Thurs 2 Nov '73

EAM 2 Mo tip. 78°.
Continuing looking at desorption ion spectra using the 500 e's pulses.
New Mo tip OK @ 5kV. No trace of ions arriving on detector, so let mic up to air & checked alignment of screen & tip. looked ~ OK, so why no ions?

Fri Nov Mo 78 same tip.
Mic now aligned ok.

230 2180 $3 10^{-5}$ He 10 sec. 1450 cf (breakdown @ 1800.

210 2300 2.xx. 1KV pulse.

220 2390 x
x
230 x
x
240 2480 x
x
250 2570 x
260 2680 x no ions (wrong -).
270 2750 x "
(2530 @ wrong pos, so should be 2830
280 2920 x ions,
290 3010 x (no gas).
x
300 3100 x
x
310 3190 x
x
320 3280 x looked like lines
330 3350 x messy
340 3440 x next line
x
350 3520 x
360 3620 x
370 3700 x

370 1500v pulse 3800 lots of ions ×
flash
×
380 3890 ×
×
390 3980 ×
×
400 4070 ×
×
410 4160 ×
× flash
×

New fcln

380 3440 × @ $1\,10^{-5}$ He.
10

360 +p 3630 ×
380 3720 × 1500v pulse.
370 3810 ×
380 3900 ×
× ↕ narrow
390 3990 ×
400 4080 ×
×
×
410 4160 ×
× ↓ some shift downwards, ? second pulse trigger ?
×
×
420 4250 × no delay gen
×
×
430 4340 ×
×
440 4430 ×
×
450 4520 ×
×
460 4610 ×
× flash
470 4700 ×
480 4790 ×

490	4980		
500	4770		
500	4520	10	New film $2\,10^{-6}$ He ? oxidised endform, not clear No anyway
"	4450	10	
490	4340	10	
480	"	10	
"	4250	10	
470	"	10	
470	4160	10	
460		10	
460	4160	10	$2\,10^{-5}$ He + $1\,10^{-5}$ Ne
470		10	
~~470~~		10	
480	4250	10	
		10	
490	4340	10	
		10	
500	4430	10	
		10	
~~500~~	4470	~~20~~	
450	4050	10	
"	"	10	
440	3940	10	
		10	
430	3850	10	
		10	
420	3760	10	
		10	
~~400~~	3580	10	
		10	
380	3400	10	
		10	
360	3220	10	
480	4250	15	$2\,10^{-5}$ He $2\,10^{-5}$ H_2 .56. .58 .
~~460~~	4050	10	
420	3760	5	
400	3580	~~1~~	
~~380~~		10	
		5	
		1	
380	2280	10	
360	3260	10	
280	2580	10	
200	2360	1 sharp line	

A more or less stable image of the surface could be obtained @ ≃ 2600 on the Polyrol At ≃ 350, the centre was very brightly lit, but surrounded by an extremely bright stable ring, with a sharp inner edge; presumably, the ~~is~~ the remnants of an oxide or carbide or other layer formed during the flash. All the gas pictures were taken from a site near the 100 (or ? 111, difficult to tell on this enlargement).

	320	340	350	370	390	410	+2 430	440	450	460
	3260	3440	3530	3800	3780	4160	4340	4430	4520	4610
1	1	0	2	13	2	1	1	2	12	3
2	3	2	0	11	0	0	10	2	13	10
3	2	5	2	11	3	2	8	17	11	14
4	1	8	5	6	10	3	9	14	7	8
5	5	10	5	1	2	3	11	10	6	8
6	7	1	5	9	2	6	11	11	5	6
7	2	2	4	4	2	8	4	11	2	5
8	1	1	1	4	2	7	5	4	4	9
9	0	3	4	6	2	5	2	5	3	1
10	3		2	3	5	5	4	1	2	1
11	2		1	0	3	2	2	4	1	1
12	0			3	1	2	1	1	2	3
13	0	1		1	1	0	1	1	1	2
14	1			1	0	2	3		1	
15		1	1	5	2	2	1			
16			1	2		2	1			
17	1			2		1	1			
18				0	2					
19				1						
20				3	2			1		1
21	1				1				2	
22										
23				2	1	1				
24	1									
25				2						
26										
27										
28										
29										
30										

The results above were taken from prints, screen dia ± 20 cm, rad of graticule 25 cm, graticule bin size 2 mm.

Mon 26 Nov Mc 78 He H_2 Ne.

Looking for adsorbed He, Ne on the ?oxidised surface left after the legs flushed on Fri – evidence then of adsorbed He.

428	3850	10	$8\,10^{-6}$ He. 1500 g
"	"	20	$1\,10^{-6}$
"	"	20	"
"	"	20	$1\,10^{-6}$ He $1\,10^{-6}$ H_2
"	"	20	
"	"	"	New site as the previous bit spot desorbed
"	"	"	
		"	No He.
		"	
	1 blank.		
410	~~4~~ 3650	20	$1\,10^{-6}$ He, H_2
		20	
		20	No He.
		20	
~~490~~	3580	30	He H_2
		30	No He
390	~~3~~490	30	He H_2
		30	No He
380	3420	30	He H_2 New He bottle ·57
			H_2
370	3320	30	He H_2 ·5+
		30	H_2
360	3240	30	He H_2 ·64
		30	H_2
350	3160	30	He H_2
		30	H_2
340	3080	30	He H_2
		30	H_2
330	~~3000~~	30	He H_2
		30	H_2
320	~~2~~900	30	He H_2
		30	H_2

300	2740	30	H_2	$1\,10^{-6}$
280	2540	30		"
260	2440	30		"
240	2270	30		"
220	2070	30		"
200	1910	30		"

Film 2. (100) evaporated metal.

400 DIV				
400	3580	10	$1\,10^{-6}$ He.	
400	"	10	" He + $1\,10^{-6}$ H_2	
400	"	10	"	
"	"	10	H_2 only	
"	"	2	"	

390	3490	10	He H_2	
		10	" "	
"	"	"	"	
"	"	"	"	

Camera jammed, re replaced film with new cassette

390	3490	10	H_2	
"		10	H_2	
380	3420	15	He H_2	.61
"	"		H_2	
370	3320	15	H_2	
"	"	15	He H_2	.61
360	3240	15	He H_2	.61
"	"	15	H_2	
350	3100	15	H_2	
"	3160	15	H_2	
"	3160	15	He H_2	.78
340	3080	15	He H_2	.68
"	"	15	H_2	
330	3000	15	H_2	
"	"	15	He H_2	.69
320	2490	15	He H_2	~.7
"	"	"	H_2	
310	2820	"	"	
"	"	"	H_2 He	.78
300	2740	"	" "	.89
"	"	"	H_2	

280	2590	15	H_2	
〃	〃	15	He H_2	1·07
260	2440	3	〃	
		15	〃	
240	2280	3	H_2	
		15	〃	
220	2070	15	〃	
200	1910	15	H_2	
180	1730	15		
160	1580	15	〃	
140	1380	15	〃	

10^{-3} He added, & tip found to be badly etched — reprogrammed to 400 BIV in He.

400	3580	10	110^{-6} He
380	3420	10	
360	3240	15	
340	3080	20	

H 400 = BIV = 4·5 v/A,

280 = $\frac{28}{40}$ × 4·5 = 7 × ·45 = 3·15 v/A.

For 280, counted (by hand!) ≃ 2760 spots in the hydrogen peak, 72 in the He peak & 48 in the desorbed He peak.

Guess say 30 Å² source,

→ ∧ $\frac{50}{2800} \times 30 = \frac{1500}{2800} \simeq \frac{1}{2}$ Å² × -section for He.

or at least between .1 Å² & 5 Å², v. approx.

Surprisingly large ?.

14 Fri Dec 73.

Mo 78° 111  (offset)

430	3800	1 sec	Canon TriX 1500 asa $1\,10^{-5}$ He.
		½	
		2	$2\,10^{-6}$.
		5	
		1	$+1\,10^{-6}$ H_2.
		5	
	3700	5	(H_2 peak).
420	3700	5	He H_2
		5	He
410	3600	5	He
		5	He + H_2
		5	"
400	3520	5	"
		5	He
390	3440	5	He
	3	5	He + H_2
		10	"
		10	H_2 only
380	3360	5	He + H_2
		5	He
370	3290	5	He
		5	He + H_2
		5	H_2
350	3120	5	He + H_2
340	3040	10	He
		10	He
		5	He + H_2
		10	He + H_2
		6	H_2
330	2950	5	He H_2
310	2790	5	H_2
300	2700	5	
290	2630	5	
280	2550	5	
270	2470	5	
260	2390	5	
250	23		

Some etching has occurred. BIV now = 370 in He.
12 evaporated in He ~~at~~ at 440.

N film.

430	3800	5	$1\,10^{-6}$ He
		5	He + $1\,10^{-6}$ Ne ~
		10	"
420	3720	5	He + Ne
		5	Ne
410	3640	5	Ne
		5	Ne + He
400	3560	5	"
		5	Ne
390	3480	5	Ne
	3	5	Ne + He
380	3390	5	"
		5	Ne
370	3300	5	Ne
		5	Ne + He
360	3220	5	"
		5	Ne
350	3140	5	Ne
		5	Ne + He
340	3060	5	"
		5	Ne
330	2950	5	Ne
		5	Ne + He
320	2870	5	"
		5	Ne
310	2790	5	Ne
		5	Ne + He
300	2700	5	Ne + He
		5	Ne
~~4~~430	3800	5	Ne (except ~~3~~40 in He/Ne)
		5	Ne + H_2
420	3720	5	
410	3640	5	
400	3560	5	
390	3480	5	
380	3390	5	
~~370~~	~~3300~~		

N film (short)

370	3300	5
360	3220	5
350	3140	5
340	3060	5

330	2950	5		
320	2870	5		
310	2790	5		
300	2700	5		
290	2610	5		

Recovery (dirty) to 440 in He.

420	3720	5	$1 10^{-6}$ He	$1 10^{-6}$ Ar
400	3560	10	"	$2 10^{-6}$ Ar
380	3390	10	"	"
360	3220	10	"	
350	3140	10		
340	3060	10		

Tues 8 Jan 74

Al, 111 oriented, in DJ's atom probe. 60°, Ar.

Originally intending to look at the oxide layer, to see if it is strong enough to be observed in neon. However, layer was v. thin. I observed a v. curious feature of the 420 environs at near evaporation field, — the ~~digital~~ image points become fainter and larger as the field is raised, then just below the evapn field they are seen to have dim centres, ie they are rings. This does not seem to be a feature of the converter system, as it independent of pos'n on c-plate, & not varying with time (ie not a c-plate extraction effect). It also appears to be specific to the 420 environs. Will try to photograph it — Tri X, f2 pentax, 4×10^{-5} Ar Eg reading.

5.42 kV	1 sec	(evapty slowly).
	2	
	5	
	½	
5.34	½	
	1	
	2	
	5	
500	½	
	1	
	2	
	5	← down to low v, recommence a little to clean up.
540	½, 1, 2, 5.	
530	"	
520	"	
510	"	
544	1	

Image starts to appear between 3.68 & 3.98, depending on presence or absence of 'bright spots'

Checking with the telescope, effect appears from 5.25 upwards, but rather depends on how fresh the surface is; it seems to slowly alter (? rearrangement or perhaps of crud ?!)

adsorbed film on 111 ☒

4.99 BIV 4.21
5.47 evap 5.11 BIV

4.53 4.27 3.96

Gandy up 4.8
down 5.1 } KV were DW.

⇒ promoted image,
Promotion by what? Background $4 \cdot 10^{-10}$ Torr (cold).

Fri 11 Jan 74. Flying ring, AC, 7.5KV in Ar,

78° $\frac{1}{2}$ 1 2 5 Ar? film.
$\frac{1}{2}$ 1 $\frac{1}{2}$ 2 5 ~ B I V

$\frac{1}{2}$ 1 2 5 $\frac{1}{2}$ evapting gently.

$\frac{1}{2}$ 1 2 of film on 100 – ? H_2.

60° $\frac{1}{2}$ 1 2 $\frac{1}{2}$ @ evapt. v.

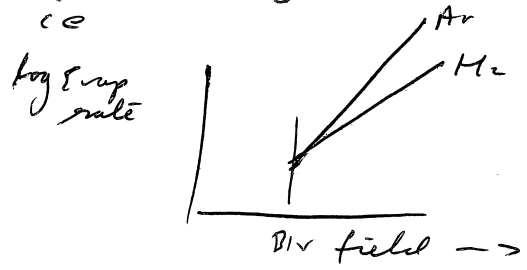
+ various others @ lo & hi field → 33 on number.
? 50° → 1 blank.
N – film
Series of pics @ decreasing voltage.

1 blank.
Series " . →
1 blank
2 × $\frac{1}{2}$ sec @ high evap rate
Warmup.
Series of pics looking at the buildup of film on (100) poles.

Above two films were looking for the 'ring' spots seen on At near evapn field in PJT's atom probe, as a fn of T. Gas background was $3\,10^{-10}$ (Trig gauge) at beginning, cold, unbaked → few 10^{-9} at end – perhaps > by factor of 2 or 3 as trigg gauge disagrees with c/gauge. Film of adsorbed gas on 100 & as enhancement on 110 is likely to be H_2 or CO left in the system, CO likely ∴ sub pump left on to getter H_2. Gives v. regular ring system around (100) pole.

Mon 14th onwards: trying to fix the VG mic converter. New P11 phosphor screen laid, pot. silicate binder, as old (basher) screen was ½" thick, white phosphor, with a soot surface? Inefficient, ? ₱. New screen fitted (3 times) converter fitted to mic ~ 4 times, still don't work ∴ shorted channel plate. Persevere. Screen (50mm × 3mm) & glass washers (60mm × 46mm × 1mm) ordered for converter for autochanger mic based on Eds' 20th century. 50mm channel plate from glass mic will be rerachromed, hopefully to use in converter.

Thurs 17 H_2 bottle fitted to flying rig (via ½" valve, as VG leak valve leaks $\simeq 3 \times 10^{-10}$ Torr). Used H_2 to image aluminium tip (same tip as last week). H_2 image is interesting: The 111 plane (central) is well resolved, rings etc. 110 is just visible as a few rings, 100 as 1 or 2 rings when evaporating gently. The image is practically as stable (at 78°) as the Ar image, but behaves differently: on raising tip volts, H_2 image evaporates much less readily than Ar image, or so it would seem. ie



The oxide layer does not image in H_2, around the metal. The oxide seen when first imaging looks different to Ar image: fewer spots, more scintillating, some "butterfly" spots.

The oxide is still present around the tip as it may be seen in Ar still. $\sim 2 \times 10^{-7}$ Torr Ar added shows some bright spots where oxide is.

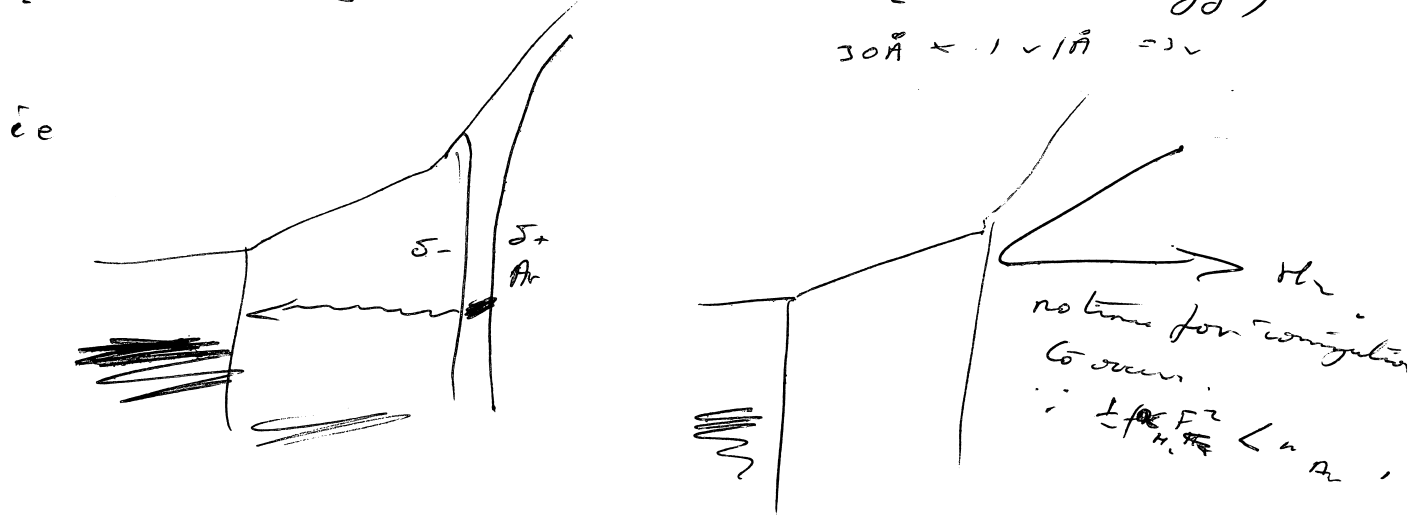
If H_2 endform is imaged in Ar, 111 pole evaporates v rapidly, & normal Ar image is obtained.
Few % H_2 in Ar, & Ar in H_2, give mixture of images, probably not useful. Ar apparently promotes the corrugation, hopping bright spots.

Vacuum was 5×10^{-7} (Varian g) at best when cold. Ar imaging perfectly feasible under these conditions, though grid collected in Co-field (00) region. Will try Ar in CAM 2 using H_2 to form image. H_2 image should be useful for looking at precipitate systems: even background across surface, no black holes.

Why Evaporating in $\simeq$ ½ vacuum seems to give a $\simeq$ Ar type surface, though oxygen field 2 > than with Ar present. Odd. How can it stabilize surface, as it apparently does.

Series of photos taken, 1st with H_2, then with Ar, then Ar + H_2, then H_2 + Ar.
$\{10^{-8}$ (?) $\{10^{-7}$

? Why doesn't H_2 image Al_2O_3 at edges ? doesn't adsorb on oxide, ionization probably small, only latter if eg Ar adsorbed for long time on surface.
? oxide visible at $\simeq 20°K$ in H_2 ? (cf B's engg.)

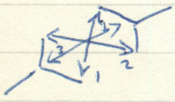


7th

March.

April 3. Measurements on anisotropy errors from tungsten desorption pict, Tilm, Jan.

Measurements of diameters of (110) rings on He pic and on desorption pic. 3 sets of measurements, 2 along lines joining 2 (11) planes and 1 along line joining (111)s. Arbitrary magnification.

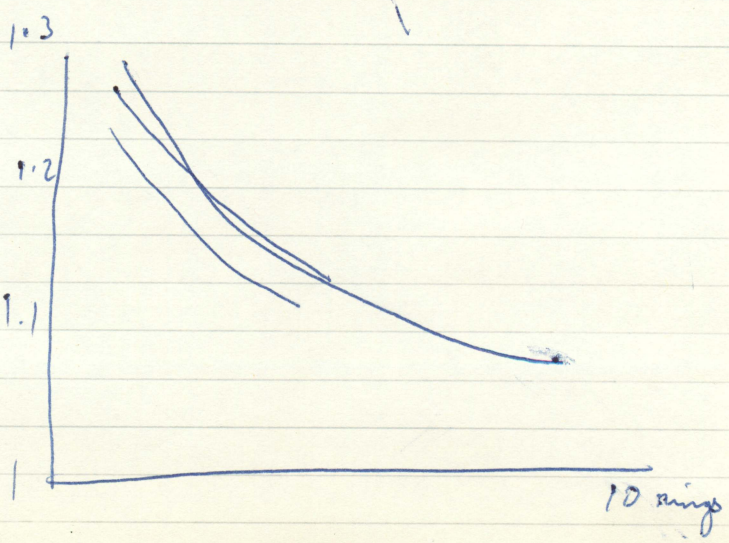


	Gas	Metal	Ratio
1	2.14	1.77	1.21
	3.25	2.75	1.18
	4.15	3.63	1.14
	5.30	4.43	1.20
	5.88	5.32	1.11
2	1.84	1.57	1.17
	2.92	2.62	1.11
	3.72	3.34	1.11
	4.42	4.05	1.09
	5.17	4.70	1.10
3	2.04	1.65	1.24
	3.00	2.59	1.16
	3.85	3.39	1.14
	4.70	4.17	1.13
	5.38	4.93	1.09
	6.08	5.65	1.08
	6.77	6.24	1.083
	7.32	6.92	1.06
	7.88	7.51	1.05
	8.74 (c-c 111's)?		

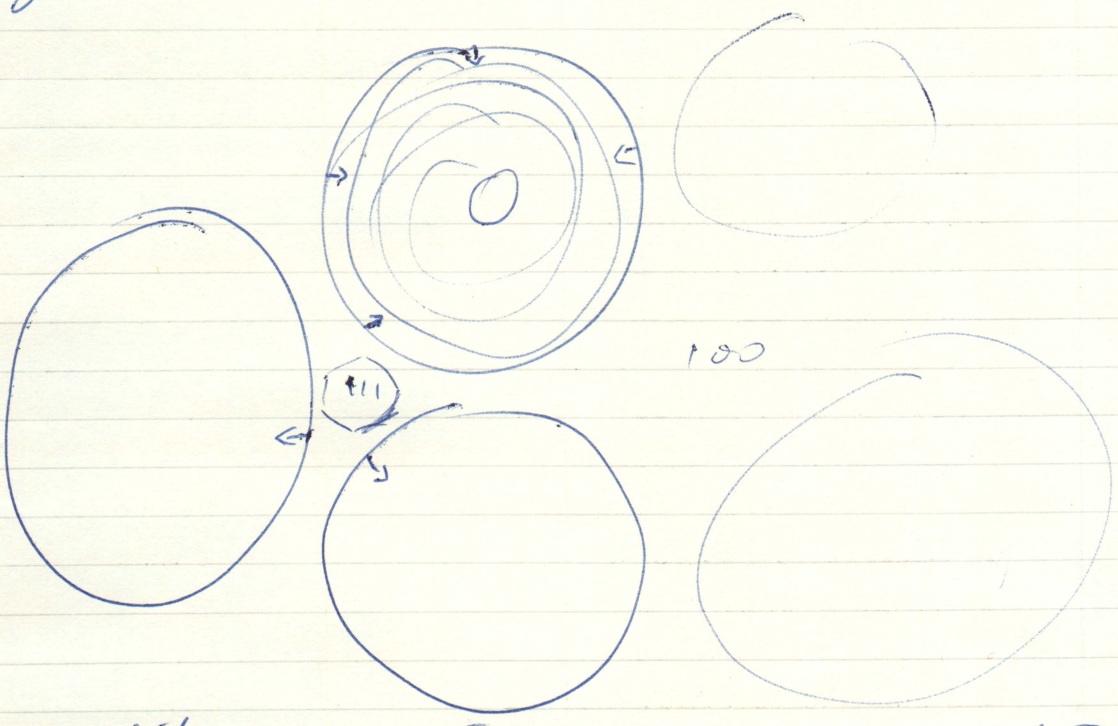
Slightly different magns of -ve c-plate:-

7.42 metal = 7.18 gas.
Ratios not corrected.
= ×1.03.

Results ≈

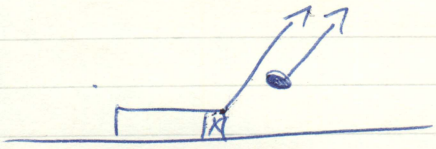


Conclusion = 110 rings on evaporated tungsten tip are always smaller than gas rings.
→ near (111) plane, tunneling up probehole on a 110 ring will give metal ion from next ~~outer~~ outside 110 ring.



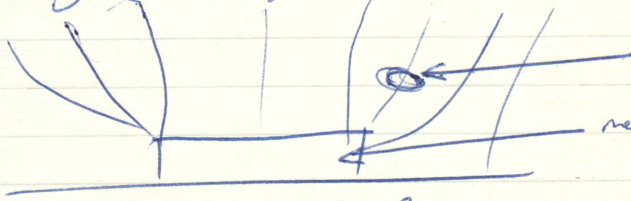
Don't know which way 111 rings collapse: not enough ions to identify rings.

Measured rings are mixture of He^+ and $W^{3+,4+}$ presumably.
→ desorbed He^+ doesn't landing far away from metal, whereas gas from x_c clearly lands far away.
? why.



a Brenner's explan.

1) arrows can't be ||, or 2 ions would land 2 Å apart on c-plate, must be divergent
2) ? why divergent: surely high field strength area directly lined up with metal atom, ie



so metal would have to follow same field line as gas.

18 April 1974 Helipot

A Coxide Ar central 78° Background $1\ 10^{-10}$ T-gauge

$3.5\ 10^{-5}$ T-gauge (dynamic)

1 sec counts.

150	30108	30186	28555	34634	1 sec
	39175	40345	37152 36125	36168	
145	39750	39257	39549		
140	40447	42114	40541		
135	38788	38803	39213	39016	
130	41196	33383	39690	39548	41476 37313
125	25700	26166	25284	24906	25349
120	13406	1266	2340	7597	8081 7868
		6620	762	697	6861 7243 7490
		9056	5673	8063	13190 15111 15403 12691
115	66	118	91	77	41/42
150	35618	35416	35758		
145	36567	37176	35743	35157	
140	34410	33874	33280		
135	34521	35650	35740		
130	35524	35821	33411	36118	
125	21639	18731	19016	21041	18320
120	278	184	293	198	284 350 3075
	2260	4272	5743	3631	8830 9552
115	36	30	37	30	24 30
0	14	11	11	11	18 11 11

Solid N_2 + some O_2.

50 31647 32621 34161 34765 34702 35525
33601 33565

145 36183 36729 37089 37143

140 41502 & 35852 & 41542 41601 41337

135 41825 42111 42570 42536

130 35992 36738 37348 36965

125 36530 35717 36531 36372

120 28191 28363 28388 28480

115 12946 13466 13421 13399

110 124 45 180 1825 16 16

105 14 15 16 311 31 105

150 37244 37674

145 39808 39651 40300

140 43066 42625 42764

135 38241 41695 41151

130 43234 42713 42814

125 36749 36775 37735 39789

120 28247 28465 26273 28432

115 10893 13580 13336

113 8766 8581 8331

110 1684 1847 1420 1555 1691

108 852 ~~809~~ 10 8 11 12 12 = bkgnd.

control

150 38986 38283 35903

155 36868 34952 35431 35060

35942 39920 38446 38095

37216 34533 34962 36637

170 32750 34294 34842 35463

34714 36240 35998 35601

175 28442 28642 28321 23334

30398 30680 30447

160 ~~25~~ 30276 28569 26732 24560

180 32753 33690 30546 30941

32116 33123

185 29313 29127 32728 31847 31021

190 30741 30133 28567 26690

24168 26852 24700

195 31556 37725 33092 29621

200 40495 41997 39677 41016

38021 34161

205 35318 33313 33041 33646 32279

210 47508 49272 45162 43000

180 46367 43189 44965

145 1, ½ f4 TriX
150
155 2
160
165 2
170
175
180 4
185
190
195 4
200
~~205~~ 3205 4
210
blank

210 31661 35285 35395 32574.
25182 2300 24781 25145

215 1, ½

215 31000 ⊗ 20684 23191 22585 21274

Hysteresis observed → small current now below 150 or so, so must have evaporated some of surface film (or HT self-drift-)

220 1, ½
31034 30396 32940 32678

230 29139 30262 30872 ~~30199~~ 27941
170 581 619 877 816 811 820
180 1259 1370 1185
190 2550 3991 3092 1936
200 7910 7498 7592
210 17717 17353 17457 17402
220 ~~25~~ 19756 19537 15437 ~~17792~~ 24501 28183 27493
230 36429 36773 34937 ~~35891~~
220 30908 29123 29487 29761
210 34224 32903 31397
200 26506 27719 27407 28484816 8493 8294
190 40970 42452 14907
180 1117 1152 1160 7580

230 28642 25750 26108

240 I see . e of flm .
39958 41110 40185 37385
47685 37519

Oxide came off between 260 & 280
BIV of Al @ ≈ 246.

Film 2.

140 1, ½ of Al in Ar, same orientation.

1, 5 of crud on reoriented surface
(Trig gauge fil fried, P = 4.10⁻⁵
Reduced P_{Ar} to 10.10⁻⁶ T-g reading
∴ i ≥ 10⁵ cps.

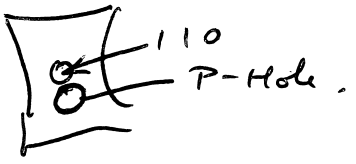
150 57970 70028 73582 81638 68895 76958
60748 55970
145 70489 73918 57135 59148 61582
140 72646 72618 78071 75183
135 65287 65138 68908 71625
130 55215 42029 43797 45068
125 51066 52212 48169 50639
120 40092 38358 41127 30330
115 34147 33703 35849 3265
110 24684 18806 15401 15011 13872
34 15603 12129
105 .

All are 2- - not 1- - .

Except clean.

155	41775	41646	41957	39658	
145	40237	41105	41745	41394	
135	35293	35034	35233		
125	24983	22028	21840		
115	15014	17175	9415	24418	15274
	53164	42712	42003	12507	11816
105	7461	23786	27016	59347	139740

155	27883	31073	30870
145	53821	54032	
155	30927	3447	36533
145	51324	48704	
135	61102	61005	60619
125	62048	58016	63114
115	6553	80 95067	64665



220 beginning — below 220 largeness of rapidly moving bright spots seen. recevaporate on raising off F without effecting surface. Still there as pictures faded out on lowering F to 200.

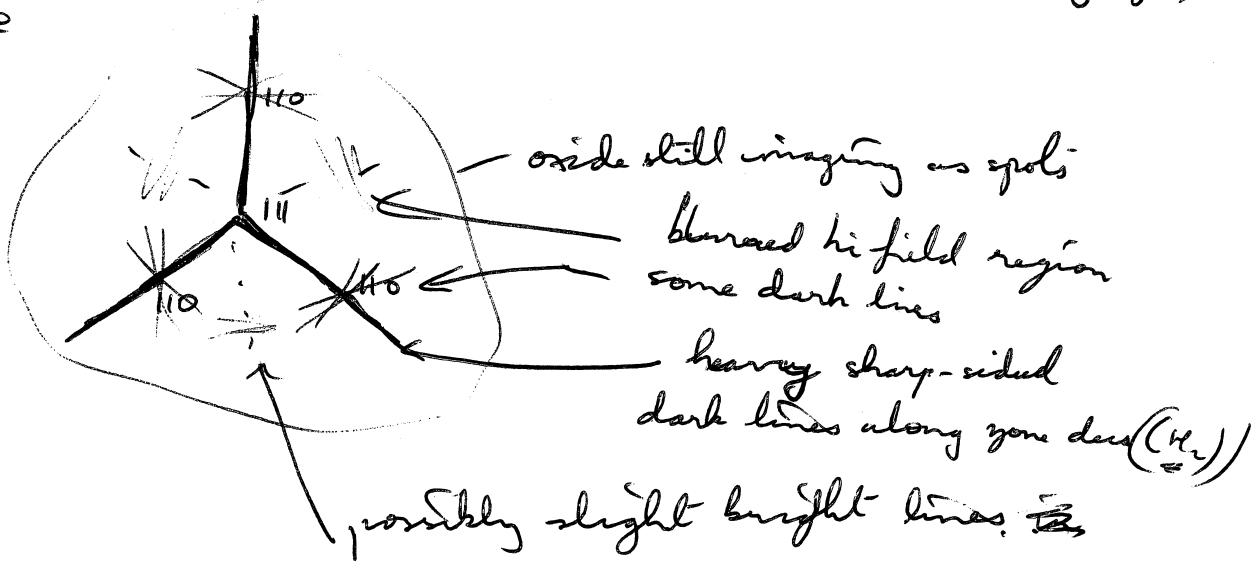
259	27383	36928	22840	26253	
250	31145	34223	34425		
240	1629	20427	19422	21461	
230	21072	8376	11073	15573	
220	5434	5574	16908	15721	
210	12991	11650	12362	12074	
200	9348	242	128	159	163
190	19	105	25	26	15 411 3135 3110

255	1, 1/2
250	1, 1/2
240	1 1
230	1 1
220	1 1
? 210	
200	1 1
190	1 1
180	1 1
170	1 1
160	1 1 → N₂ 4.

250 ≐ 7 KV.

+ several more pics taken with the metal evaporating very rapidly. 1 sec exposures. It had been ~~observed~~ noticed that the normal zone lines (H_2) appeared, but black, when the metal was evaporated rapidly in Ar. So took (?) some pics. (Firing camera with the teeth!!) Tip flashed eventually (surprise, surprise).

– Pictures showed what had been observed by eye, i.e

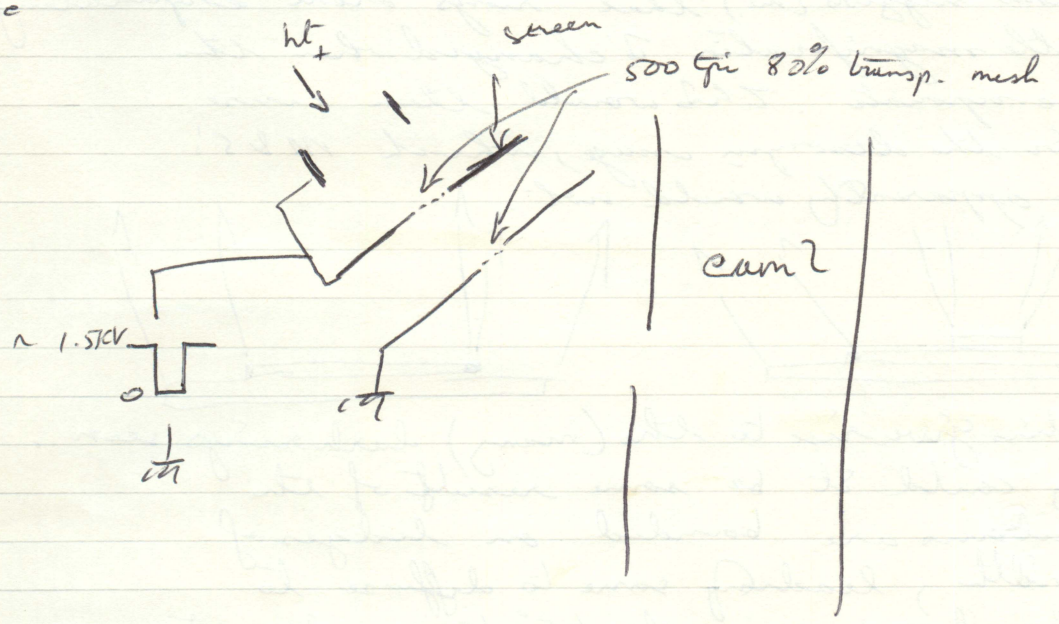


Should try again with lower Ar pressure to confirm that Ar is not forming image – i.e. unlikely, I think.

Sat Sun playing with Eds' autohanger, converter for which now works.

Mon 21 Test autohanger again.

Putting CAM 2 back together, with modified screen/mount so can apply -ve pulse to evaporate metal, then extend ions into analyser to eliminate effect of premature evapn.



Also have fitted new top flange so can add Ti Sub pump when one eventually arrives (4 wks late on 4 wk delivery!)

Put W tip in flying rig to see if could do same as with Pt tip -> desorpn pk @ dC evapn

Could see sump pattern with naked eye - v bright, with $< 10^{-6}$ He present. 78 K. Tried to take a no of pics. Tip flashed eventually. Need autohanger!
Background ~ 7×10^{-8}, 78°, He.
Could apply -ve pulse to converter (floating) with microswitch to do evaporating more controllably, instead of winding up heater as at present.

Some pics came out! Many 'dark lines', some bright lines, general ~~as~~ character as for pulse-desorpn pics.

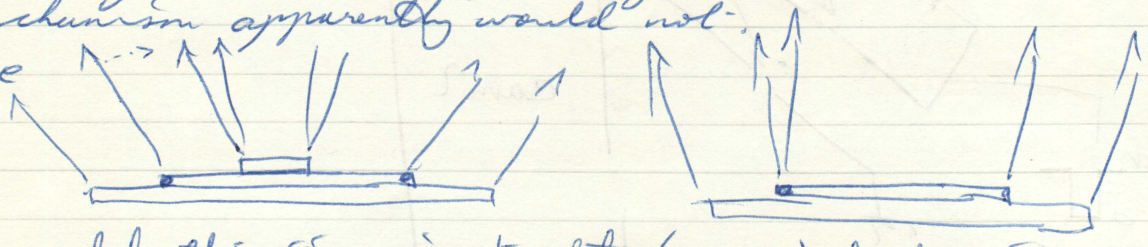
Various interesting features:-

1) Zone line round (110) dark region, presumably diffusion into zone line

2) Rings round 110. P TO

a) Moore & Swinh mentioned rings round central 110 poles even when ≥ 10 layers in desorpn image.
M&S say, we confirm, that when central group of atoms on 110 evaporate, outer rings appear to evaporate too: with 7 I gas, time exp., this gives a ~~zone~~ dark ring cov. to jump in picture.
However, ASW suggests (me!) that rings aren't evaporating, but that the magnification is changed when the last atoms evaporate. This would then cause dark rings on the desorpn image, which M&S's mechanism apparently would not.

ie



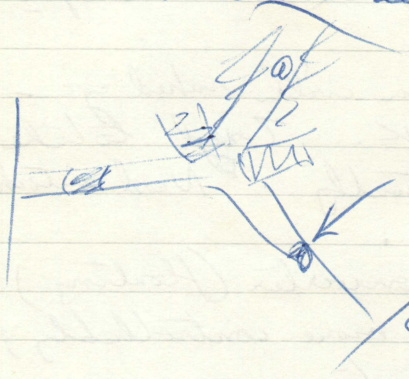
? could this give rise to the (many) dark rings seen.

b) alternatively could it be some result of the way the atoms are bonded on ledges of varying width, leading some to diffuse to the 4 bright lines seen at 45° to zone decoration — these atoms must come from somewhere!

c) Silly idea, how about some form of surface state centred on 110 affecting ionization probability of atoms.

d) Much more structure seen around 111 than previously

ie



some bright bits in dark 'propeller',

structure around 111 apparently slightly different to that from pulse desorpn.

? Don't know what effect of residual (10^{-7} or less) He was — holding field was above BW, no gas picture seen on photos — ? still adsorbed layer — should come off with first ions, be replaced v slowly. Many ~~to~~ layers needed to form pits.

Thurs 24 April W 78° EAM1 He ≈ 1.10^{-8} Tri-X
f4 macro lens. 80 ps pulser.

He 4×10^{-5} T-g 1 sec 81V = 135 = 3·8 KV.
1 sec "
No gun. 1 sec "

2 KV pulse = 165 to get visible single shot desorption image.

165 1 pin.
170 2 pins
175 2 pins
180 no pins 3 pulses.
185 bright flash 2 pins ~~[illegible]~~

tip gone.

Nothing on pins.

Put in new W tip.

YC570 Phosphor arrived from Leury-Dent for detector in PPP.

Fri EAM2 — No tip ≈ 7 KV.

Trying out whether EAM2 works still, after all coming to bits. With tip @ 235, ions arriving on detector with analyser @ 3 KV. Not perfectly focussed but not far out. Tip flashed when manipulator was moved, ≈ (HT fluctuating on mantle. Vacuum ≈ 9×10^{-7} cold (nylon nuts & bolts used to fasten retarding section together! probably a limiting factor for vacuum, will replace if retarder works as intended. Sub pump has still not arrived yet.

Sat 27 EAM2 4 78 He ≃ 5 KV

Bkgnd ≃ $9 10^{-7}$.

$4 10^{-5}$ He 220 2100 1500cp 4.5 sweep.

1 sec
1 sec Retarder = 0
10 sec
10 sec
1 Retarder + 1 KV
10
10
30 " 1500 v
225 1 " 0
10

Now try to focus analyser properly.
v. difficult!
+ blank.

220 2050 10 sec.
10 } no gas.
10

$4 10^{-5}$	217	2030	10	1 KV ret.
			10	0
	220	2060	30	1
			15	0
	225	2090	20	1
			15	0
	230	2140	10	1
			10	0
	240	2240	10	1
			15	0
	250	2 340	15	1
			15	0
	260	2420	15	1
			15	0
	270	2500	15	1
			15	0
	285	2620	15	1
			15	0
	300	2740	15	1
			15	0

320	2890	10	1
		10	0
340	3070	10	1
		10	0 ← N-fach
360	3240	10	1
		10	0
380	3390	10	0
		10	1 ← N-gram
400			↓

Mon April 29th.

W 78 He EAM1 $3\,10^{-9}$ T cold f-g.

$4\,10^{-5}$ He 1 sec @ 31V
1 sec @ 226, pulsed 80μs, 1KV.

Nagus 1/60 = x 226 no pulse.
1/60 " pulse 1KV.
flash, so let gas in, OK.

270 + 1.5 KV pulse evaporate slowly.

2x 302 pulses.
2x 305 " "
more pulses, de evapty.
2, or 3 307
more,
3x 310
"
3x 313
"
3x 318
1 flash.
Background q. brite, so open up all pumps. little change,
5x 325
3x 332
3x 340
3x 350
3x 365

$1.5\,10^{-5}$ He 1 sec 315 = 31V

New film
293°K! $3\,10^{-7}$ liquid.

$4\,10^{-5}$ He 1 sec 295 = 31V
305 + 1.6KV } evapts with gas.
" 9KV pulse }

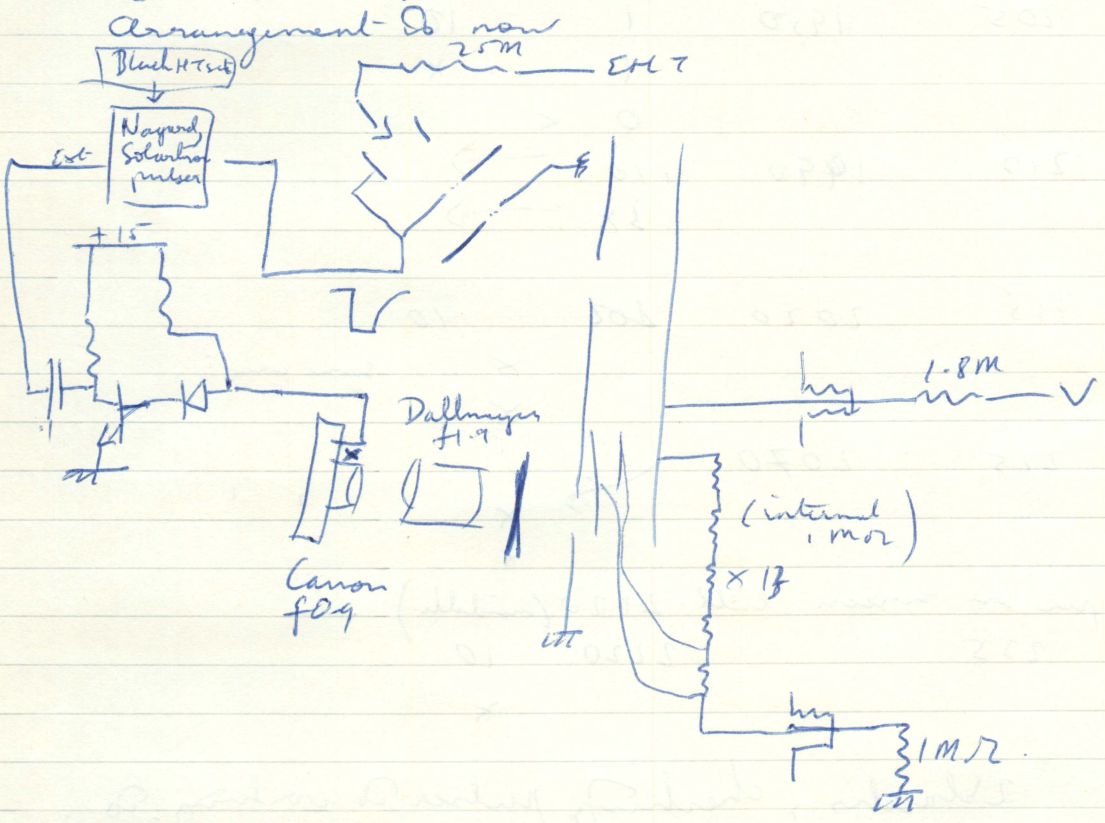
No gus. 1 × 330 kΩ
M.

Tip flashed.

Attempted to use DMT's old pulser on EAM 2 this afternoon, worked off camera, as input to mantle/reloader.

1) Tendency for Cu braid to short onto mantle support rod.
2) Analyser impossible to focus, though left fully aligned on saturday. On investigating, find that resistor chain to shorting to ground somewhere, so analyser screwed up.

Arrangement - to now



Pics from 1st film generally underexposed. Think f2 lens better than f4 for this work - find extension tube to fit. Pics look OK & the rings are definitely there.

Tues 30 78 $1\,10^{-6}$

Gas	tip	cm	screen	Time	cp
$3\,10^{-5}$ He	179	1720	0	1, ½, 10 } secs.	1800
"	200	1920	1	5	–
			10	10	
	"		x		
	"		x		
	205	1950	1	10	
			1	x	
			0	x	
g	210	1990	1 10	→	
			3x	→	
g	215	2020	102	10	
				x	some ions?
				x	
no g	225	2070	→	x	" ?
				x	

gas, no pin or screen till 2120 (middle).

g	235	2220	10	
			x	

2 blanks, checking pulser is working. do.

g "	245	2270 no pulse	x	
		"	10	
			x	ions seen.
no g }			x	
"	255	2370	x	
"			x	
"	265	2460	x }	
"			x }	
"			x }	
"	275	2560	x	end of film.

tip ergs in vac, DC @ ≃ 280

not

NB – discovered that should turn tip HT off with +/ KV on screen!!
tip ox after evaporating surface.

This film was found to be unfocused (deflector had been moved after lining up camera) but analyser looked OK.
Ions (few) seen when desorbing in 2 categories,
a) sharp line, seen x 2.
b) splurge, seen more often.
? suspect connection between pulse input & mantle,
→ erratic pulsing, too fast for retarder. check connections.

In ppm, film taken de evaporating W @ 293° K.
Film was tail-end of that used Monday.
EAM 1, 293, ~ $5 10^{-9}$ Tg.

From memory, $3 10^{-5}$ He 1 / ½ / 5 } secs

DC evap^n, rings, ½ sec exposures, 3 or 4.
DC wound up till picture seen, shutter opened.
2 pics show blurred rings, bright cross structure.
Some stray streaks on pics, only seen when tip evapty to give brite screen. ? f-e of g-boundary or other edge on tip, or discharge from edges of c-plate.

Conclude rings real, seen, somewhat fuzzy, at room T, central ring more oval O not Φ.
4 star lines are apparently brighter under d-c evaporation conditions, @ 78 & 273.
Should now try evapting @ < 20° K.

Th Mag 2 W EAM 2 78 - $1\,10^{-6}$

		screen / blank	
$4\,10^{-5}$ He	250	1KV 5 sec.	1500 cp
" 2300	"	x	
~ 2400	260	5	
		x	2 lines seen !!
		x	
2500	270	7	
		x	?
		x	
2570	280	7	
		x	?
		x	
2670	290	x no pulse	
		5	
		x	
		x	
2670	285	5	→ energy calibs.
2770	305	5	
		x	
		x	

Incr. pulse to 1500 stellions.

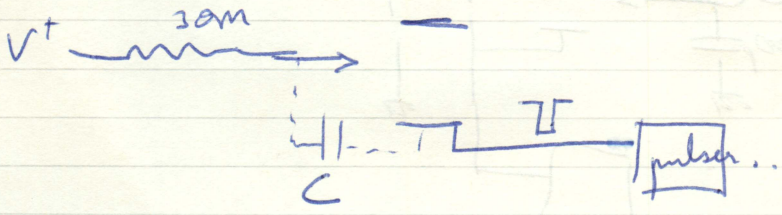
		x	
		x	
2890	320	5	

flash.

Calculate effect of Mantle-tip capacitance.

Say 100 pF worst case.

1 30MΩ limiting ext resistor.



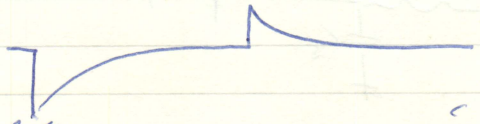
$$CR = 10^{-10} \times 3\,10^{7} = 3\,10^{-3}\ mS_{ec}.$$

Trying to apply @ a 10mS pulse with $\tau_{rise} \simeq 10\,\mu S$

effect will be V_{tip}

$V_t - V_{mantle} =$ 

$V_m =$ 

$V_t =$ 

∴ Must stabilize tip voltage, or use a 'pulse' much longer than CR.

If CR = 1 μS, (i.e less than τ_r of V_m)

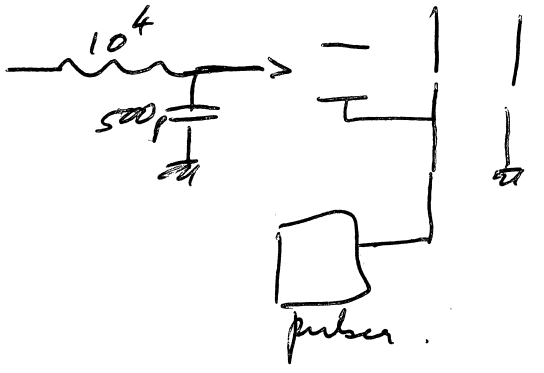
$$R = \frac{10^{-6}}{10^{-10}} = 10^{4}\ \Omega.$$

May 3

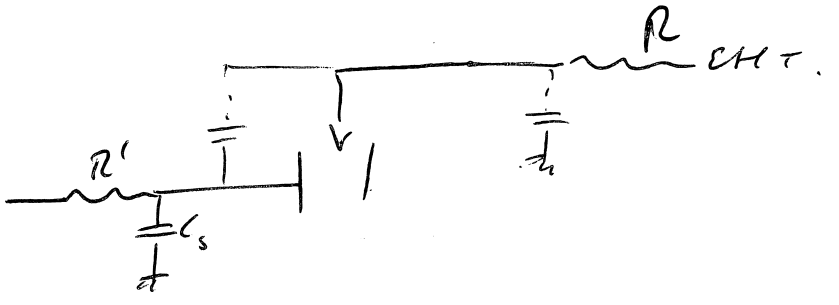
W TB He.

295 -> 2700 v on analyser,
perfectly focussed on beam.
Tip flashed on pulsing, now left.

CRT system



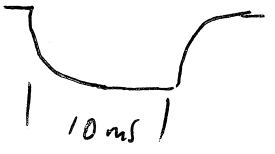
2. Do optimum.
Add R to pulser line



If $C_s = 100pF$, $R' = 10^{10} \times 10^{-4}$ sec ohms

$= 10^6 \Omega$.

So pulse now



– If mantle is efficient, putting EHT res in series should limit tip destruction.

If $R' = 10^{7}\Omega$, & $R = 10^{4}$,

worst case is $\frac{1}{1000}$ of pulse = 1.5v getting to tip.

τ_r is $10^{7} \times 10^{-10} = 10^{-3}$ sec, acceptable.

∴ Remove 500pF cap, add large R' to E pulse line

SAM I Al 7B recrystallized 111 oriented.

Turned up in H_2. bkgnd ≃ 5 10^{-9}.
V unstable pic, etching rapidly.

Then pumped out image gas, used P5 F's f 1.8 lense, + ext tube II to photo desorpn image (previous work using ×4 macro)
V. Bright, for long time – ∴ Al is good for evaps!

Series of pics @ ½, 1 sec, ¼, secs, lens wide open.

Tetrangular ⅄, lots of spots, in 100 region lot of dark patches moving slowly across image (not sure if to centre or away, I think to centre).
Got ≃ 10 pics between 5 & 10 KV, where tip flashed.

May 6 Mon   Mo 78° EAM2   10 ms pulser.
25 MΩ filted in pulser lead. Tip res = 10^4.

$4 10^{-5}$ Hc	237	2230	5 sec.	1 kv.
			x	
			x	
"	245	2280	5	
			x	
"	250	2320	5	
			x	
"	255	2360	5	
			x	
"	265	2460	5	
			x	
"	275	2530		
"			} x	
"			} 5	
—			x	
	285	2610	5	
$2 10^{5}$	300	2720	5	1500
—			x	
—			x	
—	315	2850	x	
—			x	
			blank	— pulser found to be disconnected
			blank	
$2 10^{5}$	325	2930	10	
"			x	
"			x	
"	335	3020	5	
			x	
			x	
"	345	3110	?5	
—			x	
—			x	
—	360	3250	x	many ions
		New film.		
"	"	"	x	
			x	
$2 10^{-5}$	"	"	5 (10?)	
"	375	3320	— x	
=			x	

—	390	3530	x	
			x } 23.	nowt seen!

Considerable no of blanks.

Pulser not working from sync contacts of Canon. OK on pentax

$4\,10^{-5}$	360	3250	5	
"	375	3380	5	
		4	x ← x?	
	390	3510	'x'	using 2½ sec, + pentax for pulser.
	"	"	x	
$2\,10^{-5}$	"	"	5	
—	405	3630	x	
~~$4\,10^{-5}$~~ —	"	"	x	
$2\,10^{-5}$	"	"	5	
—	420	3750	x	
—			x	
—	435	3870	x	Molto yonk!
~~[illegible]~~			x	
$2\,10^{-5}$	"	"	5	Still there.
—	450	3990	x	
—			x	
—	465	4110	x	"
—	"	"	x	
$2\,10^{-5}$	"	"	5	
	"	"	x	with image goes there

New film. — new region of tip (dark bit [illegible]

$4\,10^{-5}$	415	3700	~~15~~ 15	
			10	
			x + 5.	
"	420	3750	x	
"	435	3870.	x	(* xs, not photod.
	"	"	10	
—	450		x	not much.
—			x	~
—	465	4110	x	"
			x	
—	480	4230	x	"
			x	
"	ba	a		New film: old one sticking.
"	"	a	x	
"	" 2	.	x	
		4350	x	?
			x	
	15		x	

495	4450	x	1 blank
510	4580	x	
		x	
		x	
		x	

1 blank.

525	4700	x
	4720	x
540	4750	x
		x
		? x

1 blank.

560	4920	x
	4960	

All peaks were (analyser) slightly o-of forms, but show Mo conds @ or near same energy as He.
? 1 or 2 lines, can't tell: of forms.

SAM 1

Rec AL $3 10^{-9}$ Pa $3 10^{-5}$ Ar 2-g. f 1.8 pentode II tube
78°.

$3 10^{-5}$ Ar ½ sec
1 sec.
1 sec.
$1 10^{-8}$ residual 1 sec

getting brighter
desorption image

3 × ½.
3 × 1

etc.

Beam. pins.

Trans 7 EAM2 W 78 He $9\,10^{-7}$.

$4\,10^{-5}$ He	350	3200	5	1·5KV pulses
"			x no pulse.	10 ms
"			x pulse.	
"	360	3250	5	
—			x Else as avoided	
—			x	
$1\,10^{-5}$	370	3350	5	
—		"	x Many lost.	on scale.
		"	x	
$1\,10^{-5}$	365	"	5	
"	380	3450	5	
-			x noisy.	
—			x "	
"	390	3530	5	
			x	
			x — x from pentax.	noisy. (?)
	400	3630	x	
			x	"
	410	3720	x	
			x	"

2 blank x's during pulser ! OK

$1\,10^{-5}$	420	3800	5	
—	"	"	x	
	430	3900	x	
-	440		x	
-	450	3980	5 x x	
"	450	"	5	Scale.
	445	"	5	
—	460	4060	5 x x	
$1\,10^{-5}$	460	4060 "	5 5	
"	455		5	
	460	4010	x — ?	was wrong somewhere..

1 blank.

N uptake

—	4140	460	5× X	← flash.
$1\,10^{-5}$	4140	460	5	OK.
—	"	"	×	
—	4220	470	×	mix
—	4300	480	×	some cons } stew.
—			×	—
—	4400	490	5×	cons.
$1\,10^{-5}$	"	"	5	
"	"	485	5	
—	"	490	×	
—	4500	500	5× ×	cons.
—	4600	510	5× ×	"
$1\,10^{-5}$	"	"	5	] Σ-C
"	"	"	1	
"	"	500	5	
—	4700	525	4×	cons — broad?
$1\,10^{-5}$	"	"	5	— o-of forms. ? Why.

last equipotential shorted out.

Fri 10 May Mo 78 CH4 + He. $1 10^{-6}$ Bkgnd.

	anodegrm	Fip		pulse ht.	
$4 10^{-5}$ He	3300	367	1 sec	—	cp 1500.
			1 sec.		
"	"		~~40~~		
"	"	364	20	1KV	
"	"	"	x		
"	"	370	10		
"	"		x		
"	3400	380	10		
"	"		x		
"	3500	390	~~10~~ 3		
"	"		x		
"	"		x		
"	3600	400	5		
"	"		x		
"			x		
"	3670	410	5		
"		~~21~~	x no pulse		
"			x		
"			x		
"	~~3770~~ 3720	420	3		] calibn
"	"		x		
"	"	410	3		
—	3850	430	x	Ions	
—			x		← no gas between pulses
—	3950	440	x	Ions	
—	"		x		
$4 10^{-5}$	"	440	1		
"	"		5		] 4
"	"	430	5		
—	"	~~440~~	x		
—	4190	455	x		← +15
"	"		x		
"	"		x no pulse		
$4 10^{-5}$	"	1	3		
"	"	~~480~~	5		
"	"	455	x		
—	4230	470	x		
—	"	"	x		
$4 10^{-5}$	"	"	3		
"	"	465	3		

4470 440 × bit of a flash + many lines, ? >2 peaks.

2×10^{-5} 4600 510 × Now seen.

– gas in, O2 OK still – ? oxidised after last pulse?

$$\frac{\cdot 3 \cdot 9}{10.22 - 4.0} \times 300 = \frac{\cdot 39}{6 \cdot 2} \times 300 =$$

$\frac{11.7}{6.2} \div 19$ volts between He & Mo peaks

3 4490 $\frac{3 \times 4490}{3 \times 3460} \times 20 \simeq 18$ ✓.

19 3460 1.3 11

Sat 11 May Te 78° 2×10^{-8} Bkgnd t-g

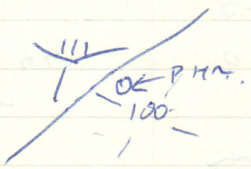
3×10^{-5} Ne ½ closing away slowly.
" | 1 × 111 / 20 secs or more.
" |
" ½
— ½ all pumps on.

T is flushed on trying to D-C evaporate in vain.

film
B Labelled Wednesday 12

Wed 14 May W 78 EAM 2 $2\,10^{-7}$ (1.)
with Sub pump.

Grain Ledary

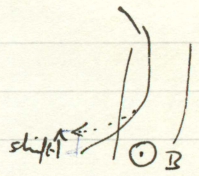


$3\,10^{-5}$ Ne $1\,10^{-5}$ He	1 sec	280	2600	0 pulses
— "	1 sec	"	—	0
"	5 "	"	"	1500
"	5 "	272	"	
"	5 "	285	"	
"	X	295	2700	
$2\,10^{-6}$	X	"	—	
"	X	305	2800	
"	X	315	2900	
—	X	325	3000	
—	X	335	3010	
	2 Blanks			
$4\,10^{-5}$	D = 1/2	410	3700	
—	1		"	
—	X	420	"	
—	"	430	3800	flush
—	X		"	
				Zip OK.
		4	~~3400~~	
—	X	~~P~~ 40	4000	
—	X	450	4100	some vars
	X	"	"	
—	X	460	4200	lots " .
—	X	"	"	
—	X	"	"	
—	X	"	"	
—	X	"	"	
$2\,10^{-5}$ He	1	"	"	
"	1	470	"	
—	X	"	"	
—	X	"	"	
—	X	"	"	
—	X	"	"	
—	X	480	4300	
—	X	"		
—	X	"		
—	X	"		

2×10^{-5} He	1	480	4300
"	1	470	
"	1	440	4400
—	x	"	"
	Neufchâtel		
—	x	"	"
—	x	"	"
—	x	"	"
—	x	flash	4500
—	x	-	"

end of lip.

12/2/75 460 460 − 470 = 300 volts = 44.4 mm.



W@ 1.87 mm higher energy than helium.

Allow .5 mm ($\frac{.2}{1.2}$ real mm) for mag defln of He, by ~~field of .06 – .08 gauss~~ as recently measured,

So Wuphill $1.37 \times \frac{300}{44.4} \simeq 9.4$ v.

or edefiit$_W \simeq 20 - 9.4 = 10.6$ volts,

This was before readi
of microscope, so 3 = .15
not .06 – .08.

$\frac{.12 \times 2.5 \text{ real mm}}{1.2}$

= .25 mm.

Thur 14 Mo 78 $2\,10^{-7}$ Mc.

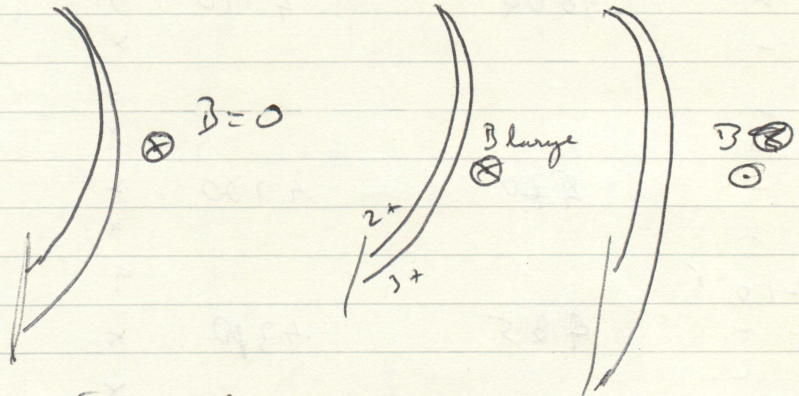
$4\,10^{-5}$ Mc	380	3430	1 sec	0
"	370	"	"	
"	375	"	"	
"	380	"	"	
"	390	3530	1	1500
—	390		x	
—	400	3600	x	
$2\,10^{-5}$	—		x	
—	410	3700	x	
—	—	—	—	reorientiert
"	420	3800	x	
"	"	"	x	
"	"	"	10	
—	430	~~3900~~ 3870	x	
—	"		x	
—	440	3970	x	Ton
—	"	"	x	
—	"	"	x	
—	"	"	x/	
—	"	"	1	
—	450	4040	x	
—	"	"	x	Hust
—	"	"	x	"
—	"	"	x	Ton
$2\,10^{-5}$	"	"	10	
"	460	4140	5	
—			x	
—			x	
—			x	
—	470	4200	x	
—			x	
$2\,10^{-5}$			9	
—	485	4300	x	
—			x	
"	Einschläfen			
$2\,10^{-5}$	530	4300	10	
"	530		10	
$2\,10^{-5}$	485	4310	10	
"	480	"	10	
	500	4410	x	Hust
	"		(x	Hus) ?
	"		x	"
	"		x	"

—	515	4520	x
—		"	x
$2\cdot10^{-5}$		"	~10
"	505	"	~10 .
"	515	"	x
—	510	4680	x
—	"	"	x
—	525	4820	x
—	"	"	x
$2\cdot10^{-5}$	"	"	505
"	535	"	5
—	565	4999	x flash
"	"	"	x
—	"	"	x
—	585	"	dc (turning pulser HT off)
—	"	"	dc ~5 sec exposures.
$2\cdot10^{-5}$	"	"	5
"	555	"	5

Definitely 2 well-resolved lines in spectrum. ? 2+, 3+. Check with magnetic field,

$t \simeq \frac{1}{B_{\perp}\text{-tesla}}$ m $\simeq 10^{3}$ m @ 1 gauss.

for 2+ $\simeq$ 1 mm deflection over 1 m, $\frac{1}{2}$ for 3+.



? Check any deviation of He reference line by strong fields

Fri 17th May   Gold $5 \cdot 10^{-10}$ CAMI   78°.

Ar $3 \cdot 10^{-5}$.

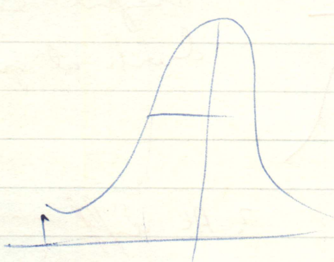
Tail end of film starting with Fe/Ne.

✓	165	1 sec	after ≃ 20 min at [illegible] field.
"	170	1 sec	[illegible] a little
"	c ~~1770~~ 182	1 sec	" " [illegible].
—	~~[illegible]~~ 182	1	no gun
—	~~[illegible]~~ 18210		"

No of [illegible] desorbing metal.

Looks v. like CWM's Pt.

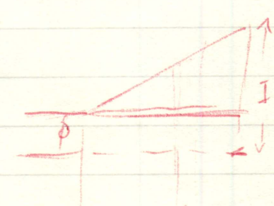
Sub-pump dirty, I think — or v crummy filament.



61 = 300 v.

$4 = \frac{4}{61} \times \overset{5}{\cancel{300}} = 20$ volts.

24 - 4 ≃ 20.

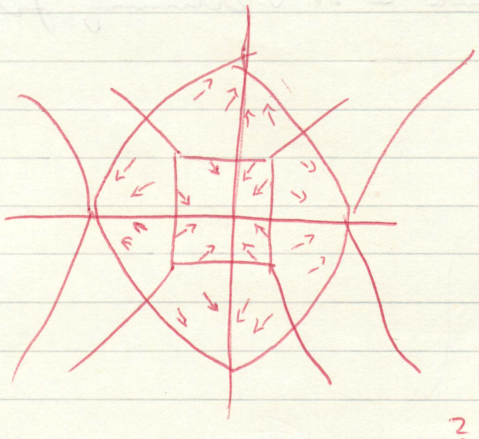


Mon 20 May. Fe tip CAM2 78 Ne.

— find V unstable at 110^{-8} with inner dewar only cold
— outer dewar cold $p \to 5 10^{-10}$, stable pic.
? g-boundary. tip popped when trying to evaporate in Ne.
— moral, put wire in 300 to see what do grain size etc.

Put in Ni — recrystallized @ ~ 900° for 1¾ hrs at 10^{-5} in evaporator, polished in glycerol/15% HCl, ac,
Tried polishing Ta in HF/HNO_3/H_2SO_4 etc — nbg ∴ don't seem to polish at all when cold, etches hot-. ? microstructure again ?

? Explⁿ of Au & Pt pics :—



bright lines on overlap, dark at glint-point.

? Al diff ∴ not transition metal, so long-range interaction, & hence 'binding' of crystal ions different.

Tues Ni 78 $5 10^{-9}$

$3 10^{-5}$ Ne

½
1
½ } ≃ 3kV. corroded crystal in middle.

½ rapid evacn with gas. 10 up to 20kV

½ Nogas.

Some puffs later evacting, but HT breaking down, so several puffs overlapped probably with HT → 0 in between. Hex sym lines to see if it extend. Cruddy area around middle, ? hydrogen etch to develop good end ? (PTE).

Put another Ni: Sn.

Wed Tip blunt.

Thurs 23 May Ni 78 EAM1 same film as 64.

2 blanks. background ~ 5 – 8 10^{-9}

½
1 } No $3 10^{-5}$ & 3kV after evacting in $3 10^{-5}$ H2 to clean up surface.
1 Slowly evacting.

Ended @ ≃ 20kV.

Good pictures; III ovaried, very strange patterns around a central shield shape with radial bright lines like gourd.

Should try this again in good HHV.

Thurs & Fri attempting to polish Vanadium tip.
First tried ac polish in NaOH etc.
Gave an apparent tip, but didn't image properly: in Phillips 301 could see many dislocations in shank, through tip sharp:.

Found that could get a good polish in conc HCl, DC: form a neck at ≃ 5 v, then polish through at ≃ 3 v. Soln goes blue when tip do polishing, tip covered in brown? oxide when etching to form neck, at most times.
Tips generally spotty, few poles, regions taken, decomp images comming.

Tried a Hafnium tip, polished in HCl, looked to be etched or something, multiple overlapped images. ? recrystallize.

Mon 26
Checked magnetic fields around OMN 2;

↓ .25 gauss
→ .15 gauss Reduced to
→ .06 - .08 g after recentering the nin.

Quench cation radials that do not enough to account for splitting of Mo^{2+} & Mo^{3+}, & gross deflection of Ho^+. Ho^+ probably shifted by 1 - 2 volts @ 10 KV, so will try to reduce field by rotating mirrorsyse.

Tues 27 May V 78 EAM 1 $3 10^{-7}$ T

$3 10^{-5}$ Ne.

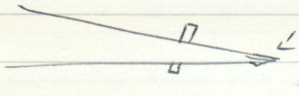
1 sec.
½
1 after evaporating a little.
½

$3 10^{-5}$ H_2
1 same surface.
½
½ after evap
1 $3 10^{-5}$ Ne same surf.
½

Slipped on something during evap.
Series of pins taken during slow evap.
Volts reduced, sort of island in middle.
Some rings  seen top right.

Took a number of pins after bright break to try & reduce to level. Was fairly stable at end with a number of poles visible. Went away eventually.

Put 2 V tips in phillips:
1 was bluntish, ≈ 15 KV in Ne
Other was sharper but had odd apparent crystallite stuck through it. — ~~Tip~~ Took 2 plates.

 slightly grotty end.

Thurs 30th (?) W CAM 78 4 10^{-9}

$3 10^{-5}$ He $\frac{1}{2}$ BIV.

— $\frac{1}{2}$ } Background
1

$3 10^{-5}$ ± reformed.

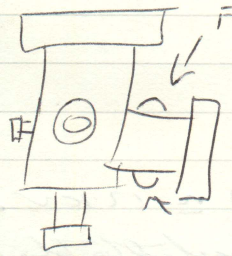
Some des. pics, but couldn't get rate high + looked as if some residual gas was imaging the surface — ? attack by residual H_2 or H_2O or what ? top flushed.

Fri 31 May   W EAM 2 78 He

Flushed.

New tips in, baked 24 hrs.

VG min returned from VG, modded:-



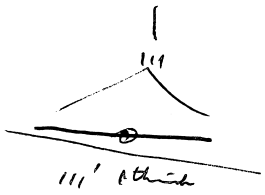
June 3rd Monday.

Continuing putting VG mix together.

Win EAM1 $3\,10^{-10}$ cold (t-gauge, gauges)

? leaky valve.

Tip had grain boundary



Boundary imaged in diffraction @ ≈ 12 kV as a dark line. Vaporised later ∴ expected to blow up rapidly.

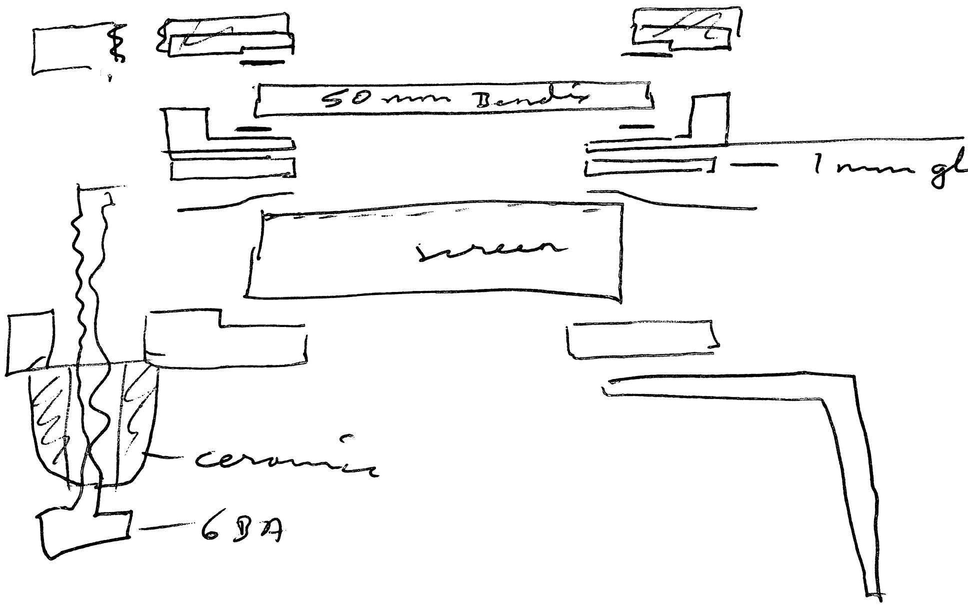
Could see collapsing rings quite brightly imaged as tip emptied slowly – ∴ effectively imaged 1 thick → characteristic pattern as rate increased drastically.

Would be v. interesting to integrated slowly evaporating rings & see if same pic as many rings emptied fast.

c-plate for VG mix remachined ∴ grotty around edges + 1 or 2 burrs across from old mounting.

Tues 4. V G mic baked with blanks on into diff pump, starting @ 2 10^-7 cold.

Converter for mic put together using new Levy-West phosphor (ultra fast).



[FT] borrowed from AJW, new one ordered.

Tried a Pd tip, ... some poles in between flashes — ? try annealing first. Not stable in Ne @ 2×10^-8, 78°

Thurs 5 W EAM 178 $4\,10^{-5}$ He $6\,10^{-10}$ Eg.

@ ≃ 7kV. [illegible]

$4\,10^{-5}$ He $\frac{1}{2}$

1

— ~ 3 × ½ sec desorption pairs.

$4\,10^{-5}$ $\frac{1}{2}$ } new surface, no void @ bottom.

1

~ 2, 3 × ½ desorption pairs

$3\,10^{-5}$ $\frac{1}{2}$

1

end of film.

Fri 6 Fe $4 \cdot 10^{-7}$

$3 \cdot 10^{-5}$ Ne ≃ 4 KV.

½
1
5

— ≃ ½ ± 1 ½ ½ f desorption looked like some retained blank gradi.

½, 1 $3 \cdot 10^{-5}$ Ne. ~ 4 KV stable.

1 Stable, $\sim 10^{-8}$ Ne
½ slow } evap=.
½ faster }

— 1
½ eruption
½ "
bit of a pop.
1 $3 \cdot 10^{-5}$ Ne below DIV as pumped
1
1 ~ DIV after slight eruption.

— 1 slow eruption in same ~ 'wriggly' sort of picture.
1 "
5 "

½ $3 \cdot 10^{-5}$ NE
1
let in ≃ $1 \cdot 10^{-6}$ H₂.
Ethl a bit
10 sec H₂ image
1 Ne image (H₂ out)
½ "
erupt a bit ½ Ne image

— ½ rapid evap=
½ "
1 "
1 slow evap= end of film. Imp OK @ ≃ 7 KV.
$3 \cdot 10^{-9}$ @ end of run.

Same tip $50°$ $3\,10^{-7}$.

1 Ne $3\,10^{-5}$

1 "

½ "

— ½ rapid evapn

— 1

— ½ more rapid

bit of a pop.

$2.5\,10^{-5}$ Ne 1 below D.V

1 " , higher V

1 after evapn. 10 KV.

100 & 110 (central ring) were bright after pop, as if

built up. 100 evaporated a lot to regain normal position.

½
1 } evapting slowly – wiggling?
10

1 v rapid

½ "

½ "

$3\,10^{-5}$ Ne No. of pulses ~ 3, 1 sec, odd-looking endform

? didn't see 1st pop.

1 sec evapting rapidly in Ne.

1 blank

1 sec evapting V rapidly in $3\,10^{-5}$ Ne.

$1\,10^{-6}$ Ne 1 sec (tigauge on) @ evapn voltage, just.

" 1 sec " off

"

" 1 sec rapid evapn.

1 sec "

1 sec v "

slight pop.

12 KV

2 × 1 sec + 1 10^{-6} Ar, 3 10^{-5} Ne below IV twinkling Ar

helipot
220 } 3 10^{-5} Ar None. 1 sec
260 } 1 sec

1 10^{-7} Ar 2 × ½ sec everything fast.

flashed @ ≃ 15 kv.

Mon June 9 [10]   W 78 10^{-7} Cass II

$3\ 10^{-5}$ He. 1KV c-p, 4KV screen, fast phosphor.

1

5

½

except a little, reform.

¼

1

5

1200 cp

½

1

5

Number of desorption peaks, but faint. to see exponent.

Tip flashed at 20KV.

Took He up to 30 KV burning off crud on insulators, etc.

same film

Tues J 11   U CAM 1 78   8 10^{-7} .

~ Blank

1   3 10^{-5} Hr

½   –

3   –

Some 1 & ½ sec desorp. pulses.

gas in → 2 g-boundaries.

½

1

1   after few 10's   ∴ nice general near bottom g-b.

1   –

1 desorp = ½ pin.

flashed.

bottom g-boundary bright-line / dark line. Focussing effects at deformed edge of tip, etc.

Background 6 10^{-9}.

Tried a rhenium tip, polished ala Cruin & Melmed, necked thin layer KNO_3, polished through in CrO_3/H_3PO_4. ≃ 12KV, & bloody awkward to polish that sharp.

Find that Re apparently polishes well in Perchloric (acetic for necking down with Lacomit) (2 butoxyethanol for polishing through)

at 20v, DC, 20° just like iron.

Wed 12 Re +8 CAM1 3×10^{-5} Hc

~ 4 or five puffs, 1 attempt - 45 secs flushed.

2nd Ep; v quality @ 15 Kv.
'Portable Helix' on comm.

Thurs 13 Re 78 CAM 1 $3 \cdot 10^{-5}$ He Desorbed $9 \cdot 10^{-9}$.

$\frac{1}{2}$ } ~ 10 kV DIV.
1 }
1

Desorption pics 11 $\frac{1}{2}$ 1 third, slower, then faster

$\frac{1}{2}$ }
1
Well developed picture
1 }
$\frac{1}{2}$

Few pics everything a few central planes.
1 × 5 sec pic at reduced C-P gain.

Desorption pics,

{ $\frac{1}{2}$
1 } In He
5 reduced gain

Re

1
1 } in He looking at evaporation of central $1\bar{1}20$ or $1\bar{1}00$
$\frac{1}{1000}$ for retention of B plane

1 } after evaporated at solid N_2 T.
$\frac{1}{2}$

Fri Ca CAM1 3×10^{-9}

Tried to image Ne first, but
~~xx~~ cropping before imaging.

Tried to take 2 x 1 sec design pics
Image in Hx, gradly, ~~1 plane~~
losing 1 plane / 5 secs @ 21V.
Took 3 or 4 pics at same forus as
for design pics, then refocussed.
Few more pics at various volts, times.

~ 2 design pics ~~at~~, no Hx, 1 sec.
Tip flashed.
Few pics of remaining Hx.
Looks like mic is not reaching 78° by quite a long way.

Fri June 14.

EAM 2. W 78 He.

						rel-
$2\,10^{-5}$ He	330	3000	1 sec	1500	5kv	0.
		3100	"			
		3050	"			
	340	3110	x			1500
	350	3200	x			
	360	3270	x			
	370	3370	x			
	380	3450	x			
	390	3530				

No He left. Change bottle

→ Mo EAM 1 78 $2\,10^{-8}$ changed.

$3\,10^{-5}$ He

1
½ } BW 5kV
1

Desorpn 11 ± ½ ½ 1 time.

$1\,10^{-5}$ He	½	below BIV
	1	
	1	BIV
	½	
$1\,10^{-7}$	1	"
"	1	everything tool.
"	1	"
$3\,10^{-8}$	1	BIV
	1	"

No. of 1, ½, & ¼ sec puls trying to catch linear retained groups on the {211} planes.

323 = evapn volts in He. $1\,10^{-5}$

Few pulses in $1\,10^{-5}$ Ne + 10^{-5} He. @ 78.

Neufeld

Various puls, ½, 1 sec @ BIV in 10^{-5} He at 50°K.

Tip flashed when tried to desorb it.

Mon
Tues

Wed Pd polish in perchloric/acetic with lacomit to neck down, 10 v DC,
drop end off @ 10 v dc in 2% perchloric butoxyeth

Number of tips put through eds autochanger. Gives reasonable pic in Ne @ 78, but not very stable, big black holes, esp in background. Best pics < 50° probably.

Took some desorption pics on Eds machine.

EAM 1 78 Pd 1 10^{-8} Ne

~ 3 1 sec pics evapting slowly.
~ 3 desorption pics in vacuo.

Surface had been exposed to Ar, but evaporates > above Ar BVV : Ar pic is grey with a few holes over major poles. Not pretty.
Tip flashed.

Polish zirconium in 2% perchloric methanol, cold, No good tips yet.

Attempting to get more spectra from EAM$_2$ but is playing up — fuming from pinhole — ? poor He bottle — replace (again, empty on monday).

Thurs Autothumper.

Few puffs W, 78, He.
Tried to desorb but flushed.
1 blank.
Nb, Ne, 78
Few puffs, 1 sec, ½ sec, (stable).
Tried to desorb — flushed.
[Nb polished in cold perchloric methanol (as I think),

These experiments v exactly.
(Retarder ≠ deflector)

Fri 21st CAM 2 Mo 78 He.

$3\,10^{-5}$ He.

Temp	month	analyser			
230	+ 0 +	2330	$3\,10^{-5}$	1 sec	cp 1500 even 5KV.
〃		2390	〃	〃	
〃		2430	〃	〃	
? 230	1KV	2200	〃	〃	dunno why only need 2200 v. now. ? was 230 initially 240 before.
230	0	2200	〃	〃	
4 blanks.					
262	1KV	2420	〃	〃	
				×	
270	〃	2530	$2\,10^{-6}$	10	
			〃	×	
280	〃	2630	〃	×	
290	〃	2730	〃	×	
300	〃	2830	〃	×	
315	〃	2950	〃	×	noise
〃	〃	〃	〃	〃	〃
〃	〃	〃	〃	〃	change ida slightly Tip has g-s blunt
325	〃	3000	〃	〃	
335	1500	3100	〃	〃	
345	〃	3200	〃	×	
〃	〃	〃	〃	s	
355	〃	3300	〃	×	noise
〃	〃	〃	〃	×	〃
〃	〃	〃	〃	s	

(See 10 May for calibn

Magnetic field ≃ 1 gauss

$Bev = \frac{mv^2}{r}$ $\qquad \frac{1}{2}mv^2 = neE_0$

$v = \sqrt{\frac{2neE_0}{m}}$

$\frac{1500 \times 1.6\,10^{-19}}{3\,10^{-28}}$

$r = \frac{mv}{neB} = \frac{m}{neB}\sqrt{\frac{2neE_0}{m}}$

$= \frac{1}{B}\sqrt{\frac{2E_0 m}{ne}} = \frac{1}{B}\sqrt{\frac{2\,10^4 \quad 10^{-27}}{1\;1.6\,10^{-19}}}$ ← ? check

$\frac{1}{B}$.

$\triangleq \frac{1}{B}\sqrt{10^{-4}} \simeq \frac{10^{-2}}{B_{Tesla}} \simeq \frac{100}{B_{gauss}}$ m.

If $B = .1$, $r = 1000$ m.

365	1500	3360	x	weak,
			x	
			5	
"	"	" end of film.	x	"
"	"	"	5	
375	"	3460	x	
			x	very bright-line.
			~~5~~	
			~~5~~	
385		3560	x	weak.
395		3660	x	"
405		3710	x	"
415		3810	x	"
425		3910	x	"

Check tip - maximum kV = 12 kV,
[illegible]

Fe Symposium 25 July – 5th.

Looked @ Ni$_3$Al (RST's single xtal)
Polish like Fe in perchloric-butoxyethanol.
Nice image in Ni in Cds anisotropy,
Design pits more or less random. Tap in 12 kV, add
Film decomposed: left in wash for long time, Thermowave.

or, alt, $3e(V-22) = e(3V-66)$

$= e(2V - 2l_1 + V - (66-22))$

If $66-22 = 20.7$,

$l_1 = 23$.

Which is not consistently possible.

So, whichever way, if we have a 2^+ ion resonating to 3^+ without losing KE, then the 3rd I.P must be v. large.
or, ion must have initial KE during the ionisation process.

From Wed 14 may (film labelled Wed May 12)

@ 460, 4200 ~~Defect~~ ν_0 uphill 2 mm.

@ 3300 analyser 47mm = 180v.

∴ @ 4200 47mm = $180 \times \frac{4200}{3300} = 180 \times \frac{14}{11}$

$= 180 \times 1.27$

1mm = 4.85v.

∴ 2mm = 9.9v.

∴ Defect ~ $24.5 - 4.5 + \overset{\text{mar field}}{2} - 9.9$

~ $22 - 10$ ~ 12 eV.

Checking dispersion, 470 − 460 = 57 mm.

10 = 300v = 57mm

or 1mm = 5.25 eV.

So 2m = 10.5 eV

So def = 11.4eV

	Λ	ϕ	I_1	I_1+I_2	$\sum_1^3 I_n$	I_1	I_2	I_3
M_o	6.97	4.20	7.10	23.25	50.38	7.1	16.15	27.13
W	8.80	4.52	7.98	25.7	50.	7.98	17.7	24.3

Suppose for M_o, M_o^+ ν_0 ionised @ $x_c \to M_o^{++}$ ionised at $x_c' \to M_o^{3+}$

Energy ν_0 $e(V_c - l_1) + e(V_c - 12.85)$ $+ e(V_c - 22.9)$

$\to 2e(V - 6.43)$ $l_1 = 0$ $3e(V - 11.91)$

(25.75)

FE Symposium 2 July – 5th.

Looked @ the Ni_3Al (RJT's single xtal).
Polish like FE in 2% perchloric butoxyethanol.
Ni seen imaging in Ne in CCDs and orthangles,
Designs pins more or less random. Tag in UHV, old
Film decomposed ∴ left in wash for long time, Unnecessary.

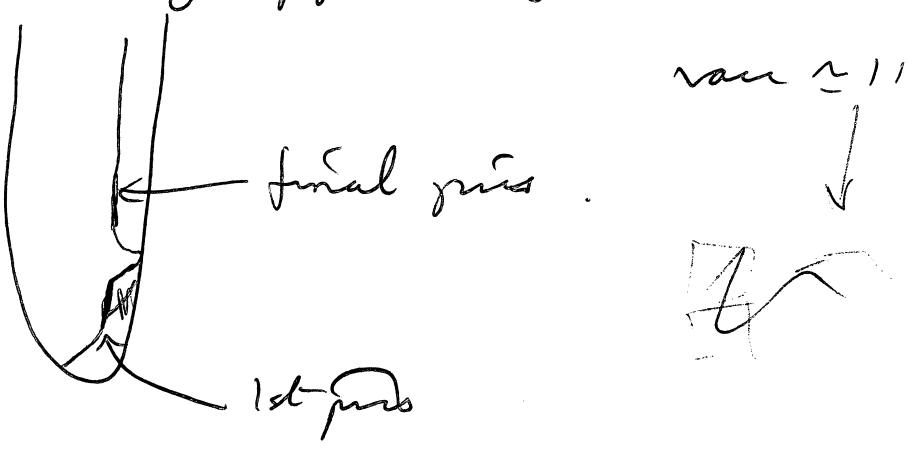
July 25 Can polish tin in KCN, aq, (aq)
& Zn 15 dr
not quite so well.

– ? getting desorption image of tin at 78,
– not the image ∴ independent of the pressure.
Rings & things like K rarity; gold etc.

Rhodium, tried to polish in molten KOH
+ NaCl as recommended by [?] –
will corrode if some $NaNO_3$ present, not
otherwise. Not good polish. Will dissolve
slowly in KCN, aq, ac but also v slow.
Not good tips.

July 29 W 78 Eds Auto He.

Grain boundary apparently like



Series of alternate He & desorption pics ending at ~ 18 KV.

Boundary static during desorpn, clearly seen in des picture.

Same film.

Rhodium in Ne, 78.

Polished in conc H_2SO_4 + CrO_3, ac, room T, ~ 10 – 20 v.

Imaged in Phillips, ~ 300 Å end. e-micrographs taken.

Nice pic in Ne. 111 centred.

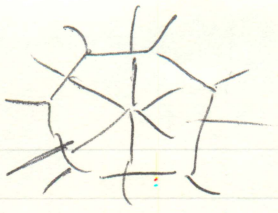
Desorbed, 1 sec pics, looks like Au.

New film.

Same tip. ~ 1, ½ 1 & 3 sec exposures in Ne. Nice image.

Then series of ½ & 1 sec exposure desorbing in vacuo

Flashed eventually.



Ir tip in CAM 2, no good.

Re polishing of Rhodium — tried various brews, such as KOH/Wall (painting)
KCN (CWM)
$NaNO_2$ (BSR)
but not one of these seems a) to give a good polish
b) to be reasonably fast-
$aqCrO_3$, ace, 20v polishes, but v slowly.

CrO_3 + conc H_2SO_4 + 20 → 10v ac- seems to backpolish Rh a little v well.

Is said to dissolve in hot conc H_2SO_4 or conc HCl + $NaClO_3$ hot-.

Ir doesn't polish well in brew.
Nor does Ta. ? have to dissolve oxide for Ta, DE.

Same film desorps images of Ir.

End of film Cu.

Cu polished in chemical polish, Turpal,
3 HNO_3
Acetic
+

Newfilm ~~Vanadium~~ Zirconium chemical polish,
vol 8 HF
45 HNO_3 slow.
45 Glycerol
No good desorps pics — ? state of surface.

Trans Aug 6. Re 78 CAM 2 Re.

1120 anneal.

Tip	rotation				
380	0	4×10^{-5} Re	3500	1 sec	CP 1500
		"	3560	"	
		"	3460	"	
		"	3480	"	
"	1500	"	3500	"	
			3560	"	
			3430	"	
"	"	"	3580	10	realigned over dark region
"	"	"	"	1	
"	"	"	"	x	
390		"	3600	x	
400		"	3660	x	
"		"	"	x	
410			3740	x	
420			3820	x	
"			"	x	
430			3900	x	con
"			"	x	
"		gun	3	5	
420		"		5	
440			3990	x	con
"				x	flash
"		4×10^{-5}		1 sec	Tip possibly slightly oxidized
430		"		1 sec	after flash – otherwise OK.
450		—	4070	x	mix
460		—	4150	x	few con
"		"	"	x	"
470			4230	x	
"			"	x	
"			"	1	
"			"	5	
460			"	1	
480			4330	x	few con
"				x	
				5	con
				x	
490		gun	4430	1 sec	
490	Newton			"	
480				"	

500 1500 – 4560 x few cm
x "
570 " 4620 x "
x
flushes.
510 $4 10^{-5}$ He " 1 sec tip 5K
500 1 sec
520 — 4720 x noisy
530 4820 x –
547 4990 x flush
x "
x
" 1 sec
537
"
545 $2 10^{-6}$ He " 10 sec
" $3 10^{-6}$ H_2 10
$2 10^{-5}$ H_2, He 1 sec
flush
425 3800 (+1800) ↓ same. >1
420 5
420 5
420 1
" + $2 10^{-5}$ Ne as well 1
" H_2, Ne only ½
" " 1
5
Ne only 1
5
" Ne, He $2 10^{-5}$ cm 2
" " 1 cp 1300
" " 5
Ne only 1
" 5(
" 5

Residual rate ~ $5 10^{-7}$.

Data analysed, Aug 27.
of Aug 6 Ne

570 ~ 500 eV, within misforms of analyser, possibly shifted
570 − 500 = 53.5 mm. by ~ .6 mm to low energies from He peak,
but v close to it.

agreed, 12/2/75.

so deficit ≃ 20 + 4 + 5 ~ 29 volts.

300 = 53.5 mm
6v = 1 mm
5.4 v .9

3 .6 He

24.5 − 5.06 ≙ 19.4 $\xrightarrow{+5.4}$ 24.8 ± 3

547 − 537 = 51.4 mm. all lines within 1 mm of He peak.

1 mm ≙ $\frac{1}{50}$ × 300 = 6 v.

Thurs Aug 8 Rhodium CAM 2 78 $2 \cdot 10^{-7}$.

He.

		pulse			
230	2200	0	$2 \cdot 10^{-5}$ He	1	cp 1500, screen 6 KV
				x	
	2340			1	
				x	
	2170			1	
				x	
	"	1 KV		1	
"	2200			1	
"	"		"	1	New site
"				x	
			"	x pulse.	
240	2270			x "	
250	2350			x "	
"	"		noyau	x	
260	2430		"	x	
270	2510		"	x	noyau
28	2600		"	x	
"	"		$1 \cdot 10^{-5}$ He	1	
"	"		"	x noyau	
"	"		"	x pulse	
290	2710		—	x "	
300	2800		—	x	
"	"	1800	—	x	
310	2850		—	x	

Analyseur readjusted.

285	2660	1500	$2 \cdot 10^{-5}$	1	
300	2780	—	"	1	
"	"		—	x	
310	2860	—	—	x	coup fin
"	"		$1 \cdot 10^{-5}$	x 1	
"	"		—	x	
320	2940		—	x	coup fin
			—	x	
320	"		$1 \cdot 10^{-5}$	1	
315	"		"	1	
"	"		—	x	
330	3030		—	x	fin coup

ordre fin

445 4020 gm

460 4140 ~ x

~ x

~ x

475 4260 ~ x many lines.

~ x

~ x

gm |

465 ~ |

475 ~ |

~ ~ x pmb

~ ~ x ~

490 4380 ~ x many.

~ x

gm |

~ x

480 . |

505 4500 x

x

520 4640 x

x

510 " gm x

530 4760 " ~

~ x

~ x mpmb

4760 $1/0^{-6}$ |

4860 ' |

4660 ' |

4760 . 1/15

Final vacuum $4\ 10^{-7}$

PM 3
in III region
on line joining
III and 100,
near III centre.

on H field III 111/100

Fri? Data analysed on Rh ions,

2475 film 445 − 435 = 59.0 mm. peaks (edges) of ions ~1.3 mm to high e ± .4 mm.

[illegible] 475 − 465 = 59.9 mm ~ 2.2 ± .4/.2 " "
[illegible] forms

2.0 ± .3

" 520) 520 − 510 56.1

[illegible] 435 − 425 59.3 2.5 ± .5

~ 14 volts, He 23. φ = 4 say → 19 → [illegible] cal. @ eV/A = [illegible] 1½ A.

Re-analysed Feb 13/74.

425 − 435 = 52 mm.

Rh ions are 2.56 mm higher energy than He.

But He deflected ~ .2 mm real (.012) = .2 × 153/50 ≈ .6 mm (.037) on pic to lower energies.

∴ Rh ions actually ~ 2.0 mm higher energy. 2.20

= 2.2 × 300/52 = 300/26 = 11.5 (12.7) v higher energies.

24.5 − 4.8 = 19.7

If He⁺ deficit ≈ 20.5, → Rh deficit ≈ 9 v. 19.7 − 12.7 = 7.

Rh ions found at up to ≈ 20 volts lower than this, but probably due to analyser forms.

Mon 12 Aug   5 films, eds autochanger, ~78°, 6 10^{-8} bkgnd. He.

Working through a heap of tips looking for ~~a good~~ brite dc pix of single xtal W. Not too much luck, but lots of interesting boundaries! One tip was warm, ∴ Ni tube was oversize. Most good pix off big green reel W: re xtallised gave streaks/voids/bounda ← ? One dislocation loop or something, brite spot in middle of almost-normal tip. v. persistent. FE polished the tips, I imaged them.

Exposures usually 1 sec for desorption, f 1.8,

1	f 1.8		for BW He imaging ~ 4 10^{-5} He i.g. reading
1	f 1.8	less gain on cp	
10	f 4	"	

Curious looking W tips, so took some photo
— good tip had popped'

~~Thurs~~ Fri Aug 16 W He 78 Cass 2 { Cannon / Dallmeyer optics
Static vac, ? H_2 or Ar contaminated.

4 sec exps $2\,10^{-5}$ He tg, 1KV ap 4KV screen.

1, 2 BIV
1 small exps
1 "
~ 7 × 1 " } ~ 1.5 planes off.
1 × 3 sec "
1 blank
4 × 1 } 1 plane.
1 × 4
1 × 2, 1 after 1½ more 1 1 0 3
1 2 –
1 blank
2 more planes off, then tip popped to give new orientation

~~single~~ poly xtal

12 KV 1 sec
5 "

~~[illegible] or Ar [illegible]~~.

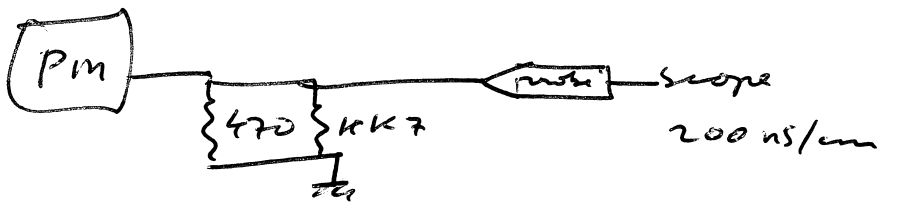
Fewer spots after everything to cleaner surface.

Tried to field desorp, but flashed.

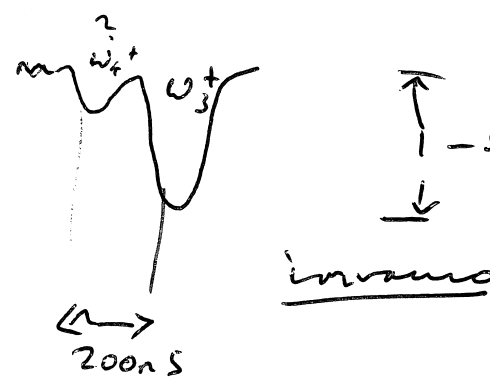
Wed Aug 27   √ G min   5 10^{-9} 78   ω He

c-plate 1100
screen 3900
e-mult 1850
scope 1 v/cm ×10 for probe
YCF 70 phosphor

pulser 2900 up ÷ 2 = 1950 v
7 up ~10 kv.

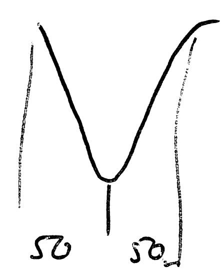


dp ~



τ_r of phosphor/mult combin

~ ≤ 50 nS.



With spread of amps of individ ions, 0 – 2 cm @ .05 ×10 = .5v at mult. ~ 1v @ 1kV c-p, 1870 pm.

but clearly vis.

Photos of scope trace 200 nS/cm, pulsing 10 Hz, superposed pulses.

~ 25 1 sec exposures f 1.8, ext tube 10 Hz pulses

Gain 2v/cm × 10 = 20v/cm. 200nS.

Some pics @ ~ same τc, but ~ 20 μS/cm + image gas looking at arrival recovery if any.
Not v satisfactory so changed τc of mult to ~ 100 μS & some recovery was apparent, ~ ½ mS @ ~ 4 10^{-5} He(?)
— try to measure more exactly, with lower τc.

Pulser ± 2600 v.
Cp 1100
PM 1330 v.

Hg pressures Hc.
$P = 4 \cdot 10^{-5} \frac{T}{4.8 \cdot 10^{-5}}$

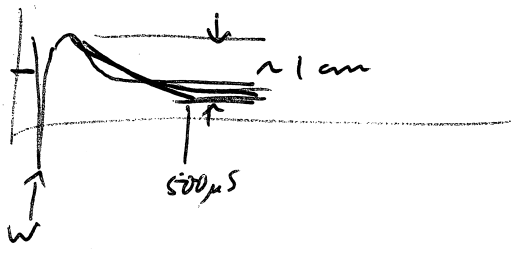
43 kΩ + probe load.

Current mean ≃ 4 × 0.2 v/cm × 10 probe.

∼ time of recovery 100 μs/cm × 5 cm ≃ ½ ms.

∼ 8 pulses like

1 blank.



Reduce pressure. ∼ $1.2 \cdot 10^{-5}$ Torr Hg.

No of pulses @ .1 v/cm, 500 μs/cm.

Recovery ∼ 4–5 μs ∼ 2 – 2.5 ms.

1 blank

$7.8 \cdot 10^{-5}$ Torr.

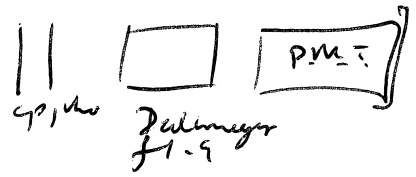
No of pulses, last 2 @ .1 μs, rest @ .05 ms/cm.

Recovery ∼ 200 μs.
Vertical .5 v/cm

end of film.

Taking 1 plane every 1 or 2 pulses @ the end.

Optics



∼ ½ μs of pinch on scope after pulse, delayed.

Thurs 22.

Same tip, $5\,10^{-10}$ '78 He.
PJT's pulser cos more stable o/p.

$4\,10^{-5}$ He. cp 1100 ~~pm~~ 1330v Resistor 43k x10 probe

scope : ·2 ~~div~~/cm $4\,10^{-5}$ 1 mopulse pulser 2KV

t-b 50µS/cm.

} 3 successively more -ve standing volts
~ 31V.

Recovery ~ 3×50 = 150µS.

2 pins : pulser 1000.
τ_p ~ 5×50 = 250µS.

---

3 pins pulser 2500
τ_r ~ 1.5 × 50 = 75µS.
Nominal 4.4 10^{-5} Torr, i-g

1 blank.

P = $2\,10^{-5}$ i-g.

scope ·1 v/cm 2 pins → pulser 2KV. τ_r ~ 5× 50µS = 250.

1 S 3 pins, 3rd @ 100µS/cm. 1500
τ_r vague but ~ 500µS I think.

2 S 3 pins τ_r ~ 2×50 ~ 100µS 2500
or 3 — 150

1 blank.
Pf 2.0 10^{-5}.

scope ·5v/cm. P = 7·5 10^{-5} Torr. i-g
1 @ 50µS cm pulser 2KV.
2 @ 20µS t_r ~ 80µS.

? 2 or 3 @ ·5v/cm
3 @ ·2v/cm 50µS cm c-p gain reduced, 900v, cos saturating
τ_r ~ 100µS, but indeterminate.
1 blank
3 pins @ 20µS/cm τ_r ~ 40µS. p 2500 v

$p = 10, 10^{-6}$ Tg cp 1100 pulses 2kV.

2 pulses @ 50 μs
2 pulses @ 200 μs. $\tau_+ \sim 800$ μs.

end of film.
Mylar (2).
2 @ .2 v/cm pulses 1500.
but for flush. 2 = front of beam lost-off screen for some pulses. repeat
1 blank.
Several ~4 pulses @ .2 μs cm. pulses 2500 v

$\tau_+ \sim 3 \times .2 \sim 600$ μs.
.1 v/cm. 1 pulse @ almost but not quite empty for reference.

1 @ .2
2 @ .5 1500
$\tau_+ \sim 1 - 1\frac{1}{2}$ ms

Tip @ 11 KV since, from @ about 9 @ beginning

Same tip.
Canon f 1.9 + Dallmeyer f 1.9,

Screen 3990 cplate 1200, 1180.

cp 900, 800 few n/sec pulse of tip.

cp ⊂ No of 1 & 5 sec exposures of tip evaporating in UHV with pulser free-running ~ 50 Hz so multi-pulses per picture.
$p = 3\,10^{-10}$ Torr Tg.

Camera was not well in focus, so had another go.
No film.

Series of pulses $3\,10^{-5}$ 800 v cp He.

Series of pulsed discharge superposed pictures 10 — 30 Hz. 2500 pulses typ ~ 13 KV. single shot.

exposures 1 sec, 5, 10, 20.

1 blank.

Series of dc evaporation pulses 1 5 10

Series of He pulses 800, or 900 cp $2\,10^{-5}$ He BIV

Good pics.

2nd film taken @ 50°.

He
$2\,10^{-10}$ nS pulses 2500 volts BIV ~ 1.5 KV
He
DC
DC @ cp volts ~~for~~ 1 KV 900 800.
He boundary
nS pulses.

Thurs 27 Aug

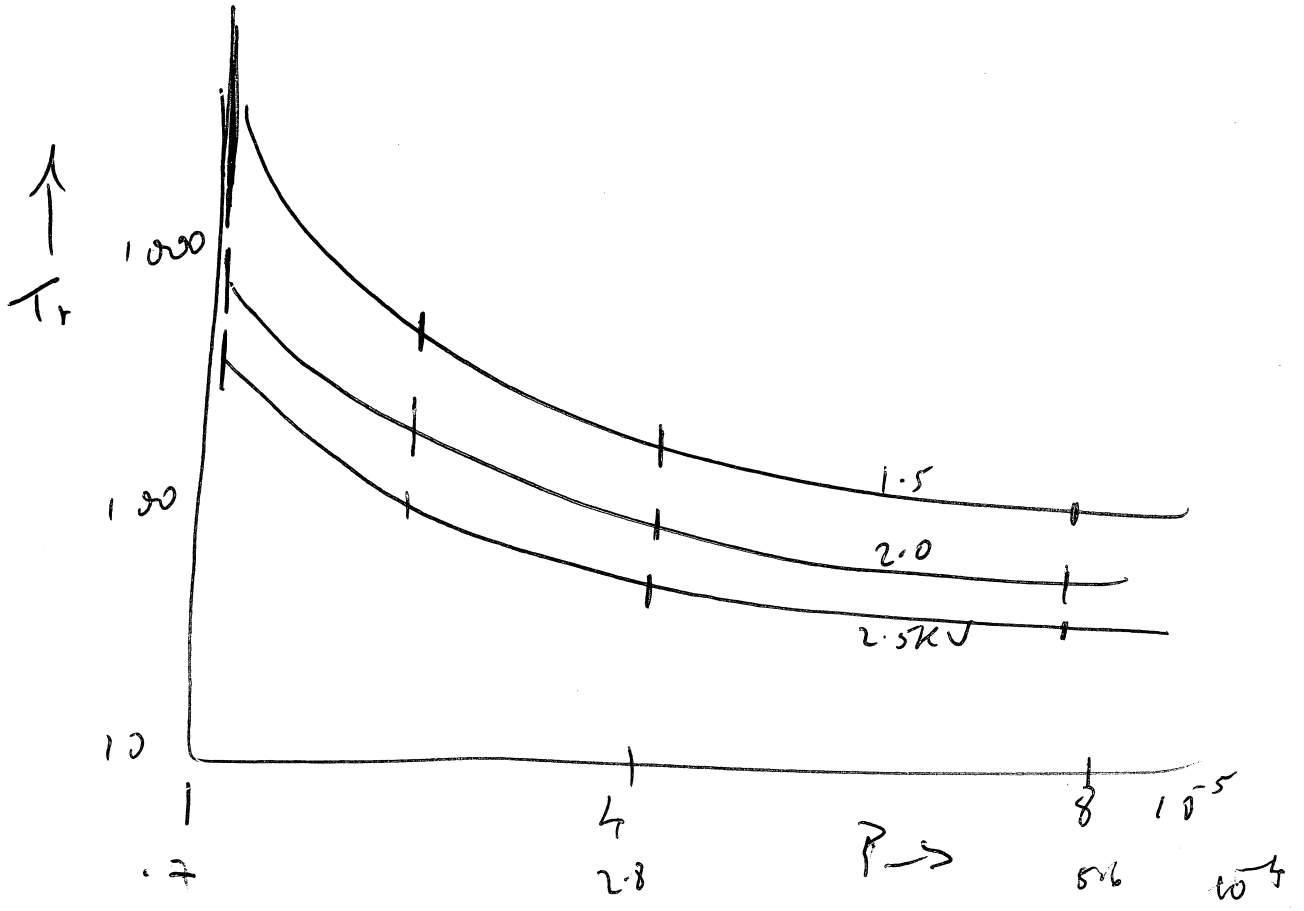
Analysis of data of thurs 22.

$=4 10^{-5}$	cm	@ pA/cm		est-	Mean
pulser 2KV	2.35	50	118	150	
	3.5		175		
	3.6		160		
1.5KV	5.0	50	250	250	
	5.2		260		
2.5	1.85	50	93	75	
	1.60		80		
	2.05		103		
$2 10^{-5}$	5.6	50	280	250	
2.0	6.4		320		
	~6		300		
1.5	~9	50	450	~500	
	~9		450		
	3–4	100	350		
2.5	4.3	50	215	100-150	
	3.5		175		
$7.5 10^{-5}$					
2.0	3.6	50	180	80	
	3.2	20	64		
	5.0	20	100		
1.5	2.2 3.				
	4.5	50	225		
	4.6	50	230		
2.5	~2	20	40		
	~2	20	40		

P 6

10	10^{-6}	cm	µs/cm		estimate
	2.0	3.5	200	700	800
		3.0		600	
	1.5	~6.5	? 200	1300	
		~ 8.0	? 200	1600	
	2.5	2.6	200	520	600
		2.3		460	
		2.7		540	
		3.6		720	
	1.5	?	200	?	
		4.5	500	2500	
		4.5		2500	

	$1\,10^{-5}$	$2\,10^{-5}$	$4\,10^{-5}$	$7.5\,10^{-5}$
1500	1500 ± 200 2500 ± 500	420 ± 40	255 ± 20	230 ± 20
2000	650 ± 100	300 ± 40	160 ± 20	100 ± 40
2500	~~5~~60 ± 100	200 ± 40	90 ± 20	40 ± 10



So is apparently an effect

? Is CWM's data using real pressures ~~of~~ or indicated pressures.

Effect is dependent on standing voltage, as might be expected

almost certainly real as otherwise severe interference from collisions and flightlike Temperature not specified. ? at 20° would expect higher currents, ? quicker recovery.

Saturday - Dev short atom probe !

Cass II

Set of pins cp 4KV/2 1SNS + Gas

blank

Set of pins - - no gas

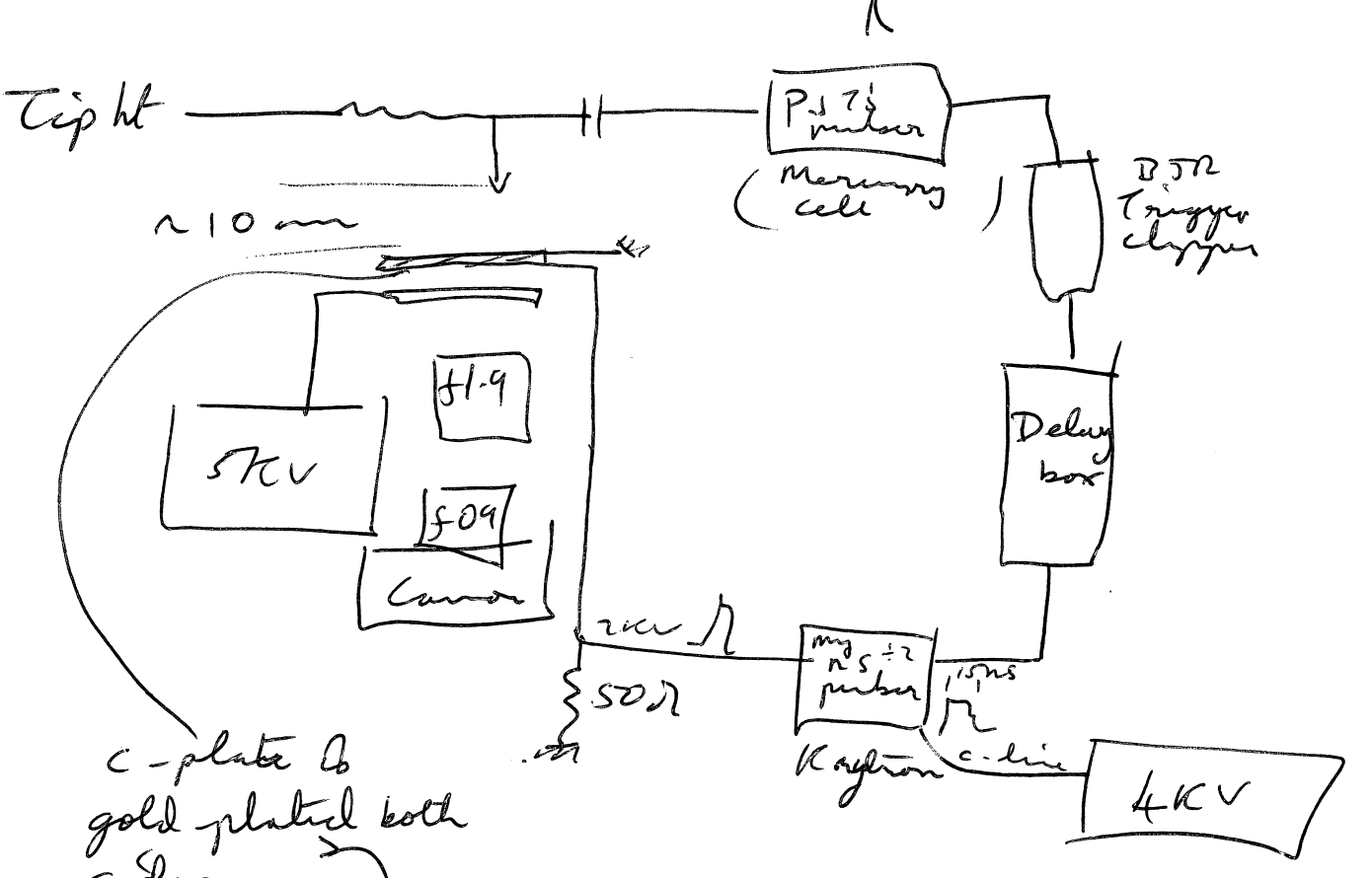
blank

Set of pins 8KV/2 - -

'fiddling' delay, higher coverage.

All time constants ~ 10ns,
ten more pins 5 planes, 1 plane
6 - 8 KV

End of film.



c-plate to gold plated both sides.

PII screen

Gas background ~ 5V0^{-4}.

(ref purity)

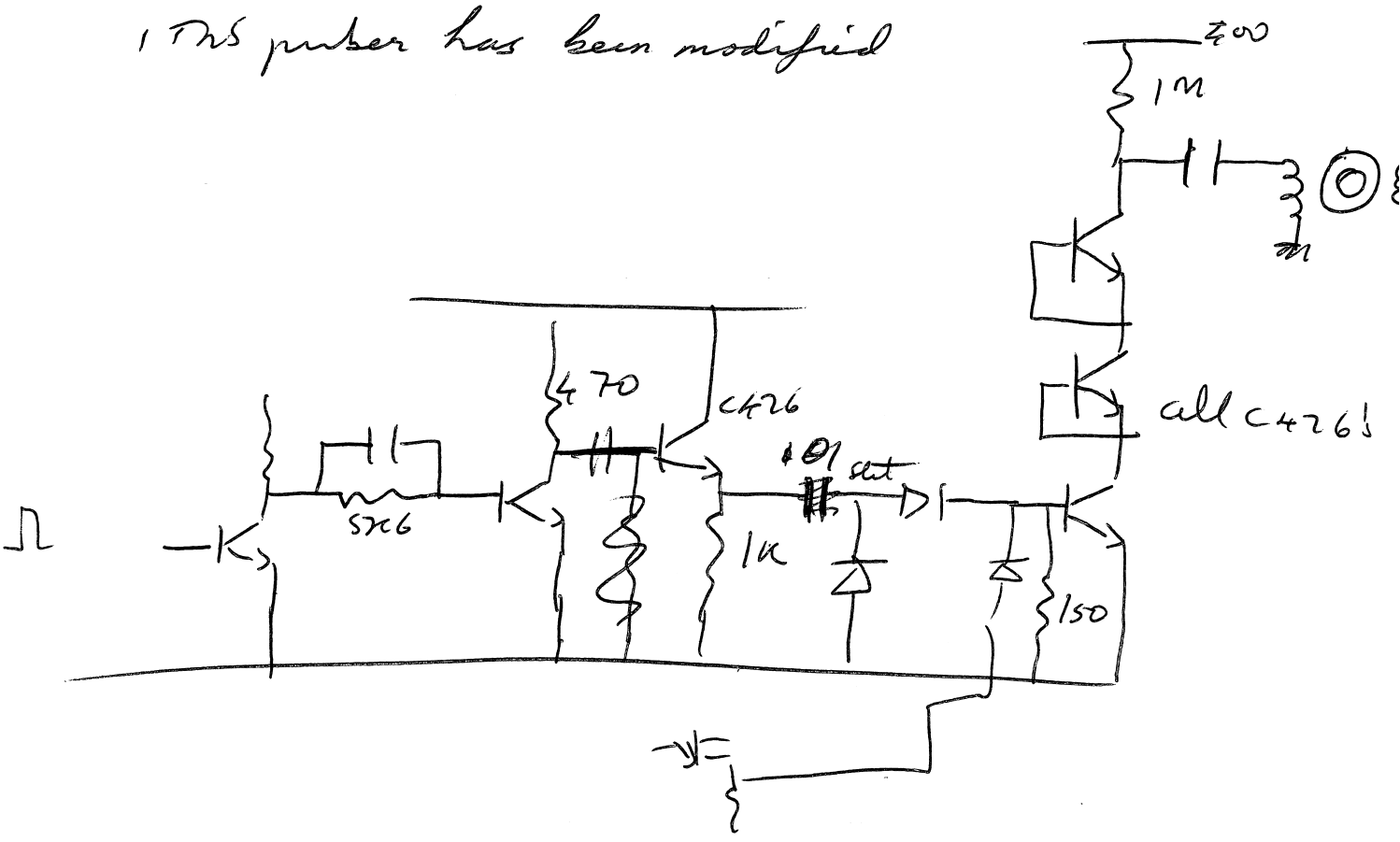
Delay needs to be

~ 3 × .2 = .6 μS for W3+

Could do with longer than 1SNS pulse on c-plate - eg 50.

Minimum delay ~ 2a .3, — .4 μS, can't see 4+.

THS pulser has been modified



Cos of delay introduced by original thyristor

Min delay of pulser delay box is quite large too.

P is out of norm, but stacks of gain look promising.

Mon

Trip ~ 10KV W 78 He 2 10^8 Bkgnd

Gatewidth ~ 80nS. (~25' ftcable (?))

Few pics 3 10^5 He various cp gains.

Few pics everything in He. W'+

blank

" " " " vacuum "

Some pics 10, 20 110 planes superposed.

~ faster rate

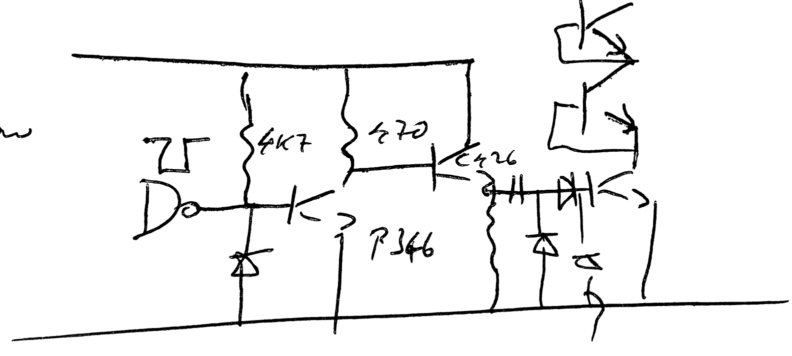
blank

" " 10, 20 110 planes ~ with He present.

It was observed that everything in He gave different behaviour to vacuum. In He the rings of collapsed slowly allway into centre, in vacuum there was a jump – all plane came off with a black hole in centre.

Camera tilted itself unobserved, so some pics slightly o-of focus – but OK.

Pulser now



This reduces delay of trigger circuit to ~150nS.
Main delay is switch on time of krytrons of input volts less than 2-3KV
Trigger pulse to krytron is ~1KV, 20nS rise; jitter-free to ~3nS.
so ? use av. transistors to pulse cp ·(+ trip?)
Min delay is ~350nS using delay box B output, bit less using A. ∴ Modify box.

Pics with 20 planes on show marked ⓔ effect.
10 less
" " 20 + He show little effect.
10 " "

Film 2 3×10⁻⁵ He 1½ 1 pins at BIV.

Image gas present. 3×1 2×½ discharging slowly.
5 110 planes.
5 "
?10 " delay wrong
10 "
blank
20
10 fast
~3 fast
~10 "
~10 "
blank.
10 110 in vacuum.
10 faster
~10 flash
~2
20
blank
~10
few pulses taken hi rate short exp to bring out any pattern

Camera apparently @ f 22.
Try again

New film (3) 5 + gas He.
10
20

run out of pulses.
So image in Ne.
Few pulses @ bi
pulser to 2.5KV
5
5 pulser 2.5KV
5
blank
5
~5 planes at above voltage
blank.
5 planes of 1 or other.
blank

for pulse . 17 KV + 3 KV pulse for oxygen.

low v peak
high v { 10 i.e. optimum
20
+ hi rate of rise 30
low v

These pulses taken with fixed minimum delay.
Voltage swept to alter time. 2 peaks,
low v one to faint, high to bright.

Tip volts too high to discriminate peaks at same rate

Tues 3 Sept. W 78 He $2\,10^{-7}$

~4KV $3\,10^{-5}$ He 3 pins

2 $1\,10$ "

10 "

5

30

flash.

10 pop

20 8KV +

& Many ~30?

20

20

flash.

He pins — ? distinct loops

flashed the tip cos helgrid backwards & forgot(!).

New tip: Converter moved ~1.5 cm forward.

78 $2\,10^{-7}$ W He $3\,10^{-5}$ few pins

Hagues ~ n planes. difficult to count.

~10 planes

W^{3+} 10 nogus pulser 1280

20

14

30

flash. ~7KV standing.

3 He pins

pulser to 1800.

quench

+ He. 10

W^{3+} 20

30 ← quench

tip flashed.

? two pulses from pulser.

delay for W^{3+} ~650 nS. — min variable ~800 nS.

p-w ~ 80 nS,

20 Sept 74

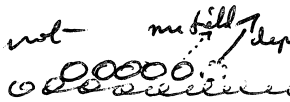
Data from 12/11/74 Film 4.
aiming errors W/He

110 ^ 110 23.0 cm } He
111 ^ 111 14.3 }

Ring	D_{He}	2D	D_{Ne}	2D	D'_{He}	2D
1	3.2	3.3	2.6	2.9	2.9	55
2	4.9	4.7	4.2	4.3	4.5	microns.
3	6.2	5.9	5.4	5.4	5.9	
4	7.4	7.3	6.6	6.3	7.1	
5	8.6	8.5	7.9	7.2	8.3	
6	9.7		8.9		9.4	
7	10.8		10.0		10.4	
8	11.9		11.0		11.3	

Ionised ion rings are smaller than both initial He image rings and final He image rings. Effect of attaching HT bias is to enhance this effect, so must be real. Conclude that aiming error is not due to ions leaving tip in field of altered surface, but- is due to some tangential velocity.

i.e.

not- no field / depth in


but-


Ring	D_{Ne}/D_i	D'_{He}/D_i	2D	D'_{Ne}/D_i	D_{He}/D'_{He}
1	1.23	.896	1.13	1.12	1.10
2	1.16	.933	1.09	1.07	1.09
3	1.15	.915	1.09	1.09	1.05
4	1.12	.929	1.16	1.08	1.06
5	1.09	.952	1.18	1.05	1.04
6	1.09	.946		1.06	1.03
7	1.08	.962		1.04	1.04
8	1.08	.973		1.03	1.05

22 Sept polishing Co & margo's Fe + Mo₂C .

Co 23 hrs @ 787° ex AM should be hcp
nething in thin layer HCl dil 15%
go through in 2/pencil. battery .
No good pics cos vacuum in auto 2.10⁻⁷ only .

Ditto margo's Fe / 3.2% Mo / 2.1% Cr / .2% C
— perch/an pure / but as standard Fe .

Want to use in gated up short-ulton, make to
test energy behaviour of ppts : tried on friday
with Fe / 15% Au ex AY 19hr 420
or 5hr 460

— small gold platelets in Fe matrix .
However, kept flashing when attempted to image in Ne —
not too bad in H_2 . ? look at in phillips .
Good system cos nice heavy Au^{2+}_{pure} , lite Fe^{2+} .

24 Sept 74 EAM 2 W 78 He $3\,10^{-6}$ ugh!

300 $2\,10^{-5}$ screen 5KV CP 1500
no retarder (ie ret = 0v)

300 2760 1 sec, $2\,10^{-5}$
¼

" 2810 }

popped.

442 3980 1 sec,
" 4020 2 sec.
380 D 3420 so 440 + 2KV pulse ≃ 500 will be ~ 4600

Set 4500.
soldering tip flashed when pulser returned-on.

Interesting zone decor seen previously.
6-pointed z-l around 110 ~~towards~~ (100) & (211) planes on fast ns pulsed evap in crappy vacuum, standing volt few % over BIV. 2KV pulse on ~ 12KV tip.

$6\,10^{-7}$ at end.

25 2 more W tips bust cos mic kept breaking down.

Ed discovered could look at Al in H_2 @ 78 in autochanger in crummy vacuum — $1\,10^{-7}$ — $6\,10^{-7}$.
so put 10KV Al tip in EAM 2. However for some reason didn't give good pics, looked sort of scrambled. Vacuum was ~ $6\,10^{-7}$ cos apparent leak somewhere, couldn't find it.

26 Sept 72 W 2 10^{-8} Cam II . 78°
g-boundary.

3 10^{-5} He 1 sec. 1 KV gp. screen 4 KV. ~ 3 KV.
5
½
75 — gp now -ve.
10 110 planes ~~~~.
20
1
2 } assisted probe W He.
5

all ordinary dc cycles.

2 2 dis pits 10-20
one popped ~ He pin
10 20 30 planes.
1 ½ ¼ He. 1 KV gp.

~ 10 KV BIV.

Delay etc set ups for W 3+
~ 10 20 30 planes in presence of He.
2 KV on gp.
1, ½ 1 KV gp BIV.

Object of exercise: looking at g-boundary, pulsed-evaporation, & pulsed evaporation in presence of He.
Boundary, from previous imaging, was ~ low angle rotation about 110 — probably 5-10°.

Oct 5th Co Ta $1 \; 10^{-7}$ Cass 2 78 Ne

$3(0^{5}$ Ne / s Gp ~ 1200.

½ s

½

1 cp 1KV

1 1200.

Ta LT

1 Ne pulse ~ 800

Ta

1 ½

½ 1 ½

Ta control trip.

1

Ta Ta

1 1 ½

Ta

1 ½

Ta ⇐ ½

½ ----

Ta

1 ½

Ta

1 ½

Nanofilm.

Slightly higher v. ~ 3KV pulsed 1KV

2 pulse

Ta

2 pulse 1 ½

Ta

2 pulse "

Ta Ta

~ 1 ½ ½ flash

10 planes. 10 20 20

1 ½

10 ← 1 ½

blank cathode

1 ½

Ta 1

Ta ½ ½

Ta ½ 1 1

60 v

↑ at this point deuterized Ta was Co matrix.

↓ Ta as Ta from here on.

mufilm 3   1½
Ta
1
Ta
~1½
Matrix
½ 1
blank

Series of alt prs of matrix or ppts.

blank.

likewise — Ta
Ta
:
mat   mixture.

mufilm 4

fewpins

10 plane 1.5 KV pulse vacuum

10 dc
20 "
7 20 dc

20 pulsed

Final vacuum 2 10^{-8} Torr.

Pictures from film 2 (X3) clearly show ppts (Ta^{3+}) and matrix (Co^{2+}) as separate entities. Whoopee!

Sun 6 Oct

W Same film as Sat. 1 pic @ 78 – (g–b) Nb

Cars IV

1, ½ @ DIV, ~10°K He gas.

DIV 6KV. – vac 5 10⁻⁹ Tg.

½, 1 after removing ~211 plane with 1600v ns pulse ~ at DIV standing v. = 4.4 Kv

2–3 sets alt W^{3+}, He images, at least 1 cont each. helegst

~5 × W^{3+} 110 planes.

He

~5

He

blank.

lower gas pressure a bit. press ~ 1 10⁻⁵

~10 planes.

~10

~20 1 or 2 dud.

20

everything at 598 + 1625 pulse. DIV 575.

1 ½

not a lot to see on film – boundary.

New film labelled (2) cos not sure of looking exp. film out of camera.

He

Series of pics of W^{3+}, fairly rapid evap n, trying to get many layers, fractional layers.

pulse 2KV, tip at 657. DIV 590.

1, ½ @ ~ DIV.

blank.

static

Series of pics @ ~ 700–800 cp volts, ns pulse evaporating trying to get pics like spindles

Tried to do evaporate in vacuum. Flashed before out seen.

— When pulse-evaporating in He, evapn was v irregular. W^{3+} pics tended to start at 110 & brighten radially outwards, repeat a few times & then fill in odd patches of the pic, ie odd planes etc all at one go. Then nothing as volts raised much till whole sequence repeated, or just odd bits of pic in intermediate region. Seemed to go in series of clicks.

Oct 7

Rh 78 Cass II He 3 10^{-5}.

1 ½ ½ ~

~3 Rh^{2+} poles (in He)

½ He

light flashes

Oct

Oct 9 Rh 78 Cass 2 3.0^8

3.0^5 He . 5 / 1 / ½ } He .

Des ~
~ (
1 ~ 2 He
~ 5 planes ...
5, 10 faster rate

bang goes another one .

17 70
12 70

$\frac{1000}{1370}$ $\frac{10}{137}$

Oct 23 Ir Cass II 78 7 10^{-9}.

1½ h @ 81V 1KV ap.

1KV pulse 81V ~ 9KV.

3 des pins ? ~~[illegible]~~ Ir^{2+} I think

2 @ 81V

des ~ 5 planes. slowly.

few more pins ~ some duff.

~ 10 planes

lower He pressure factor 3.

1 or 2 ×10 planes Ir^{2+}

1 pin Ir^{3+}.

81V He.

More Ir^{3+}, faster,

Ir^{3+} fast ~ 20 planes.

Various pins @ ~ 81V!

	5	
	10	
220	20	planes DC everything 7 10^{-9} T.
	20 pulsed	vacuum 1400 ap
	30	

~ 1 plane/sec at 1220 on helipot.

(↑ 1270 in He (? misreading pot, or what)

Reread as 1370. (? 1470 originally)

So only a few % promotion.

Blank

5 10 20 30 pulses all charges.

1470 helipot + 1.55KV

1490 gives same rate DC. (!)

Series of puls @ the DIV removing ~ 1 plane (111)

as ~~boundary~~ at edge of ...

Nufilm

few pics DIV.

~~Fr~~ 1+ 2+ ...

1+ 3+ ... more ... in 3+ peak ...

DIV. ↑ c-p on the ...

for some reason
— delay box didn't for some reason.

DIV

2 of 1+ 3+ ~ 5 planes ... first.
no at DIV

small evap sequence ... at ...

1280 cp | 10 10 2020 planes fast DC

10 nS pulse fast 1900 v pulse

blank.

20 pulsed. 2KV pulse

Tip ... → 1770 1 plane per 3 sec dc. ...

1760 nS pulse

1785 DC

1763 nS 1 pulse per 60 mS.

1798 DC

1 blank.

pix lots DC 1KV cp.

lots nS 2KV.

... 1 DIV 1560 evaporate 1765.

1782 DC in He

1653 ~~DC~~ in ns 3KV.

DIV ~ 1570.

blank. Previous pic shows ns + He
uniform

Trip at 20KV.

If 1570 ~ $2 \cdot 10^4$ volts,

1770 = $\frac{1770}{1570} \times 2 \cdot 10^4 \simeq \frac{18}{16} \times 2 \frac{1}{8} = 2 \cdot 25$ KV

22.5 KV + 3KV pulse ~ same rate. approximately.

Pulse 13Hz × avg 5 ns = 65 ns.
so rate Δ factor ≃ 1.4×10^{-7}.

So $\frac{300}{22.5}$ % = 13.5% change in field → $1.4\ 10^{-7}$ change in rate.

or 1% field ≃ ×4 rate
~~or 1% field → 10^6 in rate. in vacuum~~

Bright lines show up on both $1s^{2+}$ & $1s^{3+}$ pics, in He & in vac.
3 of lines are visible in some fast-avgs in He pics.
Blackhole in centre of III is less marked in He pics & not present in DC/vacuum avgs.
More $1s^{3+}$ than $1s^{2+}$ in vac, ~ = in He.
Subsidiary dark lines are less pronounced in ns pics.
Boundary shows up dark.

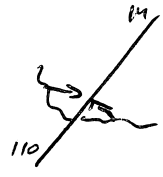
150/91 145/82 counts/cpx area

Bright lines apparently contain ~ 1.8 times as many ions as grey areas based on a counts of cpx/unit area. Approx, no overlapping of cpx.
So avg ~ ×2 as bright.

1 Nov Ed, PJT looking at Al in atomprobe, imaged in Ne at 10–20°K (He gas cooling).
Good images, ~ stable at ~ 7 kV, 8 kV tip.
Withstood atom probing, mainly 1+, some 2+ (!).

Looked at diffuse image of Al tip — temp unspecified as He had run out, but warming up. Probably coldish as up to <110°. Looked v like original Al pics (many dark lines) but now a dark cross on (100) regions as well (arms towards 111's) ? as better vacuum. ~ 3½ pics, tip finished at ~ 15 kV, still OK. No Ar at all, mainly Ne & probably H_2 residual.

2 Nov Same Al tip, room temp. Vac ~ 5×10^{-9} or so, mainly H_2.
Field desorbed tip to see if could see any change (eg to Rh – type patterns).
Pic looked v like Krautz' pics — sort of jerky rings collapsing. Pronounced dark lines radiating from 111. Rings seemed to move towards these



Took some pics, but tip time exposures, so would only see integrated pics. (+1.8 & +4, ½ – 8 secs)
Evaporating @ ~ 10 kV.
Tip still good.

~~Thurs~~ ~ 14 Nov

At PJT's atmosphere Ne ~ 20°K.

~~Thurs~~ Ne ~ DIV.

Desorption at various rates, vac.

Ne.

Ne, evaporating fairly fast looking at tracks of retained bright spots, which seem to be in chains along lip axis,

Ne evapting v fast, same 3-fold dark line system as in Ar, v fast-evapting

All DC evapting.

5176	1 plane/sec	Ne	
5490	"	"	vac
9033	"	"	vac
8612	"	"	Ne.

So Ne promotes At evapn at ~ 20°

by $\frac{9033 - 8612}{9033} = \frac{421}{9033} \sim 4.7\%$.

or $\frac{5.49 - 5.18}{5.49} = \frac{.31}{5.49} = \sim 5.5\%$.

5.5
27.5
2.5
30 2.5

~ 3 v 1A.

15 Fri Nov.

Tungsten cold (20ish) He. 1 10⁻⁴. PJTs machine

He 11.89 KV
He off ↓ 12.10
Vac → 12.73
evap'n
~1 per sec

↑ 15.845 evap'n voltages.

16.93 12.34 DW

Series of prints He – DC evapt – He – DC + 2.5KV nS pulse
~ 20, 10, 10 sec exposures.
Zone dev few planes off reph photo!

15.049 + 2.5KV pulse 1 p/s in helium.

He nS evaptd in vac endform — He nS evaptd in He endform, bit more moly.
? — faster nS in vacuum. DANG!

15 255 ~ first evap'n
15 280 1 per sec } in vacuum.

$\frac{200}{15000} \simeq 1\frac{1}{3}\%$ promotion of helium on nS evap'n.

$\frac{1.1 \times 100}{16.93} = \frac{110}{17} \simeq 6\frac{1}{2}\%$ promotion of helium on DC evap'n.

If 12.39 = 4.5 v/Å.

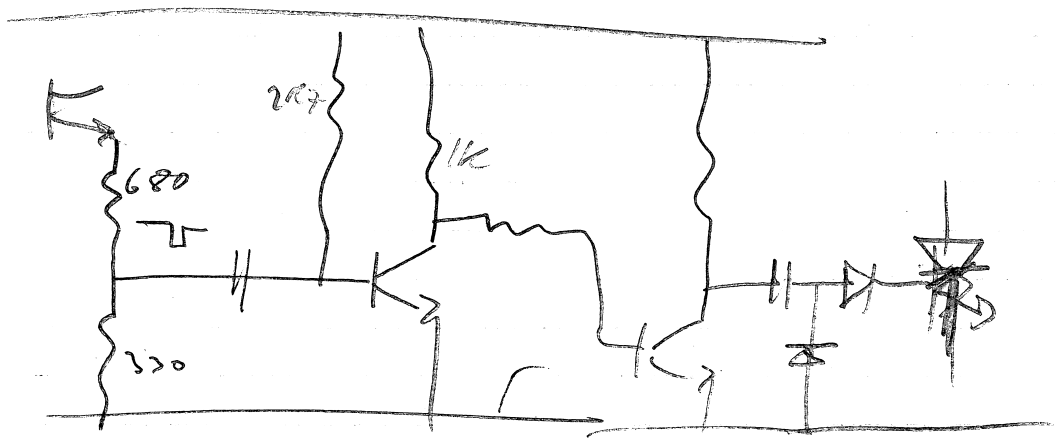
evap'n field 1 plane/sec = $4.5 \times \frac{16.93}{12.39} \simeq$

≃ 6.1 v/Å (ouch!)
This is minimum value (tip blunting)
but smaller than it has any right to be in view
of He promotion effect. Repeat the experiment!.

169
1125
845
3380
16900
169000
16.9)190125

1.125
2.25
4.5
12.4
6.2
3.1 ×

3.1) 190 (6.
186
.4
3.1


680
330

	0	100	200	300	400	500
0			1870]	2730		4400
			1900		3580	
10			~~2000~~ 1960]	2770 2810		
20		1170]	2080	2890	3760	
					(3740)	
30		1260]		2470	3740	
40		1350]	2200]	2000 3060		
			2250]	(3020)		
50		1430]	2300	~~3160~~ 3070		
				3170		
60		1520]	2370]			
70		1610]		3240		
80		1690]	2570			
				3420		
90		1740]				
1						