

5/2/90 New Fill (1st in DE) ~~18279 mV~~

2/3/90 Cleaned Window & mirror
Left Passivating over night

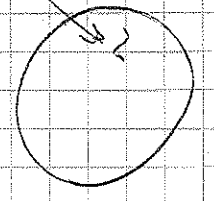
1/92 New fill

~~18279 mV~~

8/1 cleaned window & mirror

518 mV

Small scatch in output coupler
occurred in remaining window



8/10 energy 110 mV at start (440 mV)
dropped to 390 (102) after 1/2 hour

refill 550 mV = 18279 mV
125 mV

5/2/90

2/3/90

1/92

8/1

2/6/92

2/28/92

3/19/92

04/13/92

06/10/92

drops to 70 mV in 30 min
windows are not fogged
Must be confirmation

refill 600 mV = 180 mV

618 mV = 155 mV

hold 5 energy now. (2 hours later it's
still ~ 610 mV)

New fill - used pure Ne

New fill 50% Ne, 50% He

Unrecorded fill 100% Ne

New fill 70% Ne, 30% He

180 mbar Xe	} 30% He
80 mbar HCl	
726 mbar He	
1694 mbar Ne	
2680 mbar total	} 70% Ne

~ 80 mV

New Ne to fill - same composition as
above.

145 mV

145 mV pulse energy consistently
the hours of operation since 2/28 to ~ 50 hrs

energy down to 920 mV, pressure 2200 mbar.

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

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

9/15/92
 Circulating pump for
 reactor is broken out
 vortex RW 150

Call A Rhytt, 800 262 1100
 or 617 263 1100

Spoke to Michael Anderson, General Pump
 (\$470) and oil (\$21) from Gino,
 in order processing should
 arrive on 9/16 → wrong part !!

c/26
 Measured capacitor on pump motor,
 was .32 instead of .25 μF.
 (Replaced) wires OK now!

Reassembled laser. Is fill
 OK? but
 I recall something verbal
 about a pure fill but
 there is no record of
 any things like this in the log
 Booked!

Will disassemble again, take off
 shields & look for arcing.
 Looks OK to me together again.
 Clean up

If it's an inert gas fill through,
 why isn't it documented? And how
 did Noveldine & Subekat notice the
 problem with the laser head light
 if they were just cleaning a window?
 Best bet is to wait until I can ask,
 this will avoid potential wasting more
 time by guessing.

Got 505 / 3.17 = 178 μJ

Got ~~505 / 3.17 = 178 μJ~~
 Not calibrated meter

492 μJ / 3.17 = 155 μJ
 6-18-92

23106/92 (25° juw) 488 μJ / 3.17 = 154 μJ
 pressure = 2510 u bar

450 μJ / 3.17 = 142 μJ
 p = 2510 u bar

416 μJ / 3.17 = 131 μJ

404 μJ / 3.17 = 127 μJ

392 μJ / 3.17 = 124 μJ

374 μJ / 3.17 = 118 μJ

368 μJ / 3.17 = 122 μJ

344 μJ / 3.17 = 108 μJ

240 μJ / 3.17 = 76 μJ

Needs a refill

New refill, 100 u bar of Xe HCl
 80 u bar of Xe
 240 u bar of Ne

400 μJ / 3.17 = 126 μJ
 p = 2520 u bar

380 μJ / 3.17 = 113 μJ

375 μJ / 3.17 = 118 μJ
 p = 2505 u bar

326 μJ / 3.17 = 103 μJ

366 μJ / 3.17 = 115 μJ

362 μJ / 3.17 = 114 μJ

310 μJ / 3.17 = 97 μJ

290 μJ / 3.17 = 91 μJ

118 μJ / 3.17 = 37 μJ

452 μJ / 3.17 = 142 μJ

364 μJ / 3.17 = 114 μJ

380 μJ / 3.17 = 120 μJ

08106/92 364 μJ / 3.17 = 114 μJ
 08107/92 380 μJ / 3.17 = 120 μJ

Need new refill
 100 u bar of Xe
 80 u bar of Xe
 240 u bar of Ne

2505 u bar
 2500 u bar
 2495 u bar
 2495 u bar

2505 u bar
 2505 u bar

2505 u bar
 2505 u bar

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2505 u bar
 2505 u bar

2505 u bar
 2505 u bar

10/28/92 New fill

100 mb Xe
80 mb HCL
2420 mb Ne
2600 mb after

~435 mV $\xrightarrow{\pm 3.17}$

137 mV

(average)

~450 mV $\xrightarrow{\pm 3.17}$

142 mV

(peak)

10/28/92 New fill

10/23 ~ 435 mV \leftarrow 137 mV

~ 3 hrs operation @ 3 Hz

10/24 ~ 2 hrs operation @ 3 Hz

120 mV

~ 5 hrs operation @ 3 Hz

~ 100 mV - until fill terminates

10/27

start: 105 mV

~ 10 mV
95 mV

New fill
100 mb Xe
80 mb HCL
2420 mb Ne
2600 mb after

5 hrs operation @ 3 Hz

140 mV

10/9/92 ~ 120 mV

\approx 3 hrs operation @ 3.0 Hz

10/10 ~ 116 mV

= 3 hrs operation @ 3.0 Hz

10/11 - 10/14

~ 116 mV constantly
mostly @ 3.0 Hz

10/23

~ 116 mV @ 3.0 Hz 5 hrs

10/24

~ 116 mV @ 3.0 Hz 1 1/2 hrs

10/26

~ 116 mV @ 3.0 Hz 1 1/2 hrs

10/28

~ 116 mV @ 5.0 Hz 4 hrs

11/08

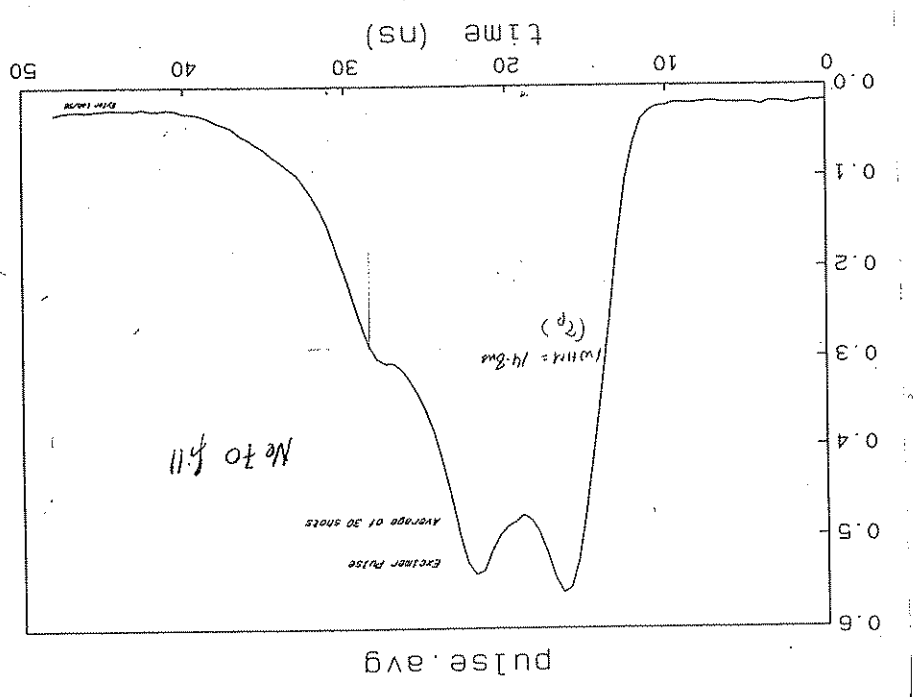
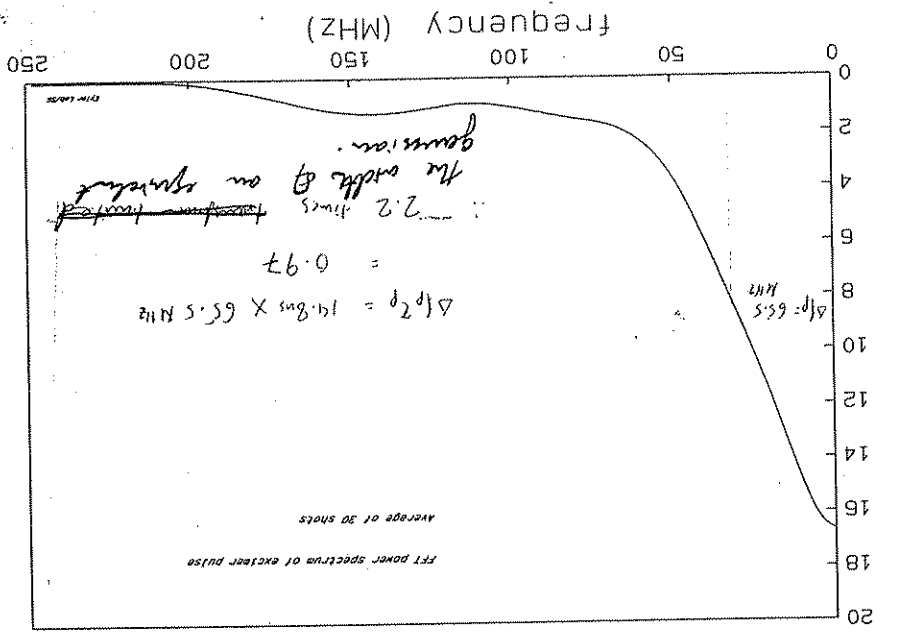
~ 105 mV @ 5.0 Hz 4 hrs
end: 85-90 mV (needs new fill)

11/13

~ 110 mV @ 5.0 Hz
New operation of Xe & Ne installed
down to 100 mV after 3 1/2 hrs

11/15

~ 110 mV @ 5.0 Hz 5 1/2 hrs



11/17 ~88 μs
 ↳ because of new cylinders?
 New fill: Bomb HCl, 150 μb Xe, 2420 μb Ne, 2600 μb total
 Inhd: 115 μs
 settled to 105 μs
 11/18 112 μs constant for 3 hrs @ 5 Hz
 ~70 μs *
 New fill: Bomb HCl, 150 μb Xe, 2420 μb total, 2600 μb total
 after ~5 min: 100 μs

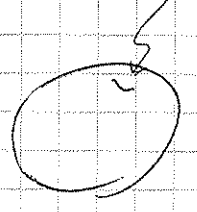
3/25/93

11/18

11/17

8/25/93

- cleared output coupler of warm.
- output coupler was a faint scratch



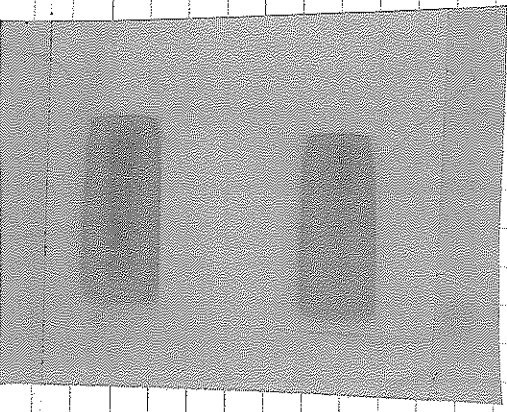
1st found a reference to this in 8/1/90's entry outside the beam region.

- prepared for a beam

800 HCA
100 mb Xe
2420 mb Ne
2600 mb Ar

1400ms (436 mV)

- beam is dipped on top
- E3 aligned the cany from outside
- Made a little with 1400ms every pulses.



profile x i

8/28

- 117ms @ 20.5 kV - same fits as 8/25
- dropped to ~97ms after ~1 hr.

800 HCA
100 mb Xe
2420 mb Ne
2600 mb Ar

- about 400mV, or 126 mV

- re-focused the output coupler
- about 142 ms

8/30

- 120ms
- dipped to 102ms

- tried to tweak the output coupler - no good
- put in a little bit of HCA
- no immediate effect
- ~~the~~ way abo a new fit tomorrow.

8/31

- 140ms

- 140ms
- dropped to 130ms

9/1

9/2

- 130ms

9/3/93 Repaired oil pump capacitor (see repair log for details)

450 mV on detector \approx 145 mV or so. Actually HV a little high. More like 425 mV.

High voltage seems somewhat unstable - fluctuated 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 wire in the lead. Will look inside head again after lunch.

9/4 Doing a few more diagnoses on HV. Doing a few more diagnoses on HV. Doing a few more diagnoses on HV.

1) Unplugged & reinserted all leads in control unit
 2) Unplugged HV board to head when HV and no open circuit fault is present just because rep rate was 0, or does it prove problem is in HV supply/control? Will check.

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

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

9/12/93 New fill :-

80w6 HCL	100 w6 Xe	2420 w6 U6	2600 w6 total
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Before fill : 335 mV

After fill : 526 mV or 166mJ

(after ~ 15 runs of (shamp))

Note: - We may go w/ a Ne-20 fill next time because the pulses are swifter (better for dump measurements), and we ~~have~~ 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

9/23 390 mV @ 20.5 kV

9/25 315 mV fill. Output within looks ok except for scratches from recent cleaning \Rightarrow will not clean it.

9/27 390 mV fill is above 10 psi left. Used last of HCL - new clean for next fill.

Incidentally used He, not Ne; Pumped out fill of HCL line. Replaced HCL cylinder, evacuated line, flushed once.

Head to about the part of fill (defective) limits used He for balance since ~ 2 liter. So
 He 15 $\frac{60}{242} = 24.8\%$ of rare gas
 80 mbar He
 100 mbar Xe
 1820 mbar Ne (to 2000)
 600 mbar He (to 2600)

Need new He regulator!
 Energy: 530 mV (~ 170 mT). Pretty good.
 Passivation I guess.
 after running 2 hrs at ~ 2 Hz, down to 430 mV.

9/29 Energy 410 mV
 9/30 Energy 420 mV
 10/2 400 mV
 10/4 370 mV
 10/5 370 mV
 10/6 350 mV
 10/8 350 mV
 P now at 2300 mbar. added a little HCl. No change.

10/19 310 mV @ 20.5 kV
 10/19 changed the He regulator - 310 mV @ 2000 mbar
 New fill 100% Neon. 100 mbar Xe
 80 mbar He mix
 2420 mbar Ne
 1800 mbar He
 2. have to order a He bottle in the bottle -

just want to be a source that does not require fill in the gauge.
 - Spot inside looks 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. (on window) and made looks o.k. (not too bad).
 It is it from the fact that there was some contamination of the gauges which occurred when we reset the He regulator?
 cannot run like this - will attempt a new fill and hope that we have enough Xe -

10/29 Energy 368 mV - p = 1600 mbar - Why did we read 292 mV yesterday? How the output window worked?
 After a few weeks (~ 15) energy drops to ~ 295 mV
 Toward up output window, 1 oph mjad made & energy. New ~ 305 mV -

10/21 ~ 350 mV, dropped to 320 mV, and stayed stable.
 10/22 ~ 340 mV stable - good by!!
 - new He bottle is here!
 10/23 - 10/25 ~ 350 mV stable
 10/25 energy - dropped to 310 mV, and

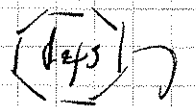
11/7/93

pressure: 330 - 320 mV
pressure dropped to 230 mbar

need new fill next time

pressure dropped to 2250 mbar

output: 270 mV



to 270 mV

changed the no. of Xe cylinders

purged the line (into the cylinder valves) with the He which.

set a re to fill (to be consistent)

80	u-bar	HCl
100	u-bar	Xe
726	u-bar	He
1694	u-bar	He
2600	u-bar	total

as well as 424 mV

11/12/93 energy 352
11/20/93 energy 334 mV
dropped to 320 mV after few minutes.

Get a new fill.

Xe: enough left.

no: run out of it.

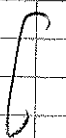
OK, though, get a new one
comparator:

80 mV HCl

100 mV Xe

1620 mV No

800 mV He



2800 mV total

purge lines smooth

(see appendix)

380 mV stable

next fill: leave to change
the the bottle and the Xe bottle.

December 1993

→ H₂, R, HD runs (v=0)
→ ~~run~~ run consistently, with Ne Ze fill, ≈ 120mJ.
→ details in the exp. log book.

3/15/94

→ pressure @ 1800 uBar --
→ Used a Ne Ze fill (don't care about energy width
→ want a better frequency structure)
→ 360mV

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

→ Run fill: turn tube, used the 700% Ne fill.
80 uBar H₂
100 uBar Xe
2420 uBar Ne
2600 uBar total
436 mV

3/30 + 3/31
Returned state @ 350mV

(end of 3/31's run → dropped to 350mV
(pressure OK)

4/22

→ ~280mV, 2400 uBar pressure
→ Run fill.
→ finished H₂ & Xe line w/ He (twice)
80 uBar H₂
100 uBar Xe
2420 uBar Ne

3/30
Energy dropped to ~260mV (gradually over the
days)

→ Run fill -- (same as above)
→ dropped other
→ 460mV, 2600 uBar

4/17 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 or first. No laser output, very little discharge light.

Bad fill? Fan failure? Subtle HV problem? Will probably need to order new Xe & HCl call X for suggestions After talking to Lambda, decided to re-pressurize.

4/18 Left at 8:00 pm with 200 mbar HCl/He. Don't run laser! (To be sure, I took the key) He will try laser tomorrow Apr. 4/20 Filled with pure new Xe, dd 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 a 160 mbar HCl mix, the HV supply (but did not fire) for a few minutes so circulating fan could distribute gas.

6/6/94 240 mV

cleared medium w/ 3.02
 80 mV HCl
 100 mV Xe
 2420 mV He

2600 mV He

4 after ~ 10 min 450 mV

6/6 - 6/26 : 340 mV

6/26 250 mV, 2400 mbar
 (Leans HCl for 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.

Fill with 80 mV HCl mix
 100 mV Xe
 2420 mV He

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 He 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 encouraging.

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

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

First few shots 530 mV, sealed at about 570 mV after 10 min. at 2 Hz. will let it run like that a while! lifetime on that fill could still be a little short. Still, looks good.

After 1.2 hours, ~460 mV. P came up from 2620 to 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 its 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, $P_{HCl} = 32 + 14 = 46$ psi. To see if laser leaks into line, stop firing & press. Helogen fill button for a moment --

HCl pressure dropped a little \rightarrow 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 uBar

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

5:23 p First put 30psi (relative indication on the gauge) in the water line

5:33 put 60psi (relative pressure, about 5.4 atm) to see if any change happens in the chamber pressure.

6:01p No change in the pressure gap on the Exiror

7:35p No change in the pressure

Fill the laser with the He. and leave it overnight.

6/4 Pump down the water line for about 2 days. Look also there is a leak since the ~~temperature~~ pressure didn't go down more than saw when 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 out all. but there is a leak internally in the water line because 1st the pressure on the

the tank regulator drops and 2nd the pressure in the chamber goes up.

through the water line.
 Pump down the water line and fill the chamber with
 1000ubar of He, leave it overnight.

7/12/95

1. The water cooling coils have been replaced by new ones.
2. Gas chamber has been evacuated for five days. Then fill with 300 mbar/He + He mix. One fill with 100 mbar/He + He mix, and find

3. @ 0Hz, 20kV, Power reading = 516mW, 10:10 am
4. Pumping @ 10Hz for a while, and check the power level @ around 12:00 noon.
5. @ 0Hz, 20kV, Power reading = 510mW, 11:42 am

6. Keep running @ 10Hz very good
7. @ 0Hz, 20kV, Power reading = 504mW, 12:45 pm
8. Shut-down (P = 2680 mbar (P = 2600 mbar, fresh filled)

So this is a clear indication that there is a leak
 was down to ~ 600ubar.

We live 500ubar in the chamber

at 2:38p put 30psi (~30psi) in the water line
 in chamber 500ubar of He

at 2:50p with 30psi in water line, chamber: 520ubar
 at 3:02p with 30psi, chamber: 510ubar

Do oxygen test with 500ubar in the chamber, and
 at 3:06p put 45psi (~40psi) in the water line

at 3:18 with 45psi in water line, chamber: 535ubar
 at 3:30 " " " " chamber: ~510ubar

Do the same test with open water line (John)

Start at 3:33p with John in water line and chamber 500

at 3:45p chamber ~505ubar

at 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

7/13/95

① No sign of pressure dropping @ 8:00am
⇒ No observable leakage

② Power reading = 568 MT at 20.5 KT (2Hz), 8:05am
= 618 MT at 20.5 KT (10Hz), 8:26am.

③ Fire at 10Hz for 30 min.

④ Power reading = 518 MT at ~~20.5~~ 20 KT (2Hz), 9:09am
= 514 MT at 20.0 KT (2Hz) = 9:10am.

⇒ The cooking water flow may be lower than 2?

⑤ Start running at 2Hz from 9:21am.

⑥ Power reading = 532 MT at 20.5 KT (2Hz), 9:50am.

⑦ Start down.

⑧ Currently, cooking water flow rate is 1100 ml/min, which seems to be only 1/4 of the requirement.

⑨ Not the flow rate @ 1.92/min.

P = 626 MT at 20.5 KT (2Hz), 1:44pm.

Try to run for 45 min @ 10Hz.

⑩ P = 558 MT at 20.5 KT (2Hz), 2:33pm.

⇒ There is cooking water being.

⑪ The light available flow rate is 242/min.

⑫ The flow rate is not @ 2.00/min.

7/14/95

① The pressure is still holding steady.
P = 2600 mbar.

② P = 648 MT at 20.5 KT, 2Hz, 10:28 am.

③ Water flow is not to 3.00/min.

④ Running 10Hz for 45 min.

⑤ P = 554 MT at 20.5 KT, 2Hz, 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 MT at 20.5 KT, 2Hz, 4:05pm

7/19/95

① P = 2610 mbar, 8:29am.

7/20/95

① P = 2600 mbar, 2:35pm

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

7/21/95

① P = 2605 mbar, 9:33am

7/27/95

P = 2595 mbar, 8:43am.

7/28/95

① P = 2595 mbar, 8:33 am

② P = 596 mT @ 20.5 kV, 2 Hz, 8:51 am

③ power dropped by a factor of $(1 - \frac{596}{648}) = 8\%$ in two weeks without warning.

8/9/95

P = 2580 mbar

After being filled with 260 mbar gas for 27 days, the pressure dropped to still less than 20 mbar. \Rightarrow The total gas leakage is less than 1 mbar/day.

9/13/95

Prepare for the morning

① Turn on the main power

\Rightarrow Move from the working floor on the power supply.

② P = 2580 mbar & evacuate the gas chamber \downarrow very good.

③ Evacuate the hydrogen 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

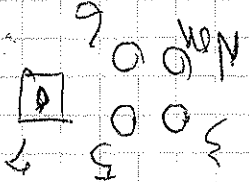
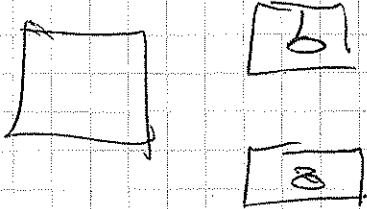
⑧ The lower head is ready for the work

⑨ shut down the lower power supply.

9/16/95

①

②



The End of this Note !!