. The water cooling coils have been replaced
by new ones.
2. Gas chamber has been passivated for two
days. Four fills with 200mbar/HCl+He mix.
One fill with 100mbar/HCl+He mix, and fired
for 40 min.s.
3. @ 2Hz, 20KV, Power reading $\approx 516mV$, 10:10 am.
4. Running @ 10Hz for a while, and check the
power level @ around 12:00 noon.
5. @ 2Hz, 20KV, Power reading $\approx 510mV$, 11:42 am.
very good
6. Keep running @ 10Hz
7. @ 2Hz, 20KV, Power reading $\approx 504mV$, 12:45 pm.
8. Shut-down. P = 2680mbar (P = 2600mbar, fresh
filled)

7/13/95

- ① No sign of pressure dropping @ 8:10am
⇒ No observable leakage.
- ② Power reading = 568 mV at 20.0 kV (2 Hz), 8:25am
= 618 mV at 20.5 kV (2 Hz), 8:26am.
- ③ fire at 10 Hz for 30 min.
- ④ Power reading = 518 mV at ~~20.0~~ 20.5 kV (2 Hz), 9:09am
= 514 mV at 20.0 kV (2 Hz), 9:10am.
⇒ The cooling water flow may be too low?
- ⑤ Start running at 2 Hz from 9:21 am.
- ⑥ Power reading = 532 mV at 20.5 kV (2 Hz), 9:50am.
- ⑦ Shut down.
- ⑧ Currently, cooling water flow rate is 1,100 ml/min, which seems to be only 1/4 of the requirement.
- ⑨ Set the flow rate @ 1.9 l/min.
P = 626 mV at 20.5 kV (2 Hz), 1:44 pm.
Try to run for 45 min @ 10 Hz.
- ⑩ P = 552 mV at 20.5 kV (2 Hz), 2:33 pm.
⇒ More ~~and~~ cooling water helps.
- ⑪ The highest available flow rate is 2.4 l/min.
- ⑫ The flow rate is set @ 2.0 l/min.

7/14/95

- ① The pressure is still holding steady.
P = 2600 mbar.
- ② P = 648 mV at 20.5 kV, 2 Hz, 10:28 am.
- ③ Water flow is set to 3.0 l/min.
- ④ Running 10 Hz for 45 min.
- ⑤ P = 554 mV at 20.5 kV, 2 Hz, 11:18 am.
- ⑥ No more water is necessary obviously.

7/18/95

- ① P = 2620 mbar, pressure is holding very well.
- ② P = 616 mV at 20.5 kV, 2 Hz, 4:05 pm

7/19/95

- ① P = 2610 mbar, 8:29 am.

7/20/95

- ① P = 2600 mbar, 2:35 pm

Pressure is held very well over a week's checking.

7/21/95

- ① P = 2605 mbar, 9:33 am

7/27/95

- P = 2595 mbar, 8:43 am.

7/28/95

- ① $P = 2595 \text{ mbar}$, 8:33 am
- ② $\phi = 596 \text{ mV}$ @ 20.5 kV, 2 Hz, 8:51 am
- ③ power dropped by a factor of $(1 - \frac{596}{648}) = 8\%$ in two weeks without using.

8/9/95

$P = 2580 \text{ mbar}$

After ^{being} filled with 2600 mbar gas for 27 days, the pressure dropping is still less than 20 mbar. \Rightarrow The total gas leakage is less than 1 mbar/day.

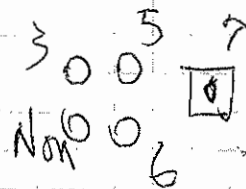
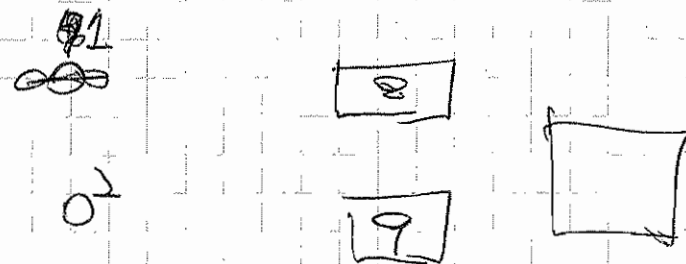
9/13/95

- prepare for the moving
- ① turn on the main power \rightarrow noise from the cooling fan on the power supply.
 - ② $P = 2580 \text{ mbar}$ & evacuate the gas chamber \uparrow very good.
 - ③ Evacuate the halogen gas line and regulator.

9/13/95

- ④ evacuate the Noble gas line and regulator.
- ⑤ evacuate the buffer gas line and regulator.
- ⑥ flush the buffer gas line x3
- ⑦ back fill the chamber with He of 1000 mbar
- ⑧ the laser head is ready for the move
- ⑨ shut down the laser power supply.

9/16/95



The End of
this Note !!