Belle Background 2000-2001

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KEK

Today's menu

- How mcuh imporved from the last MAC?
- What are changed in summer 2000?
- Vacuum bump exp. HER/LER
- Background & beamsize
- Current status & Future of background

How mcuh imporved from the last MAC?

CDC leak current
Energy Spectrum in CDC
SVD dose
SVD occupancy
Trigger rate
&
Vacuum pressure

What are changed in the summer 2000?

Gold coating inside IP beampipe

Sawtooth inside IP beampipe

Gold foils in front of SVD LSI

More tungsten near IP

Correction of bowing in QC2RE chamber

Vacuum pressure bump experiment in HER/LER

Vacuum pressure bumps were made by

Activating NEG pumps

Turning off Ion pumps

ΔP^*L can be evaluated from $\Delta(1/\tau)$.
Check Δ(background)$/\Delta(1/\tau)$

HER: Clear conlcusion••Upstream straight section and neighboring arc have a very large contribution once we make the masks adjusted.

LER: Contribution from straight section is larger than others, but not so dramatic as HER.

(Maybe not all background are coming from vaccum)

Background & Beamsize

LER beam shows a clear dependence

smaller beamsize ⟷ **larger background shorter life time**

Touschek effect

Half or more of LER background can be attributed to this and will be dominated after further vacuum improvement

HER beam shows a clear dependence

larger beamsize ⟷ **larger background shorter life time**

Narrow aperture

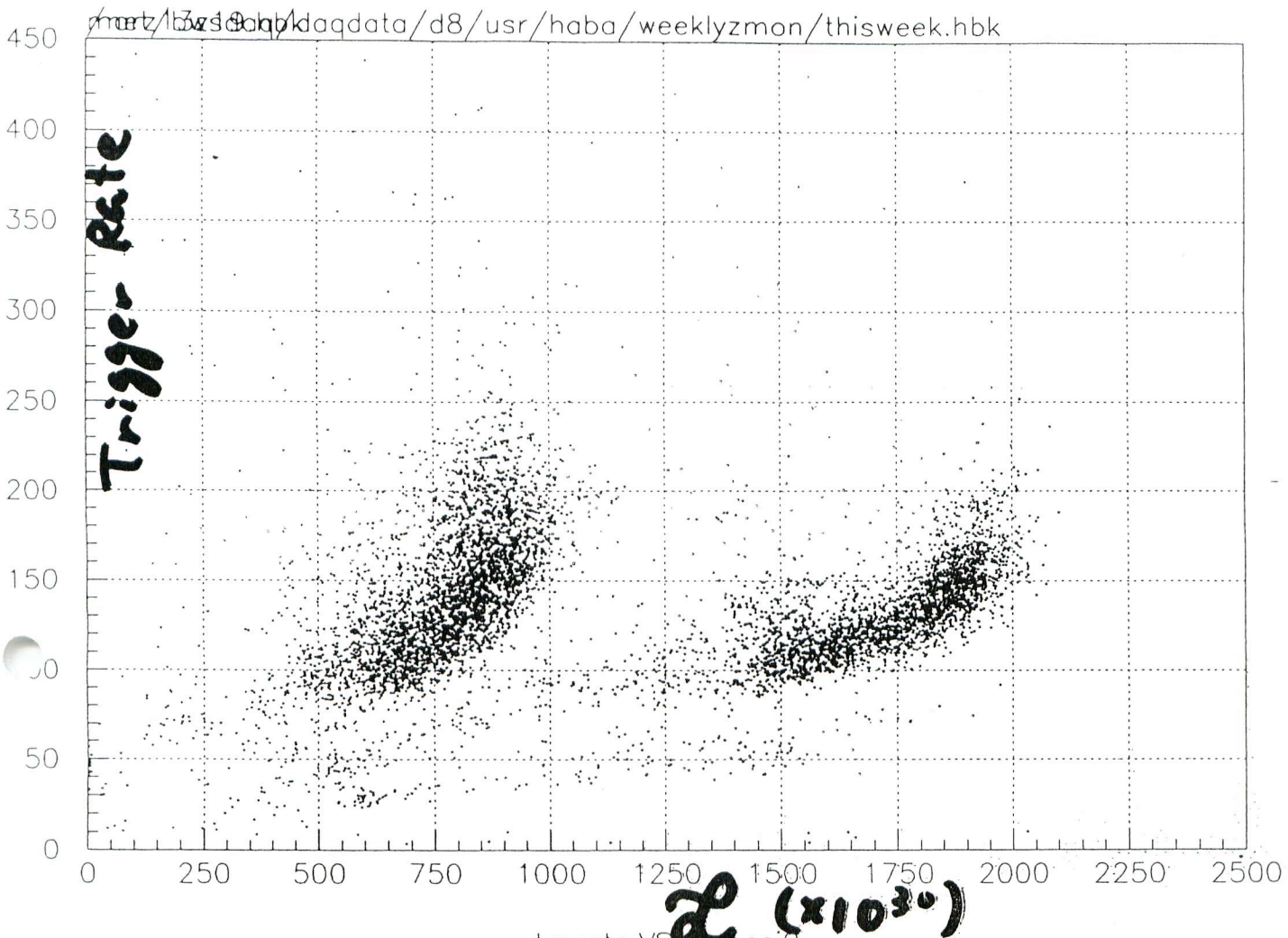
Current status & Future of background (cont.)

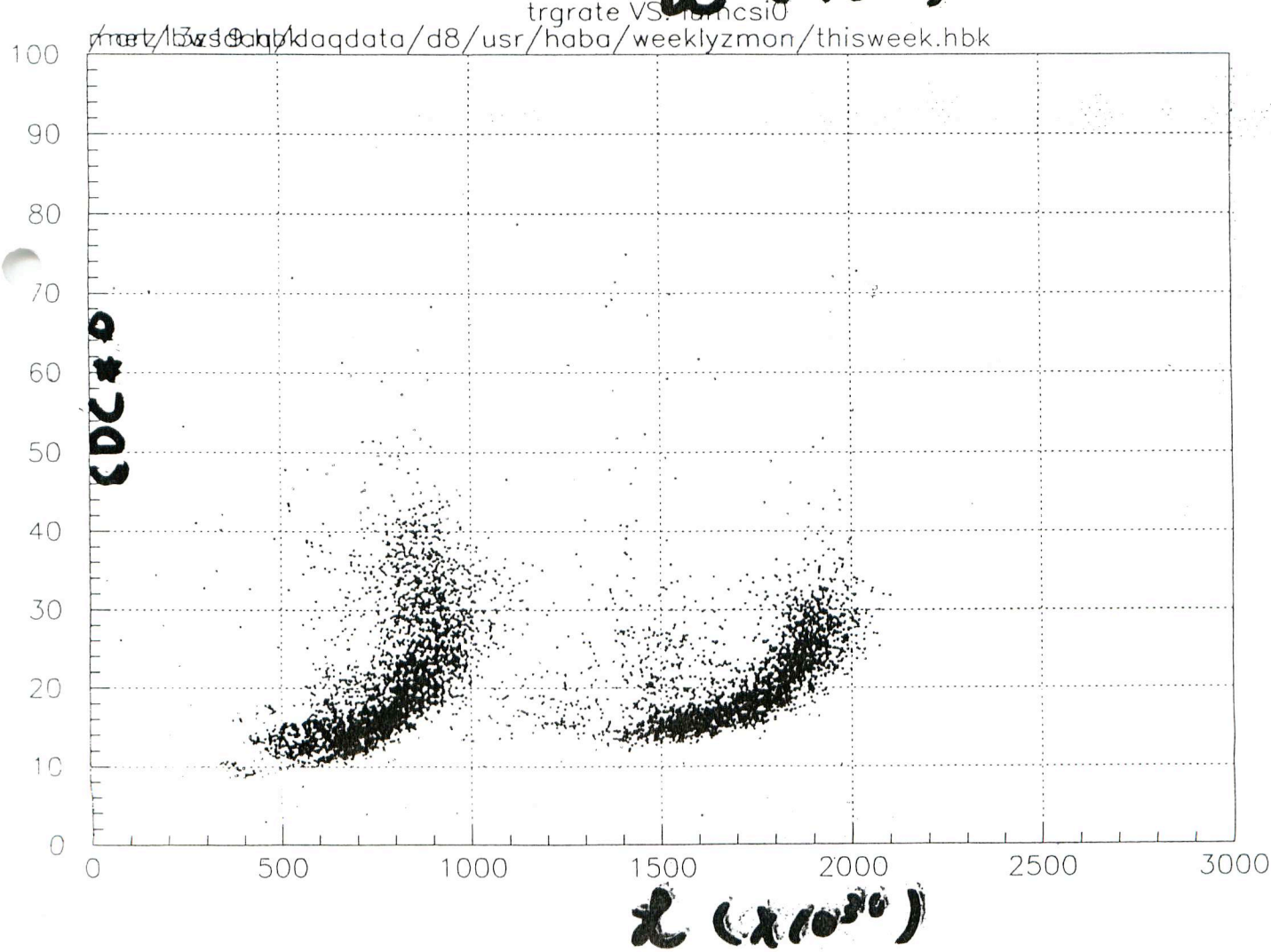
Current background condition is very comfortable for Belle thanks to the great effort by the KEKB crews.
(Twice higher background is not, of course, preferable but tolerable)

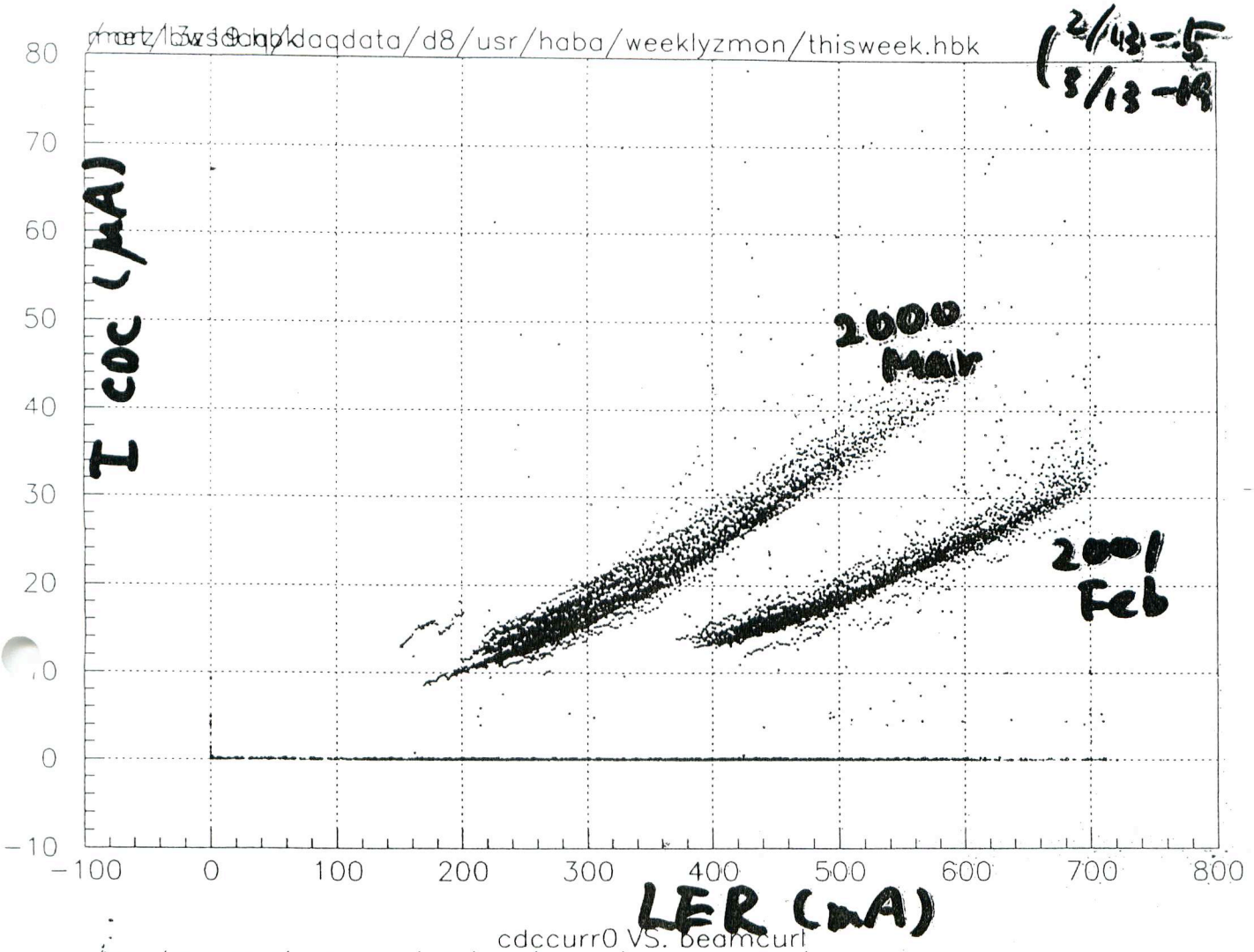
TOWARD FUTURE HIGHER LUMINOSITY (BACKGROUND) OPERATION

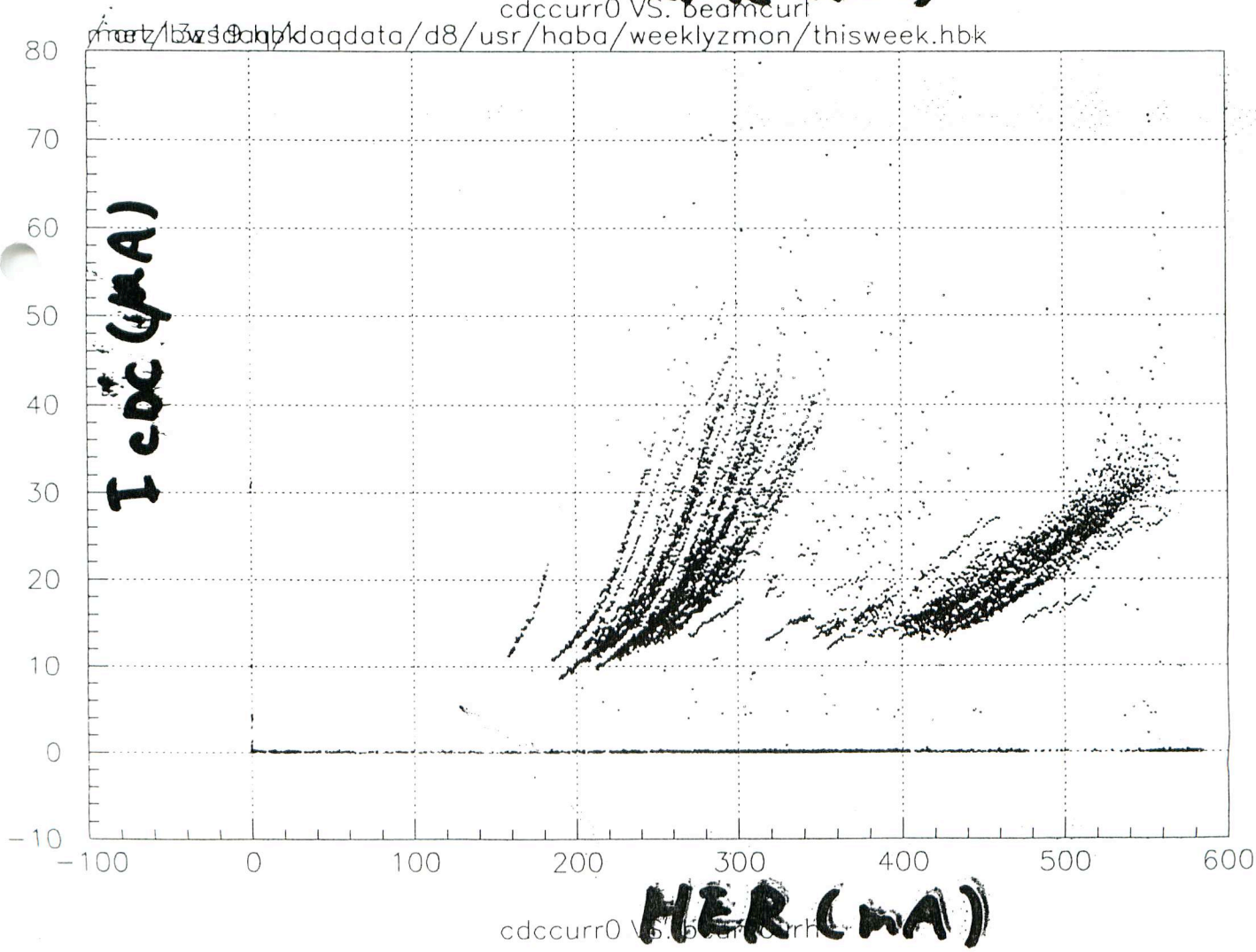
HER
- Better vacuum at D1 staright and arc section
- IR masks (location should be optimized)
- Larger aperture

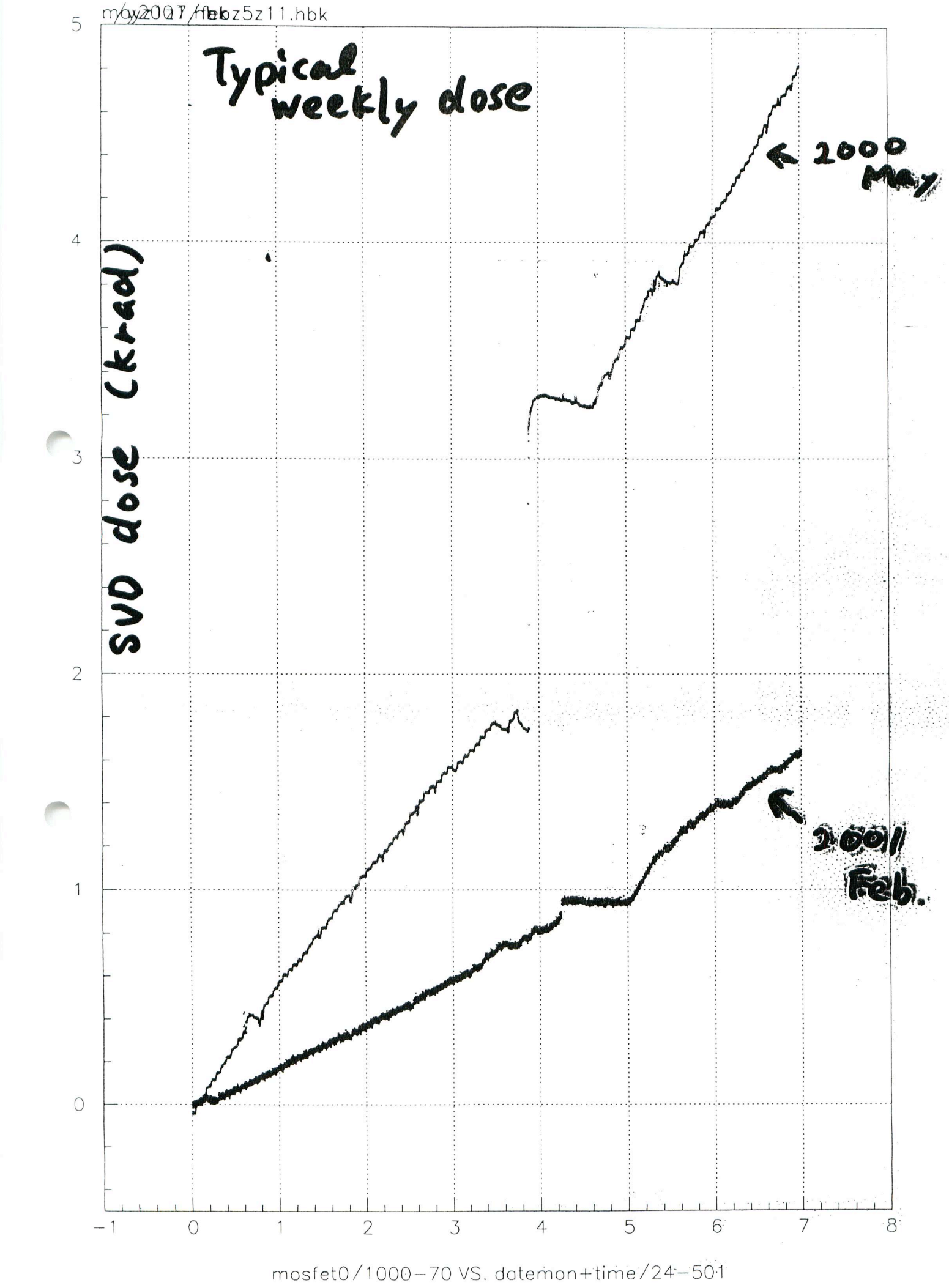
LER
- Reduce beam loss due to Touschek effect
- Additional masks to stop the particles kicked away through Touschek effect. (should be studied more)
- Further vacuum baking

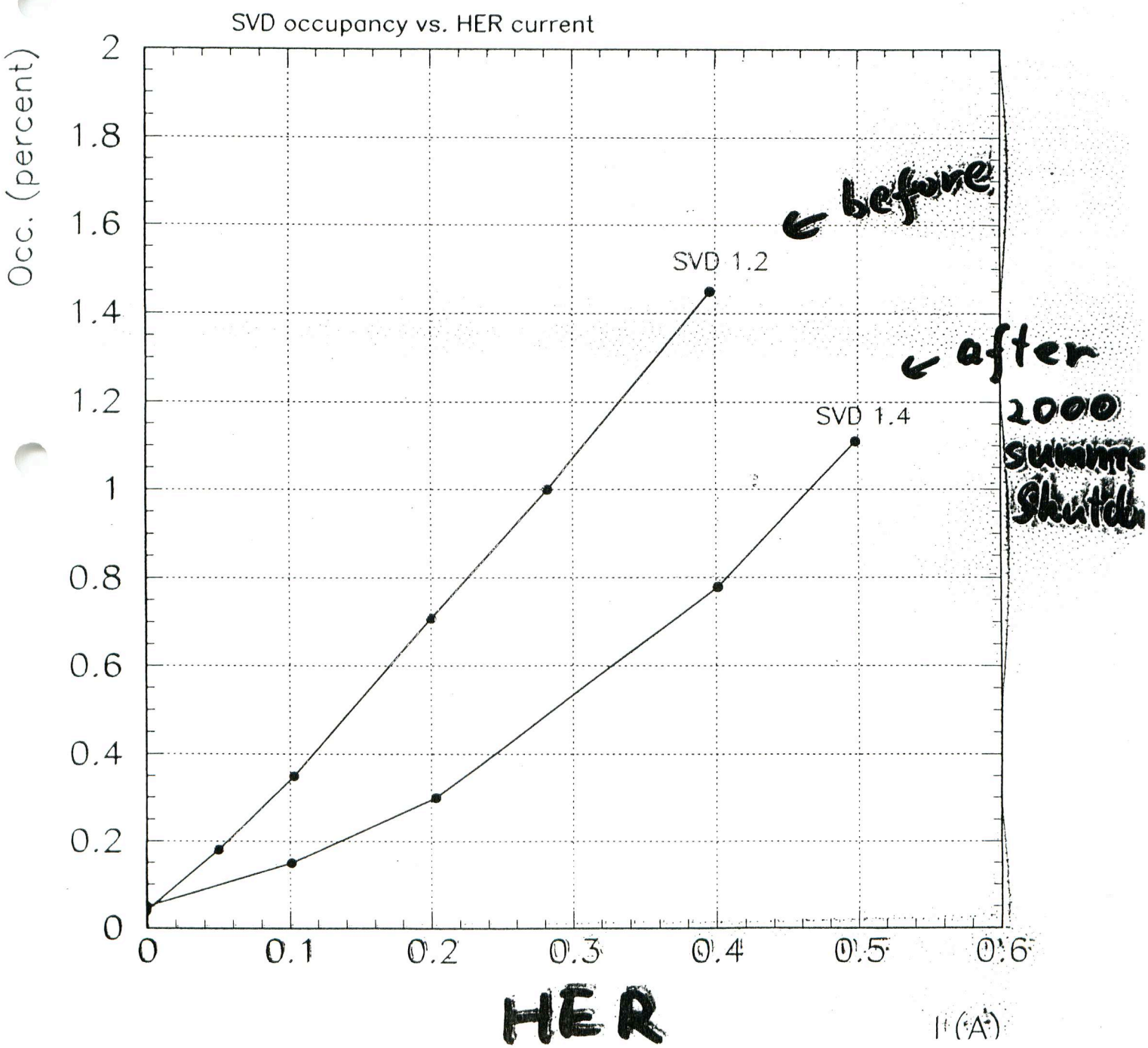

/home/hadaq/daqdata/d8/usr/haba/weeklyzmon/thisweek.hbk
Trigger Rate
0
50
100
150
200
250
300
350
400
450
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
ℒ (x10³⁰)


trgrate VS. lumcsi0
/home/hadaq/daqdata/d8/usr/haba/weeklyzmon/thisweek.hbk
CDC*0
0
10
20
30
40
50
60
70
80
90
100
0
500
1000
1500
2000
2500
3000
ℒ (x10³⁰)


/home/usr/haba/daqdata/d8/usr/haba/weeklyzmon/thisweek.hbk
(2/18-5
3/13-19
I CDC (μA)
2000 Mar
2001 Feb
LER (mA)


cdccurr0 VS. beamcurl
/home/usr/haba/daqdata/d8/usr/haba/weeklyzmon/thisweek.hbk
I CDC (μA)
HER (mA)

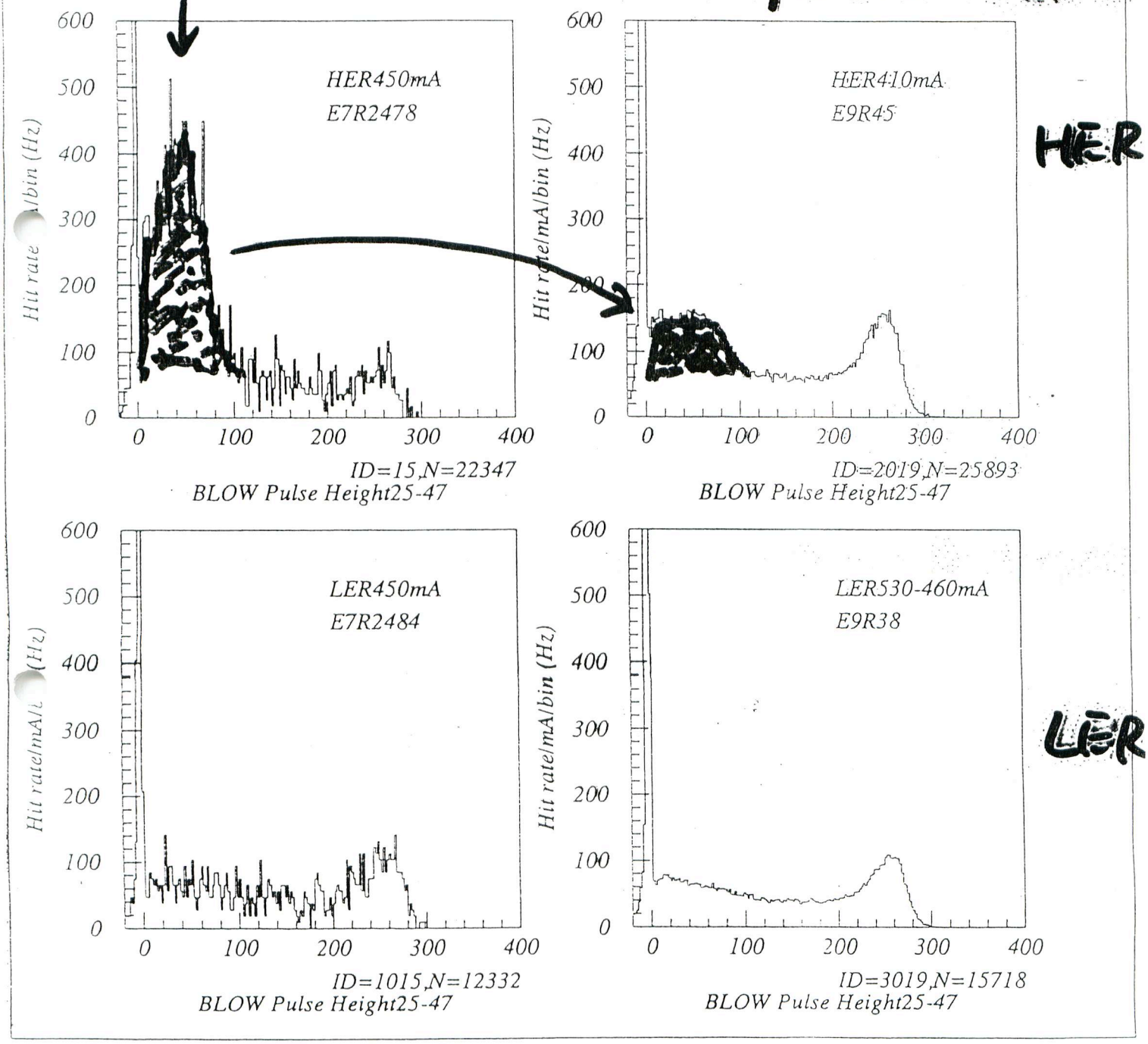

may2001/hbbz5z11.hbk
Typical weekly dose
2000 May
2001 Feb.
SVD dose (krad)
5
4
3
2
1
0
−1
0
1
2
3
4
5
6
7
8
mosfet0/1000−70 VS. datemon+time/24−501


SVD occupancy vs. HER current
Occ. (percent)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
SVD 1.2
SVD 1.4
← before
← after 2000 summer shutdo
HER
I (A)

CDC deposit energy

Reflected x-ray further reduced

~5keV



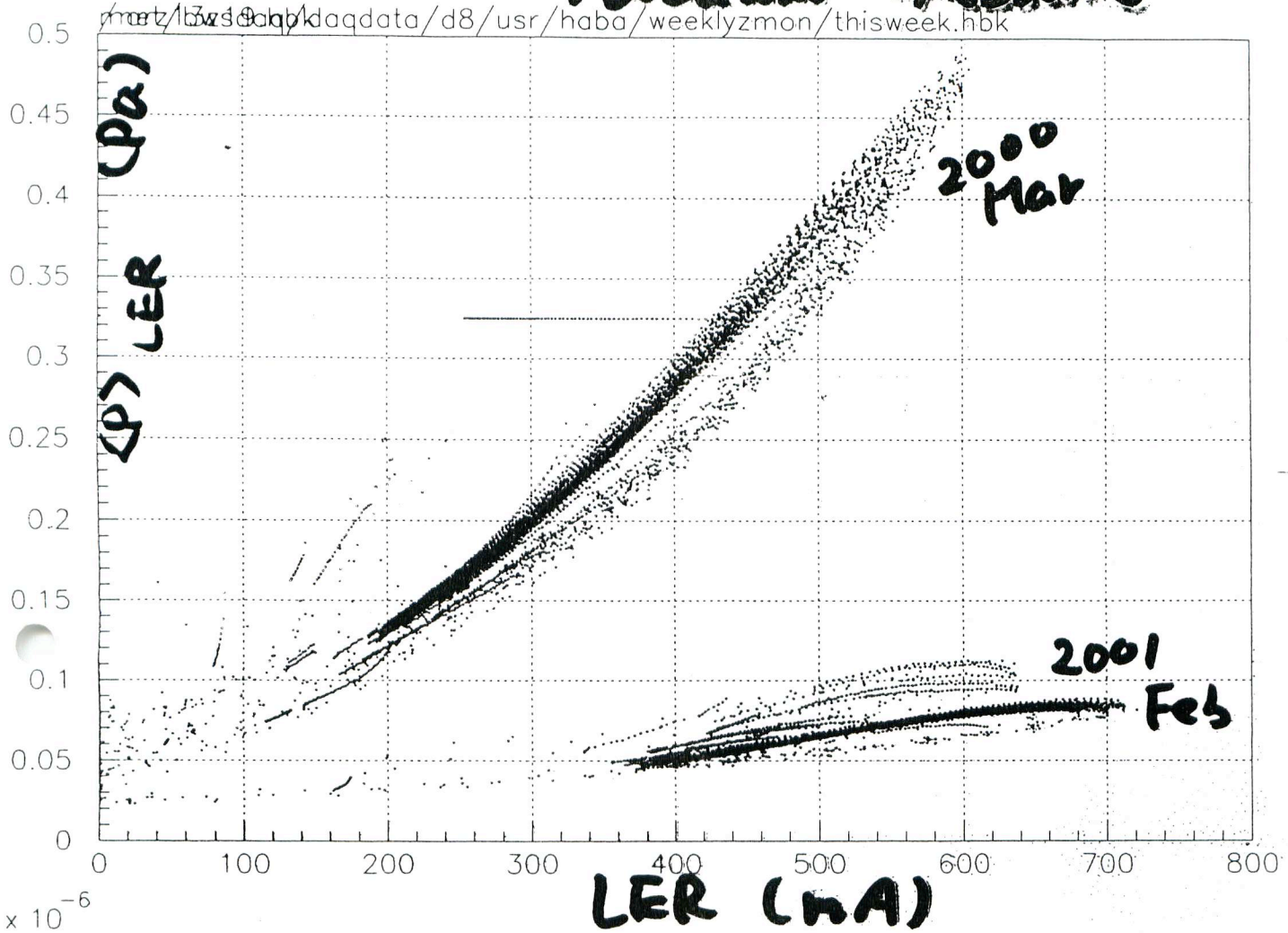
HER

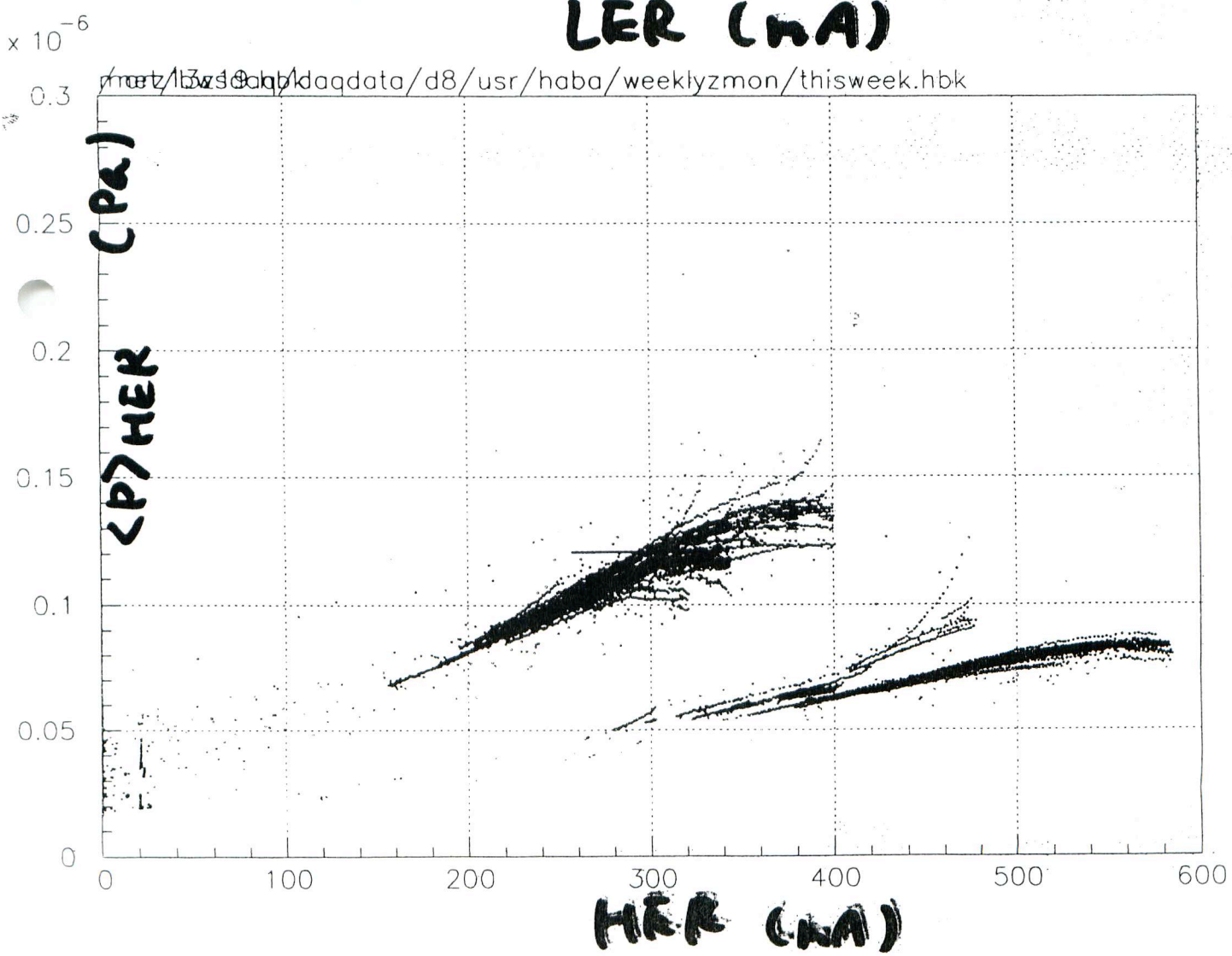
LER

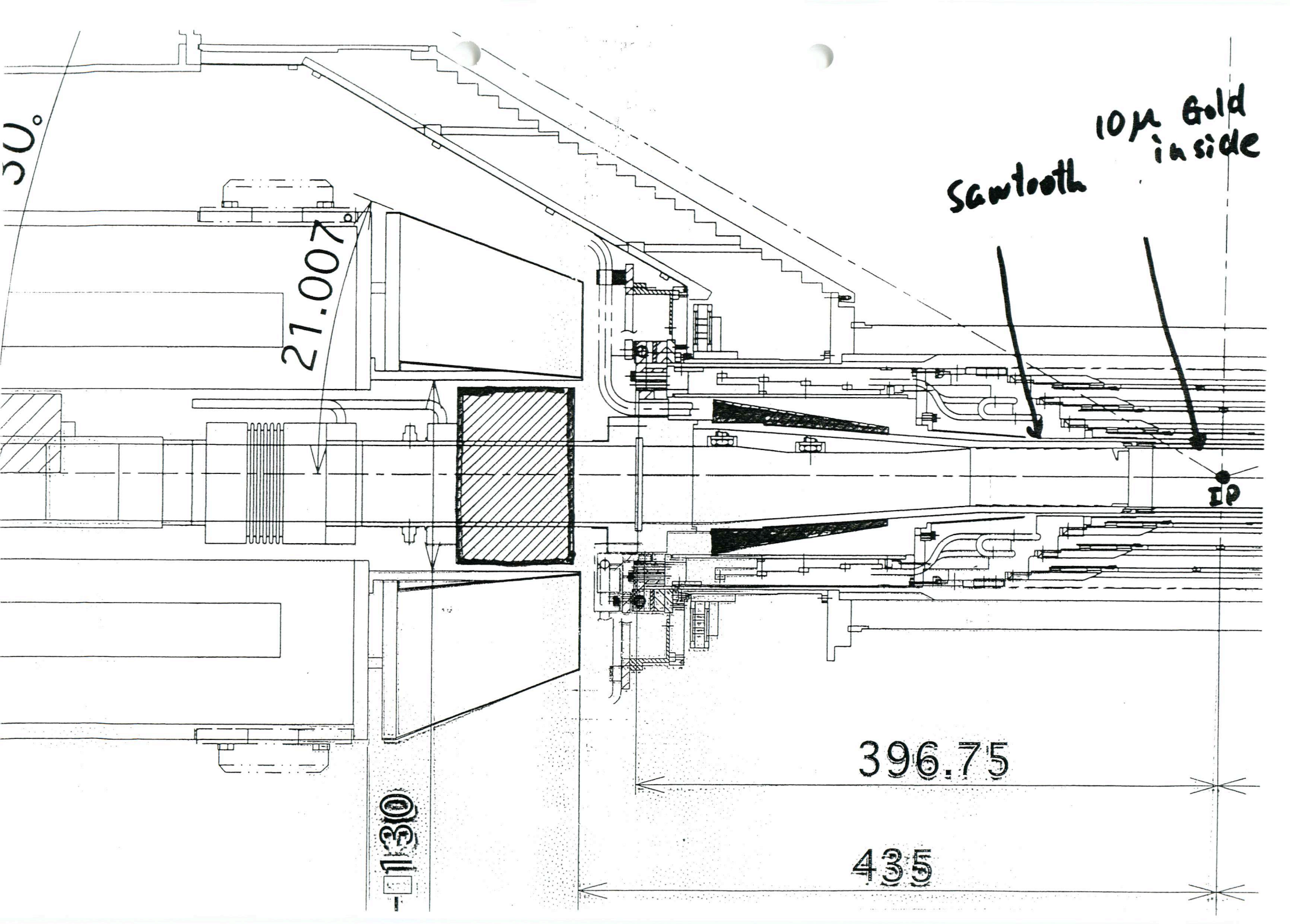
2000 .Jul.

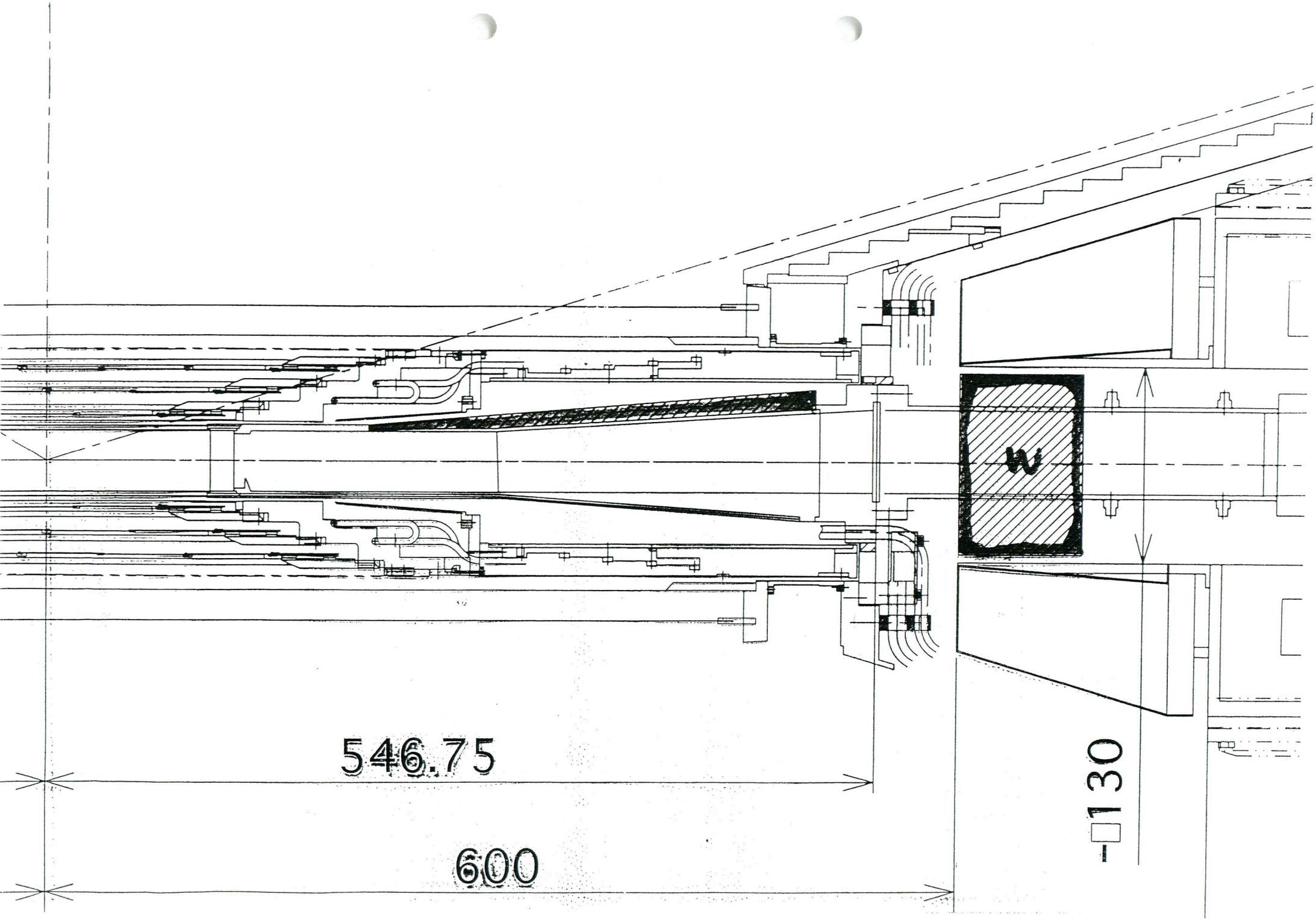
2000 Oct.

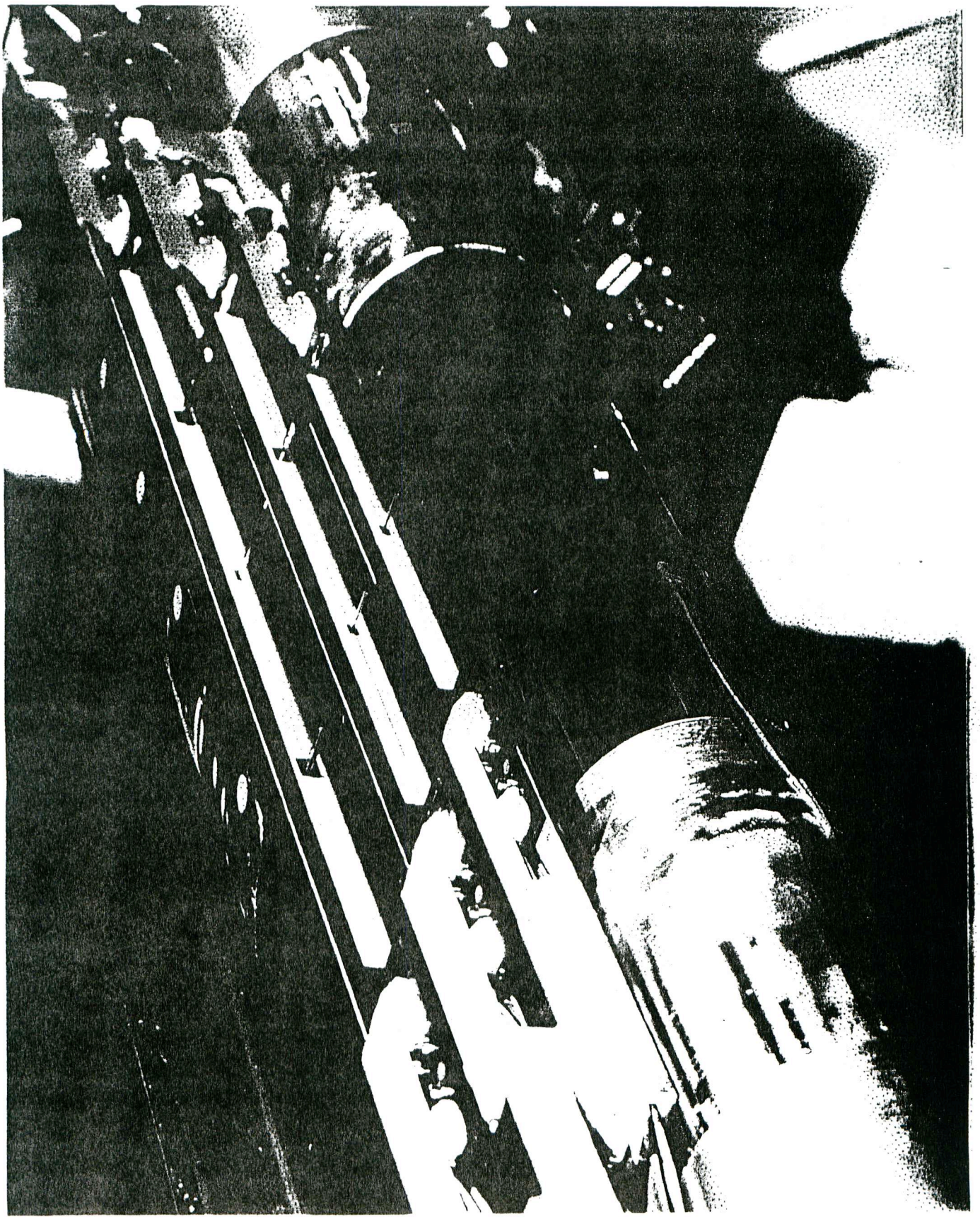
Vacuum Pressure

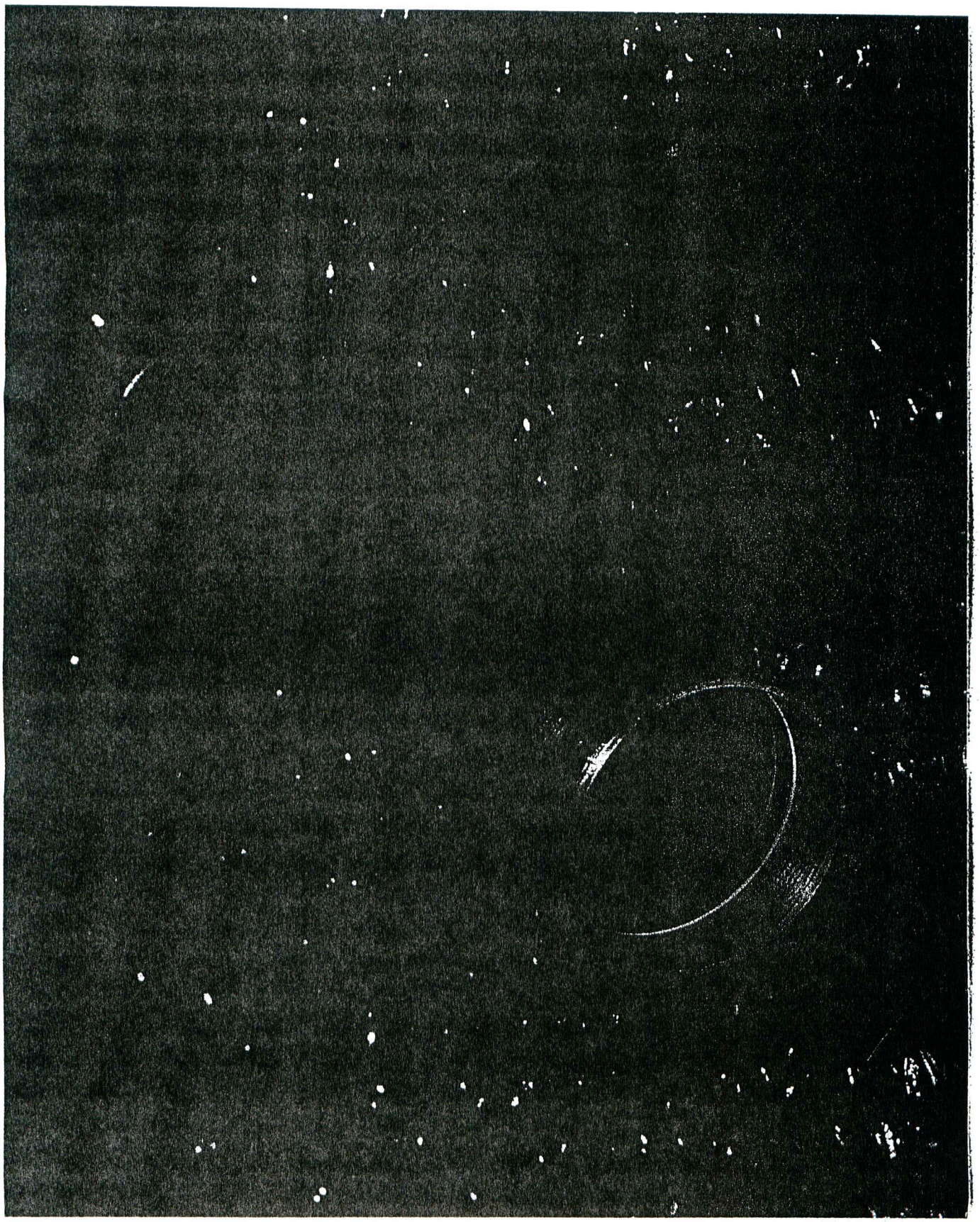


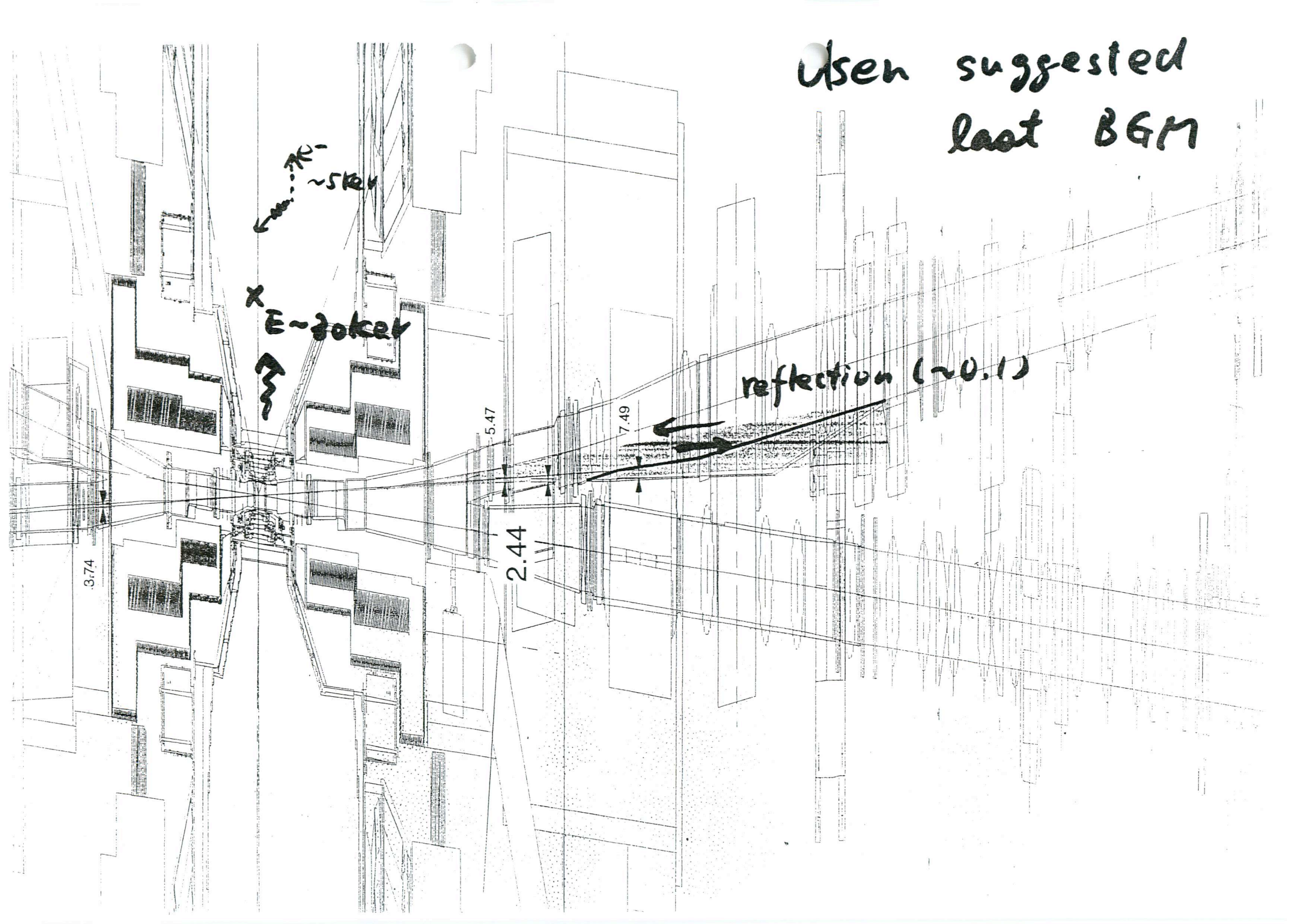


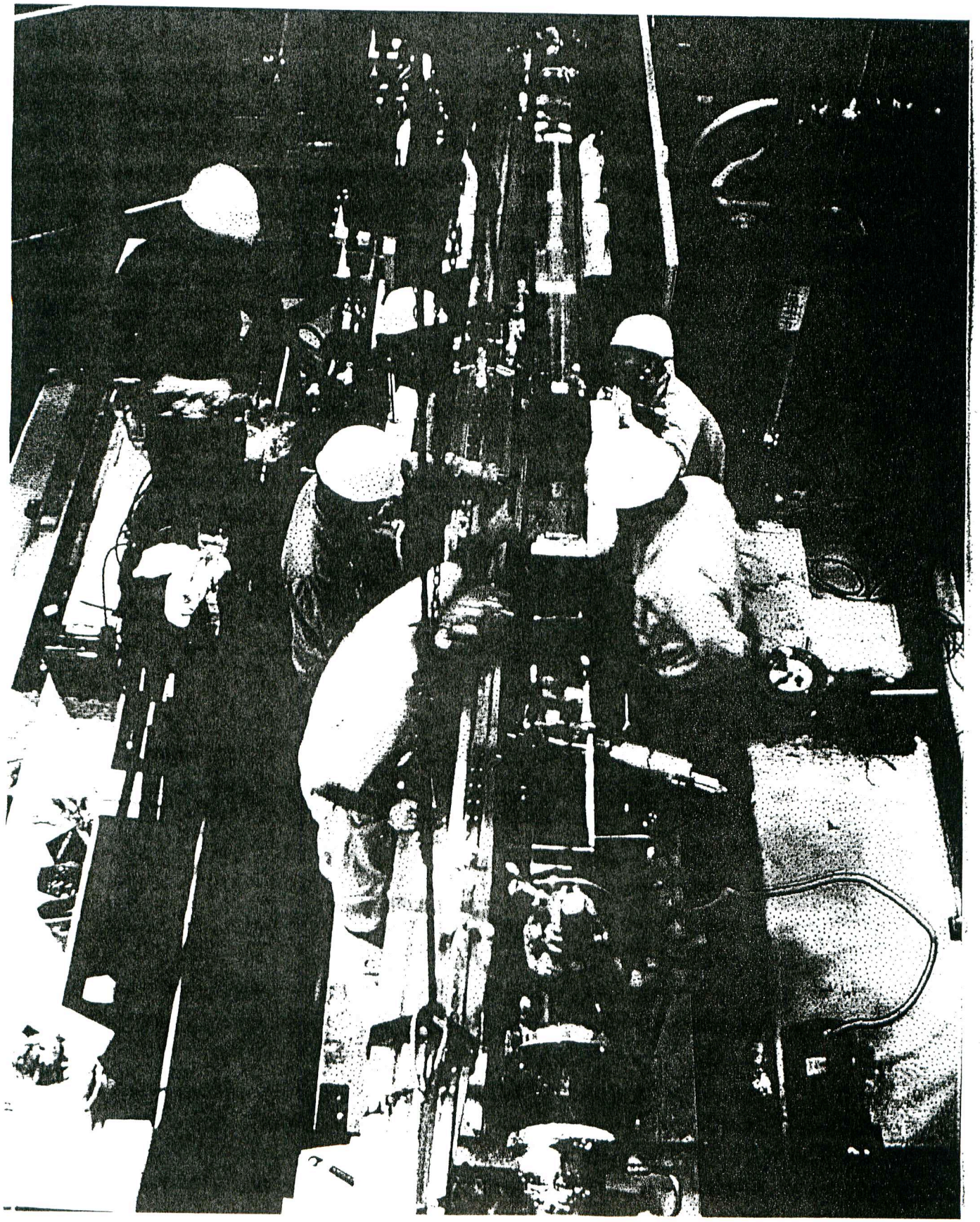

30°
21.007
Sawtooth
10μ Gold
inside
IP
396.75
435
□130


546.75
600
□130



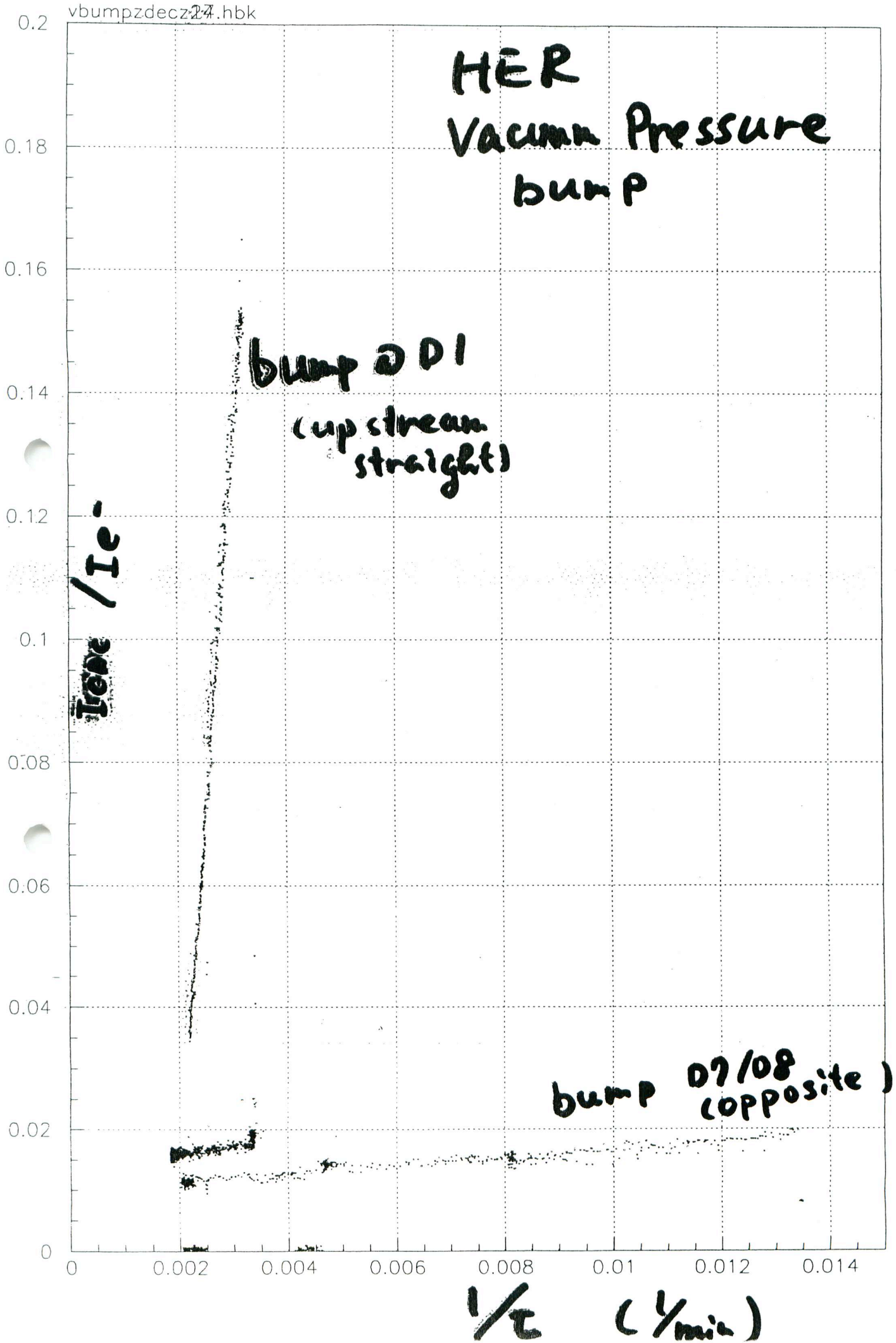


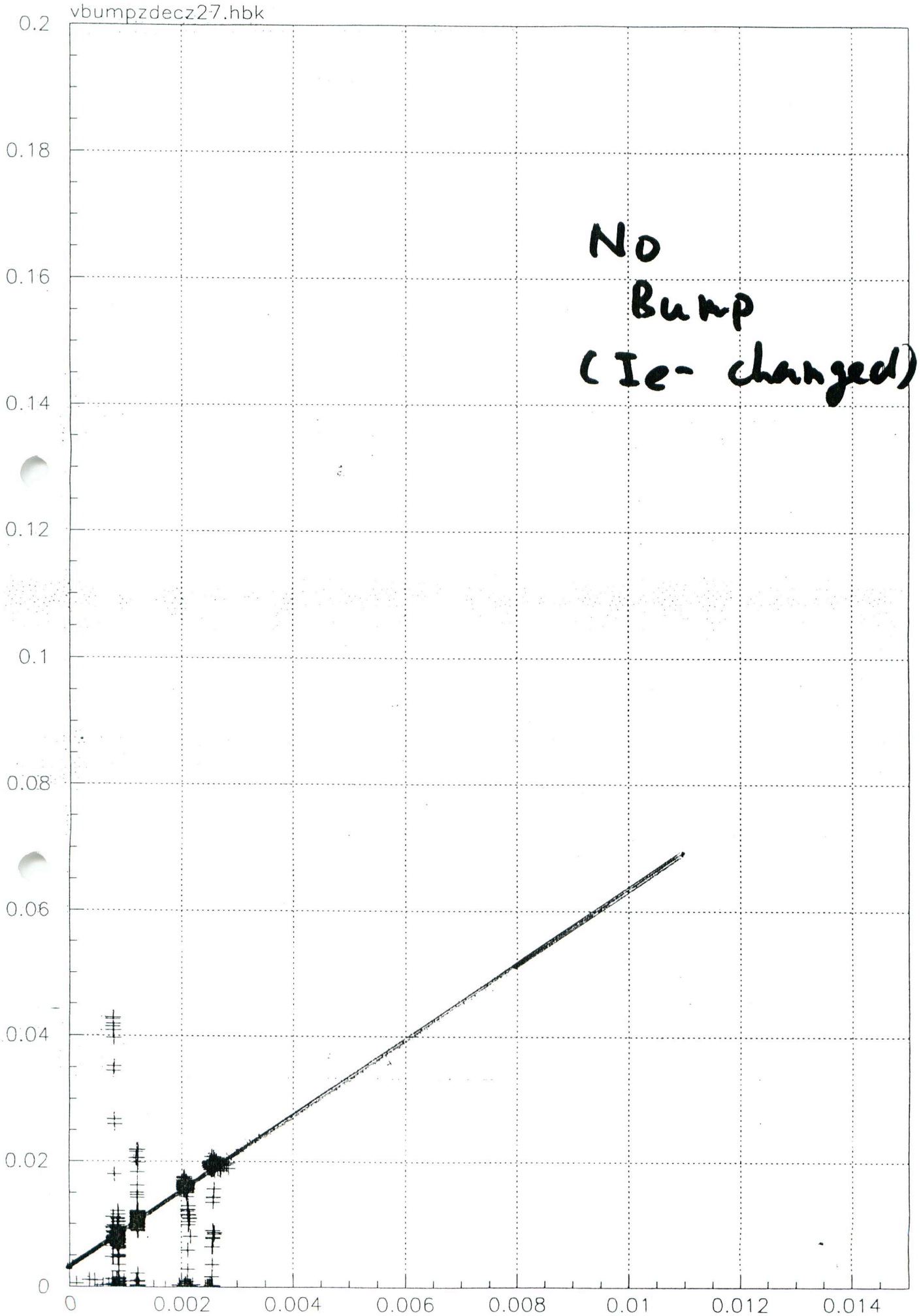

Usen suggested
last BGM
~5km
E~Joker
reflection (~0.1)
3.74
5.47
2.44
7.49

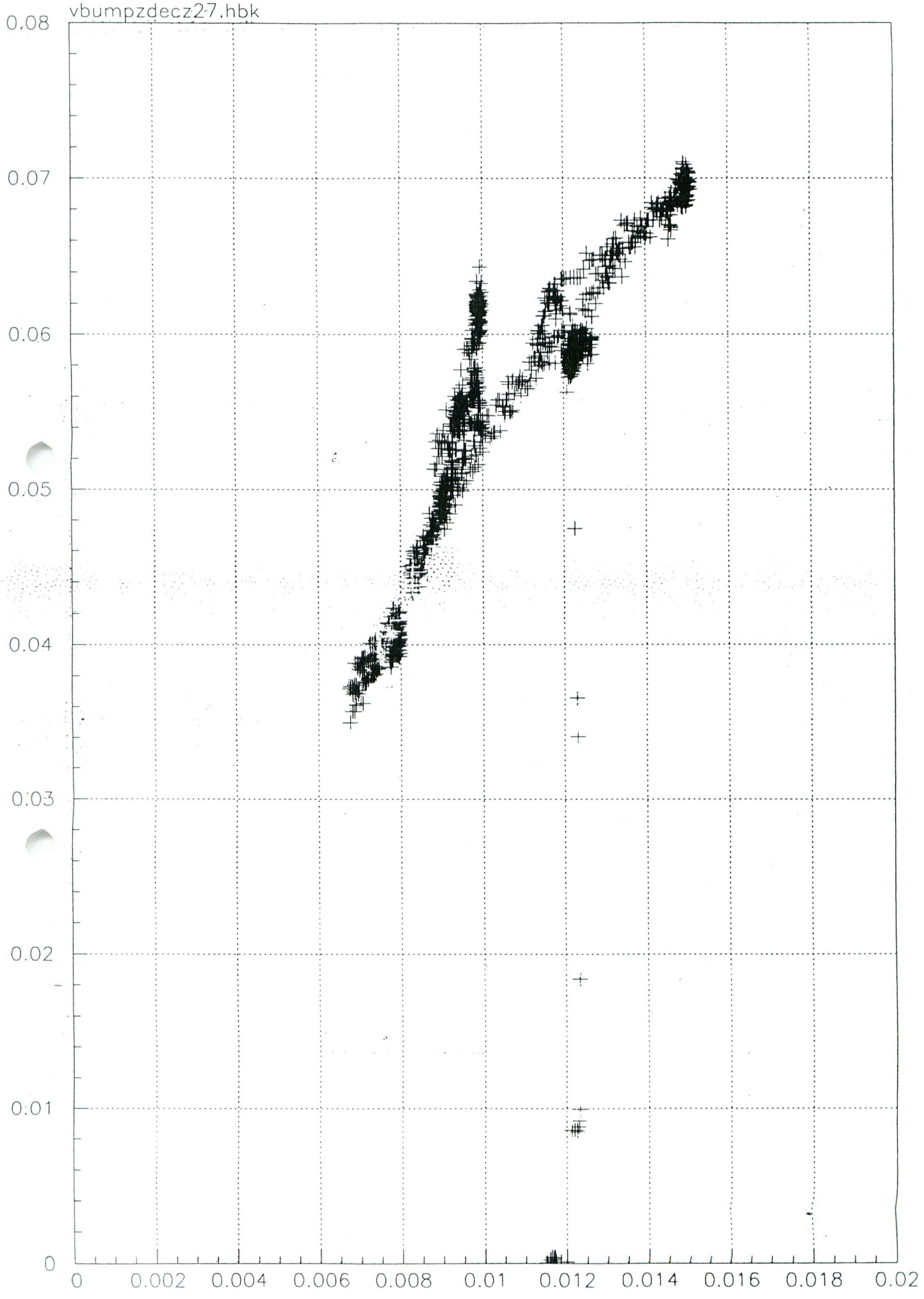


Vacuum Bump experiment Summary

	Location	bump length (m) ***L***	effective pressure rise in average vacuum from life time change (10-7Pa) ***V***	Bump height (10-7 Pa) ***V*L/3000***	Δ(1/life) (1/min) ***a***	Δ(CDC#0/Ibeam) (μA/mA) ***b***	slope ***b/a***
HER	D1 straight	65	2.0	92	0.001	0.12	120
HER	D1 arc Up	166	0.22	4.0	0.00015	0.028	187
HER	D1 arc down	76	0.11	4.3	same as above	same as above	
HER	DI IR	5	--	--	--	--	
HER	D6 arc	240	2.6	32.5	0.00145	0.0006	0.41
HER	D2 straight	174	3.2	55	0.0016	tiny change	0
HER	D7/D8	482	19	118	0.012	0.01	0.83
HER	No Bump	3000	0.7 @500mA	--	0.0026	0.018	7
LER	D10/D11	192	3.8	59	0.0043	0.013	3
LER	IP <-> BL1RP	20	0.01	1.5	same as below	same as below	
LER	BL1RP<->arc	95	1.0	32	0.001	0.015	15
LER	D7 straight	70	1.7	73	0.0016	0.004	2.5
LER	No Bump	3000	0.8 @600mA	--	0.0045	0.021	5

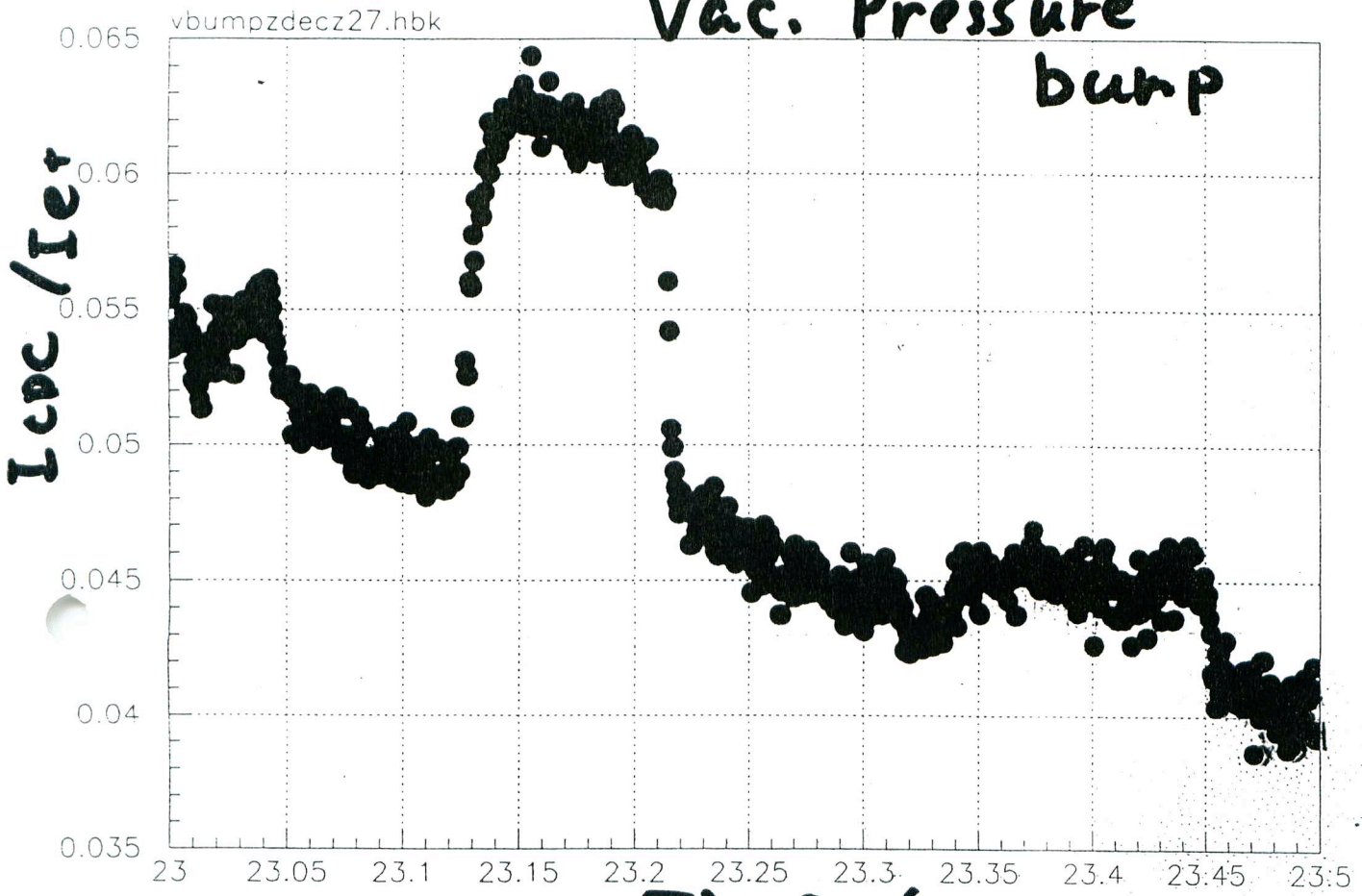

vbumpzdecz24.hbk
HER
Vacuum Pressure
bump
bump @ D1
(upstream
straight)
bump @ D7/D8
(opposite)
Irene /Ie-
1/t (1/min)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.002
0.004
0.006
0.008
0.01
0.012
0.014

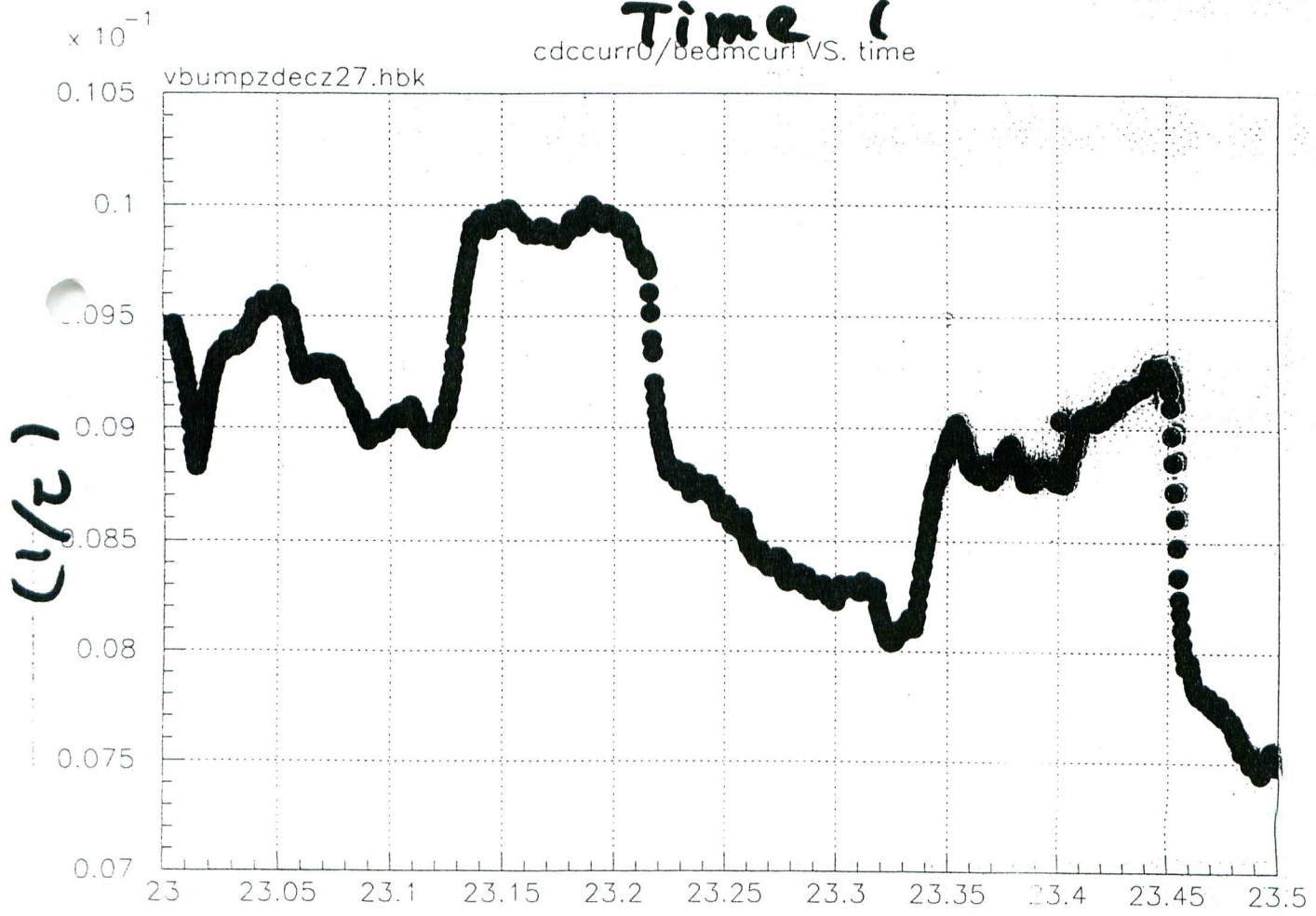

vbumpzdecz27.hbk
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.002
0.004
0.006
0.008
0.01
0.012
0.014
No
Bump
(Ie- changed)

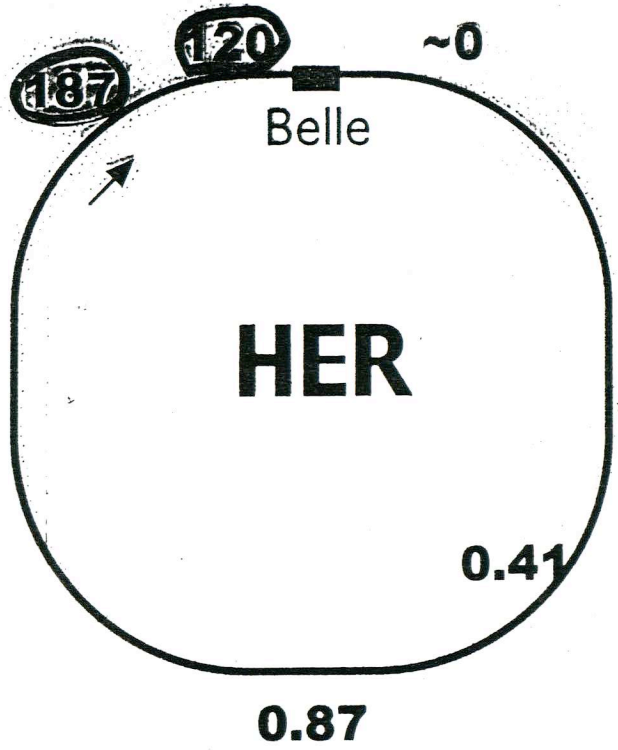

vbumpzdecz27.hbk
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
0.002
0.004
0.006
0.008
0.01
0.012
0.014
0.016
0.018
0.02

LER Vac. Pressure bump

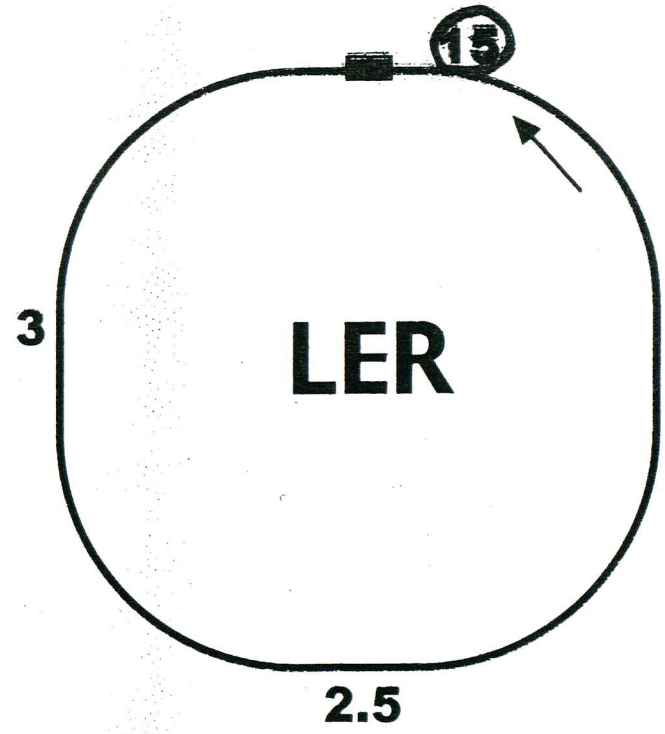
z1/02/22 21.13







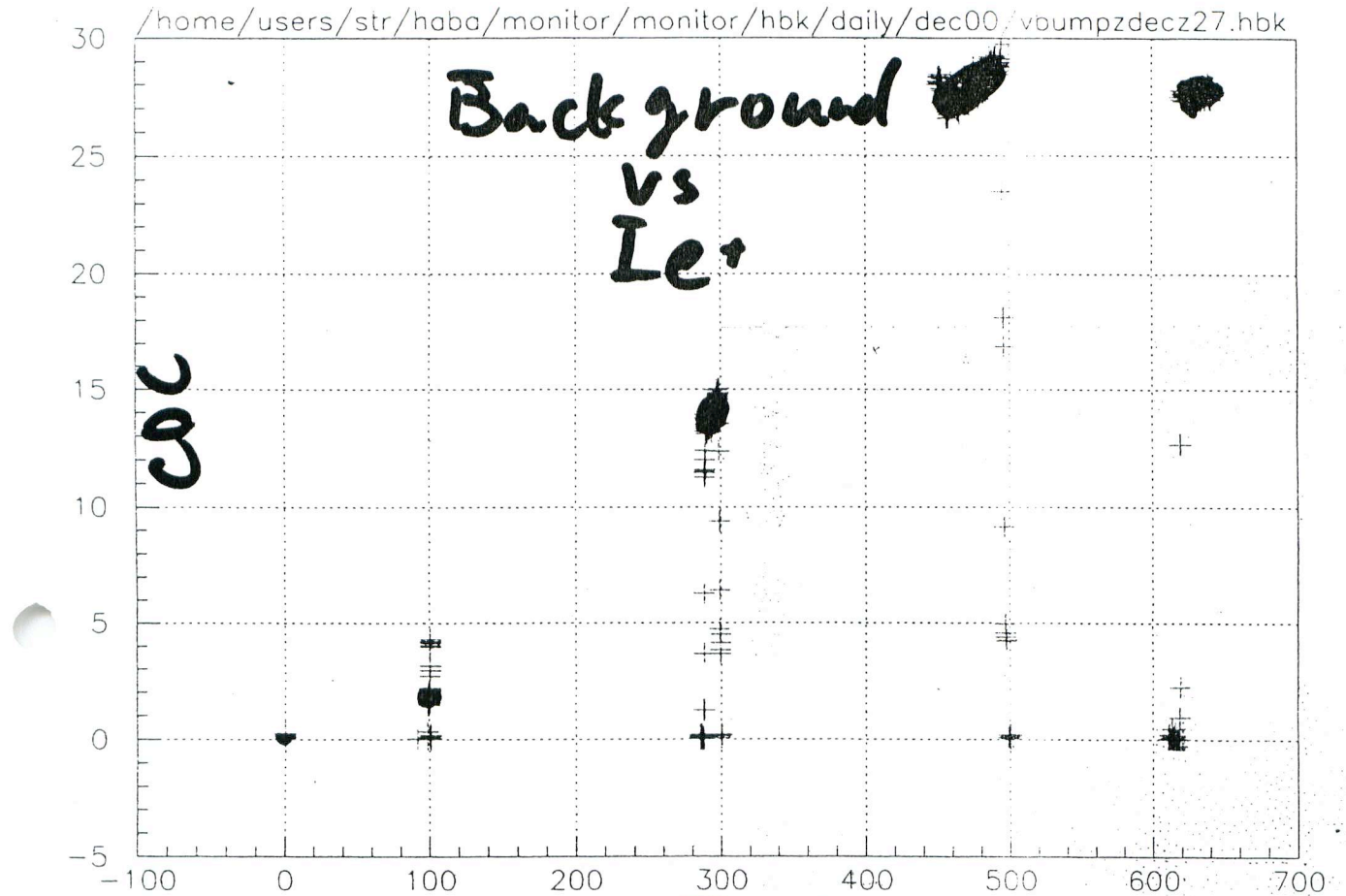
$\Delta(CDC_{leak})//\Delta(1/\tau)$



Brief summary

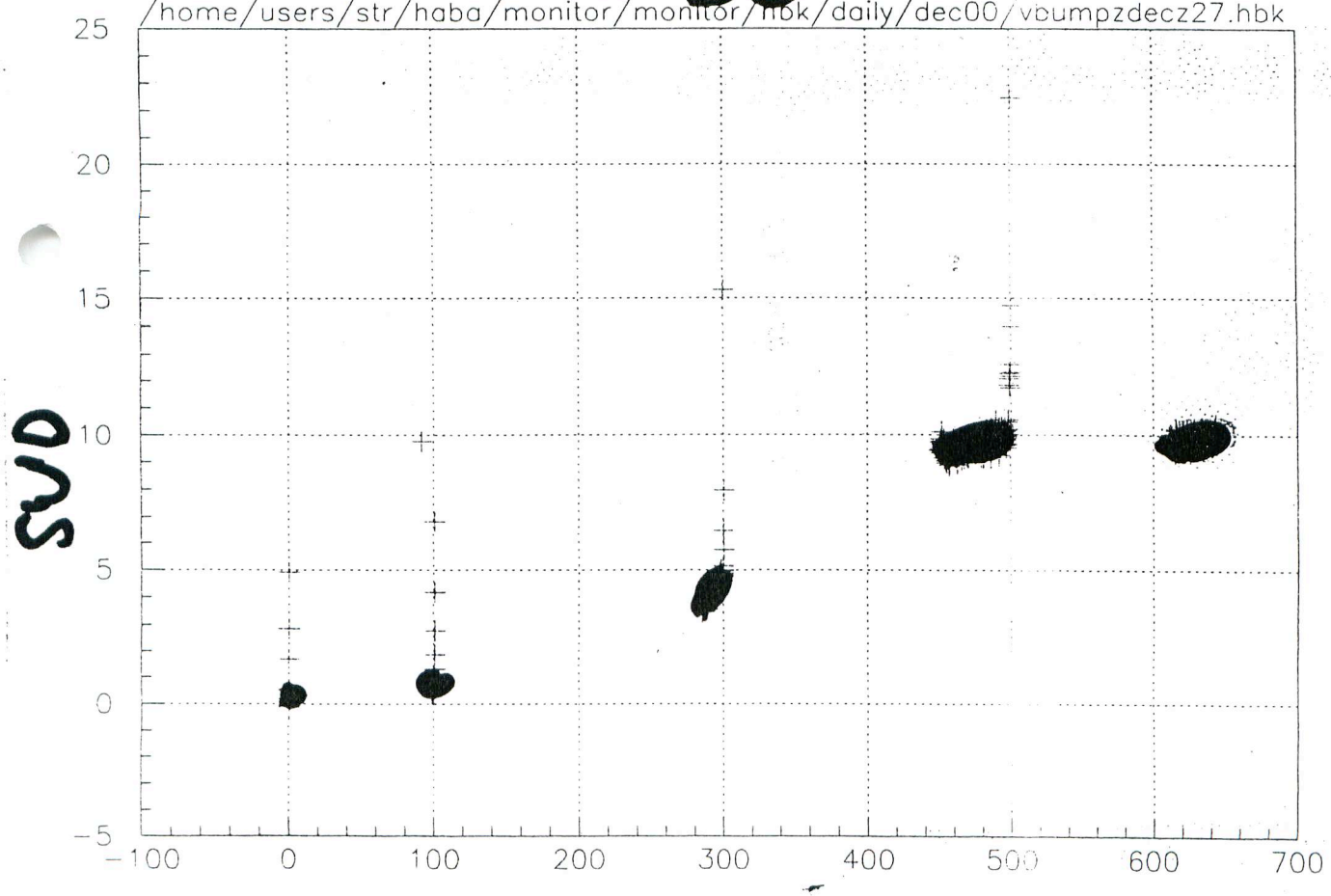
Strange behavior

z1/02/15 20.59



Ie+

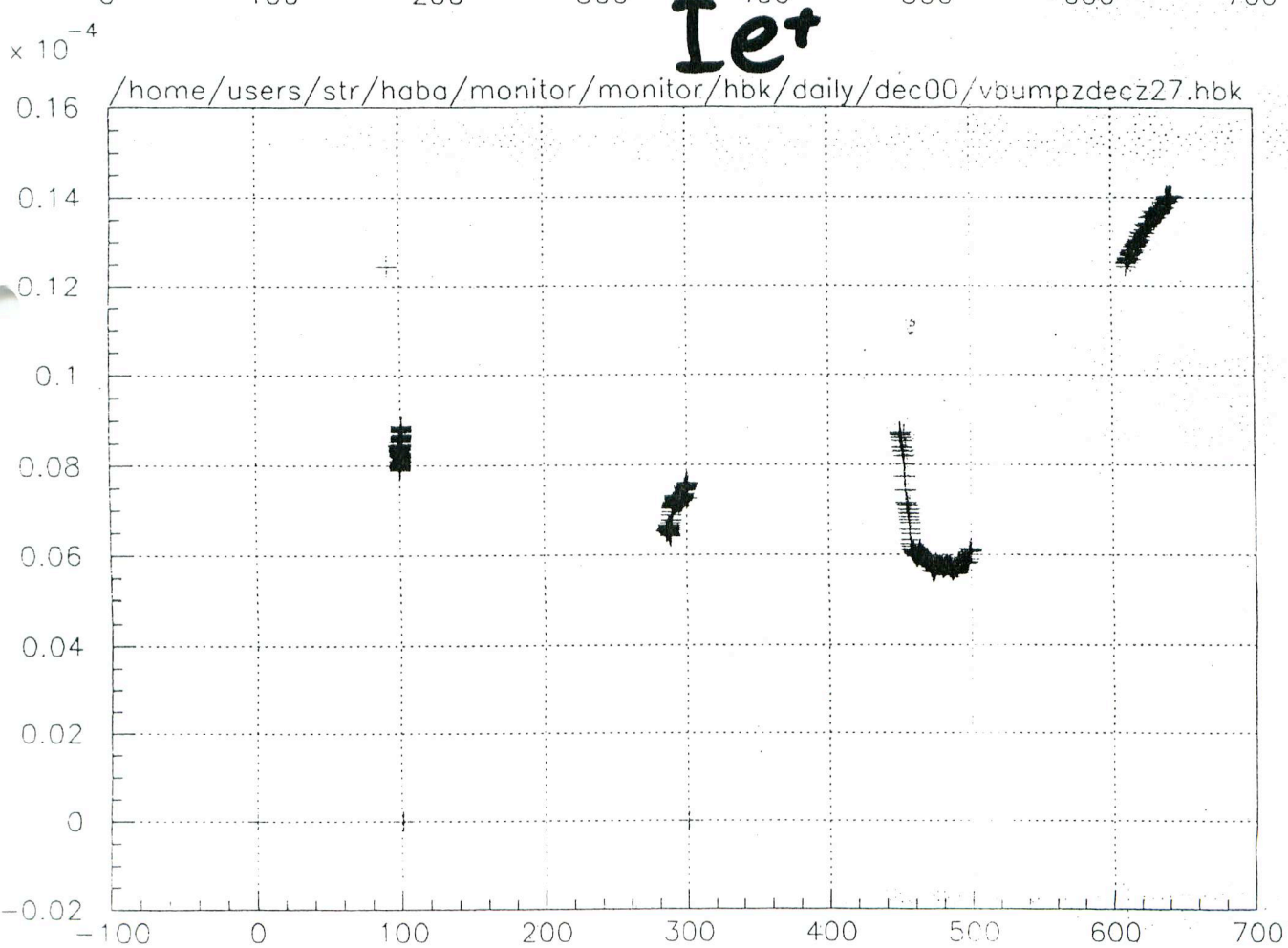
cdccurr0 VS. beamcurl



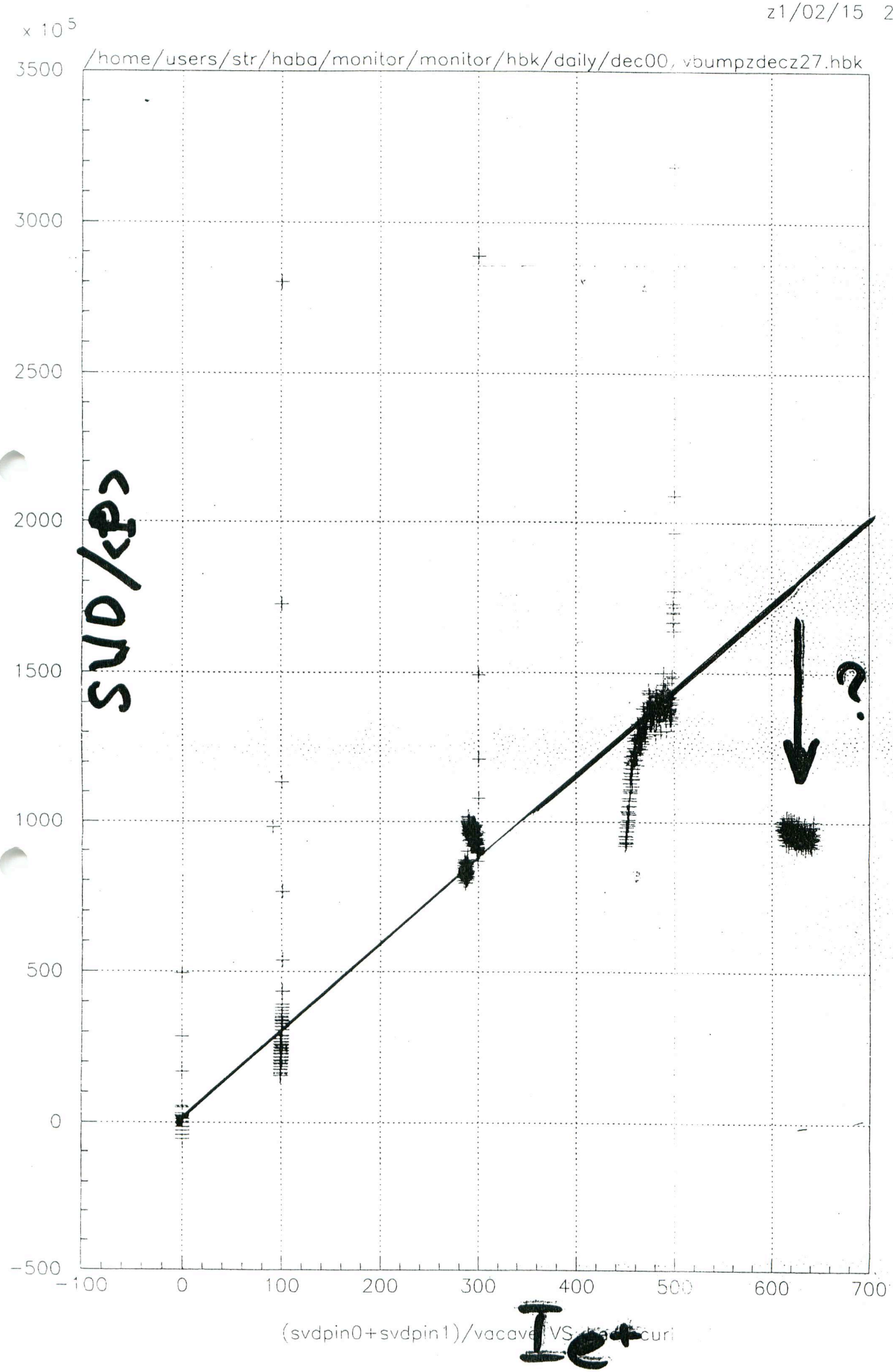
svdpin0+svdpin1 VS. beamcurl

What happened!

Ie+

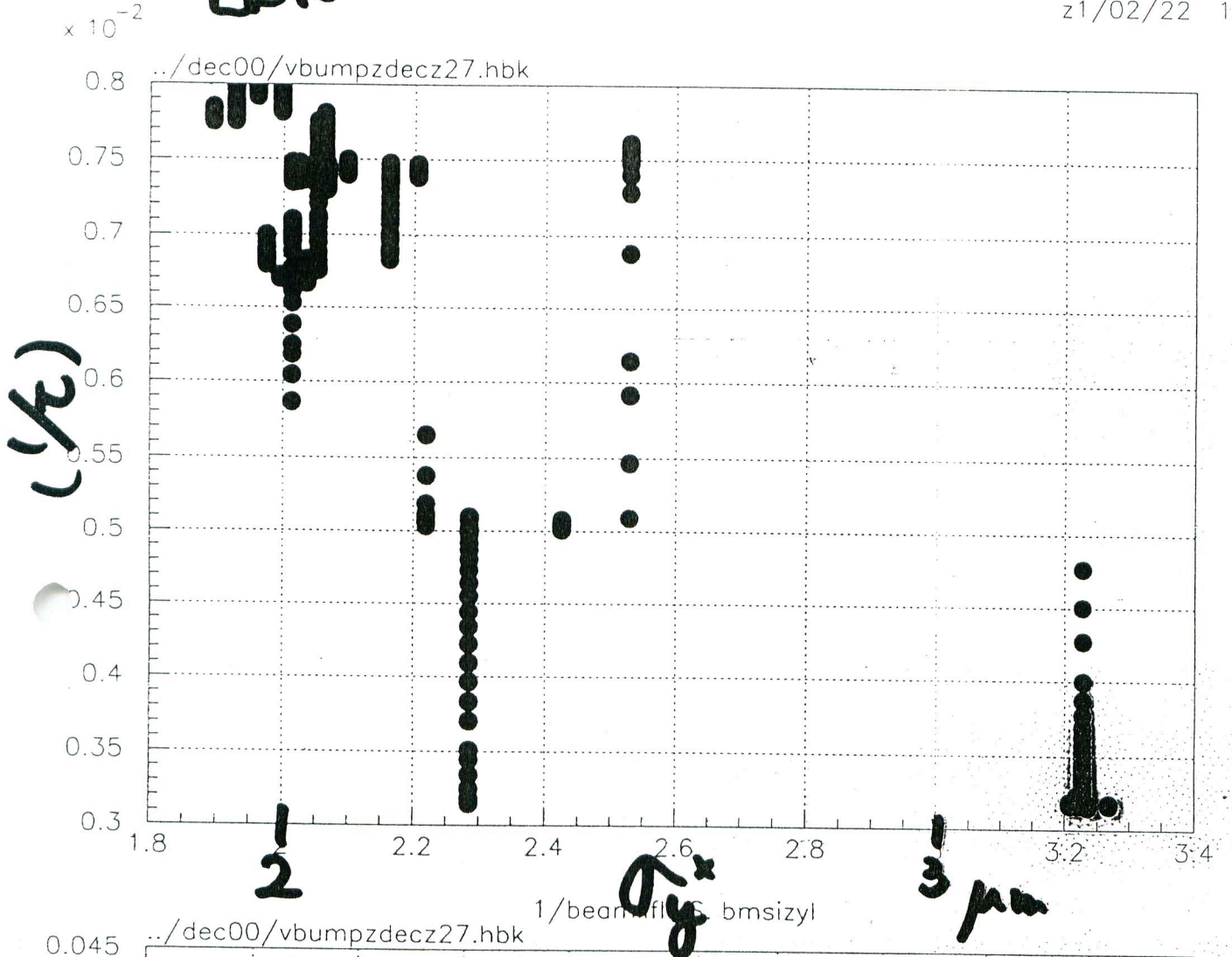


beamlifl*vacavel VS. beamcurl


x 10^5
/home/users/str/haba/monitor/monitor/hbk/daily/dec00/vbumpzdecz27.hbk
3500
3000
2500
2000
1500
1000
500
0
-500
-100
0
100
200
300
400
500
600
700
SVD/<P>
?
(svdpin0+svdpin1)/vacave
VS
curr
Ie+

LER

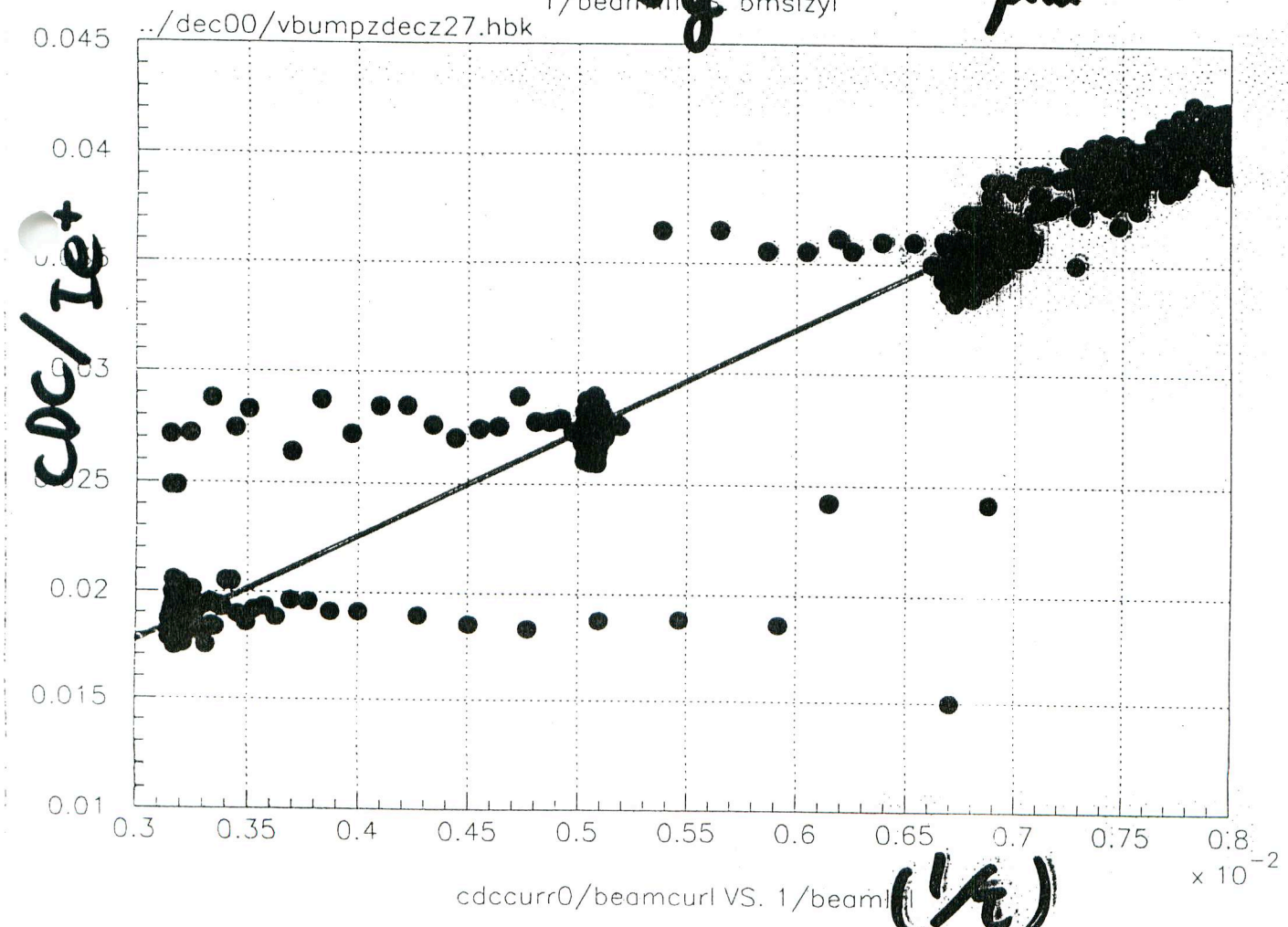
z1/02/22 12.01



(1/t)

σ_y^*

μm

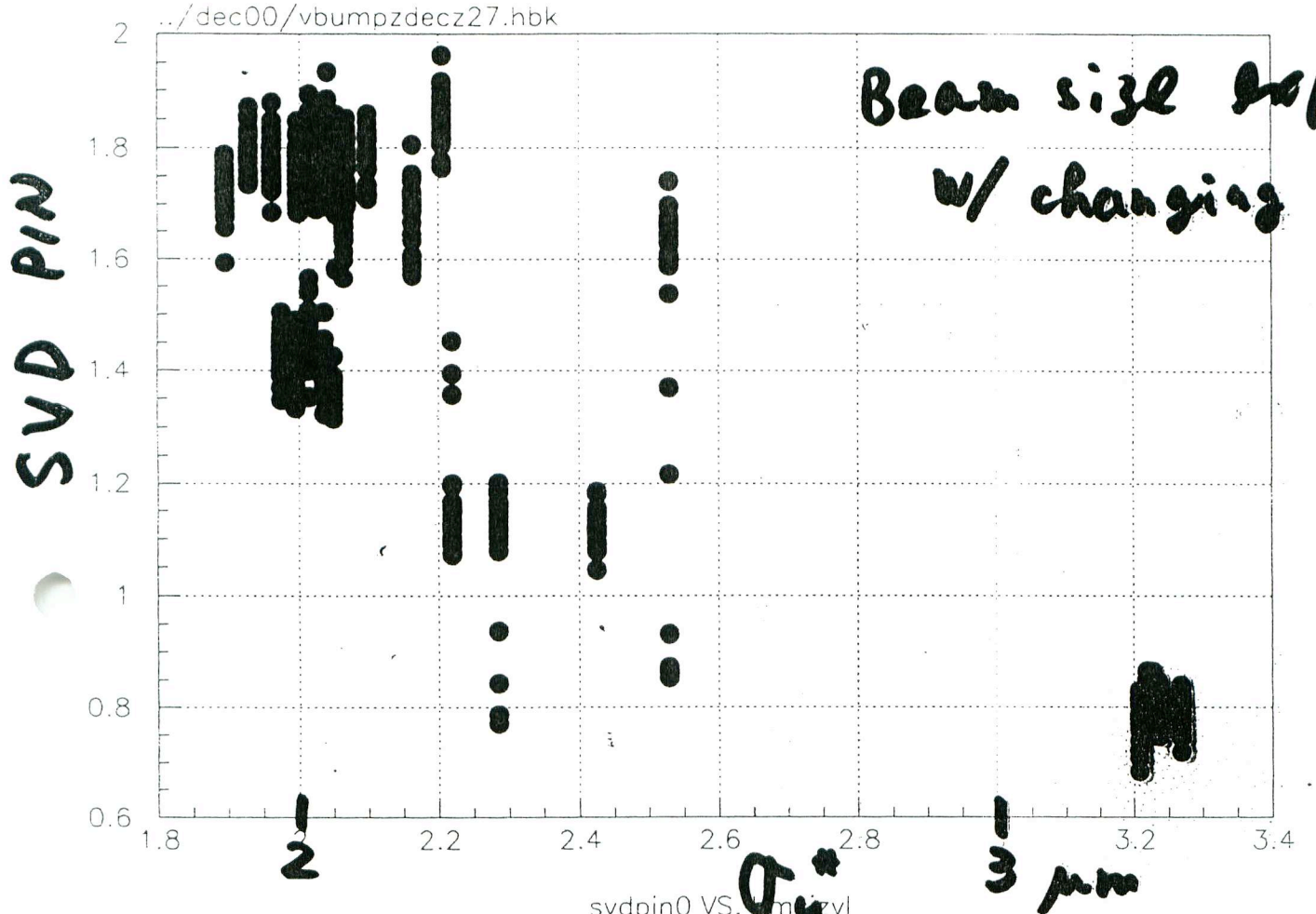


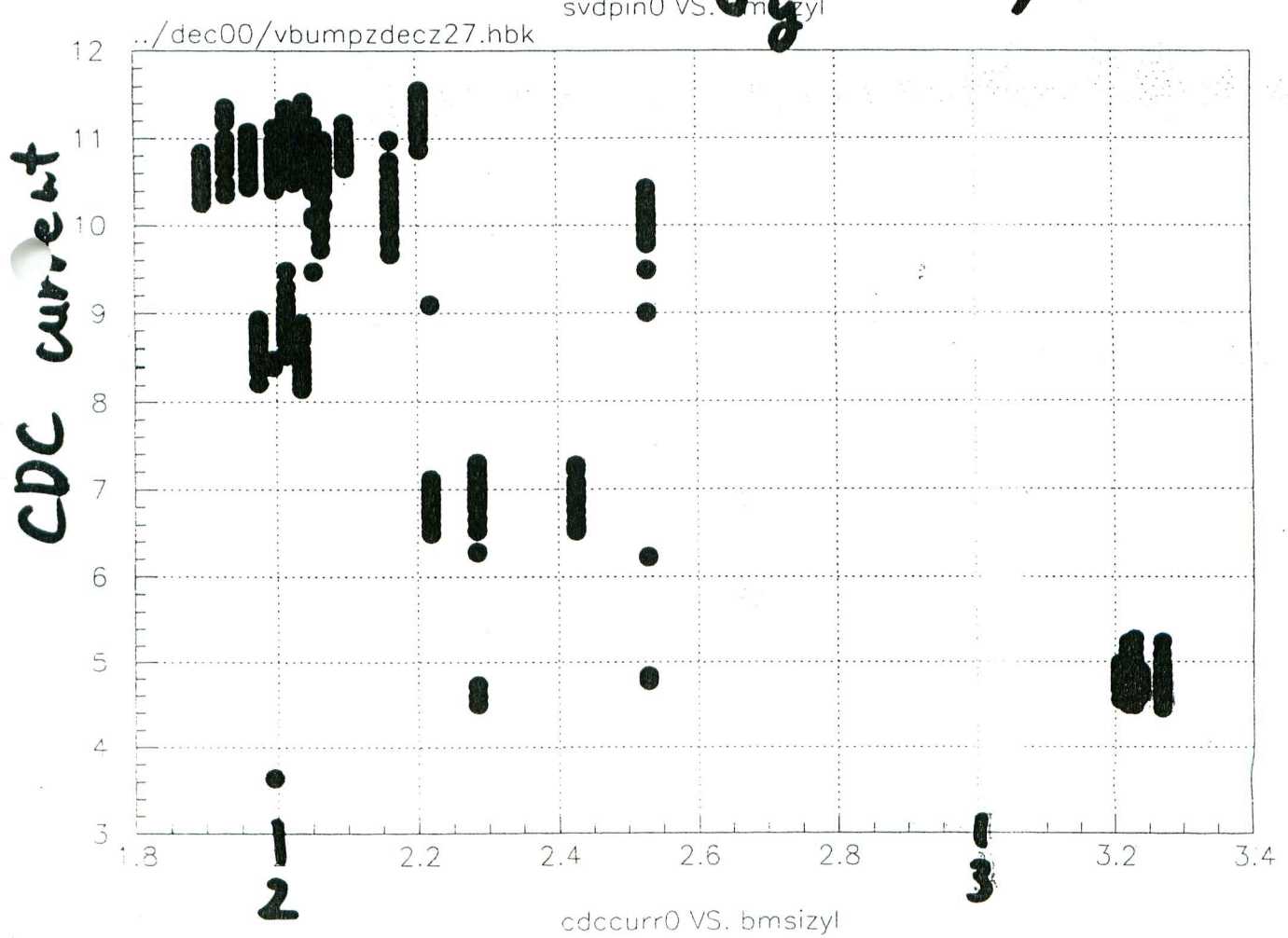
cdc/1e+

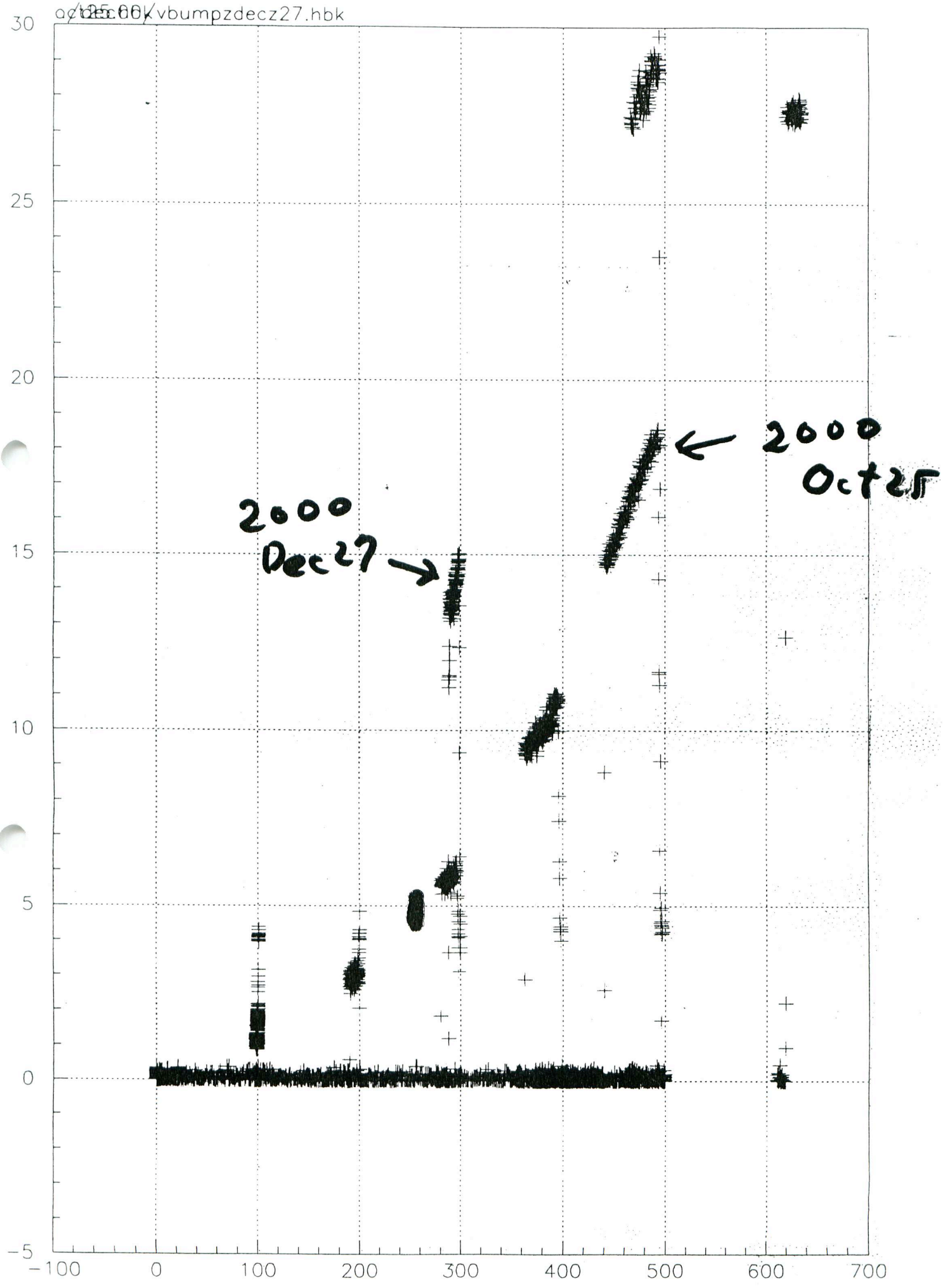
(1/t)

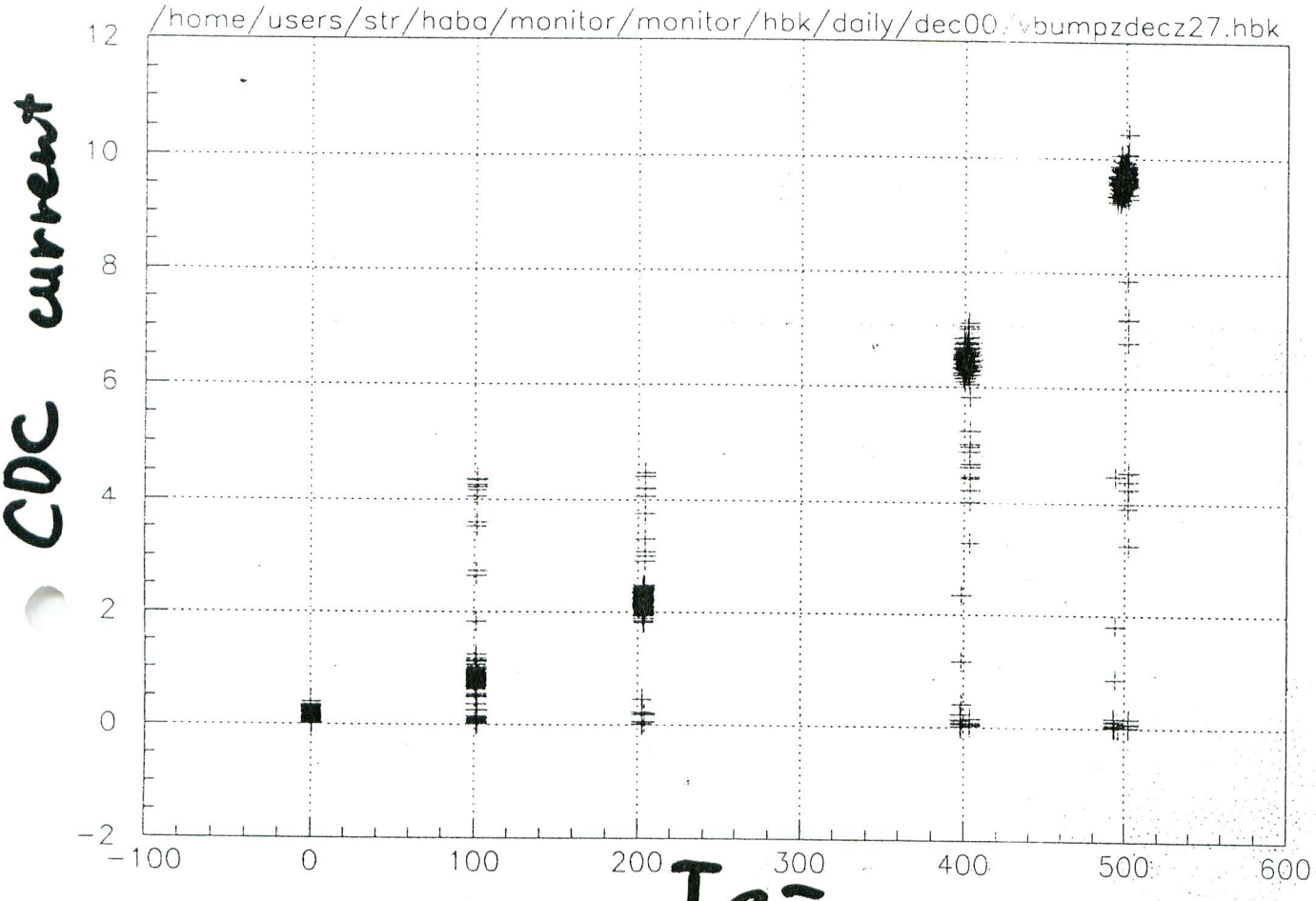
LER

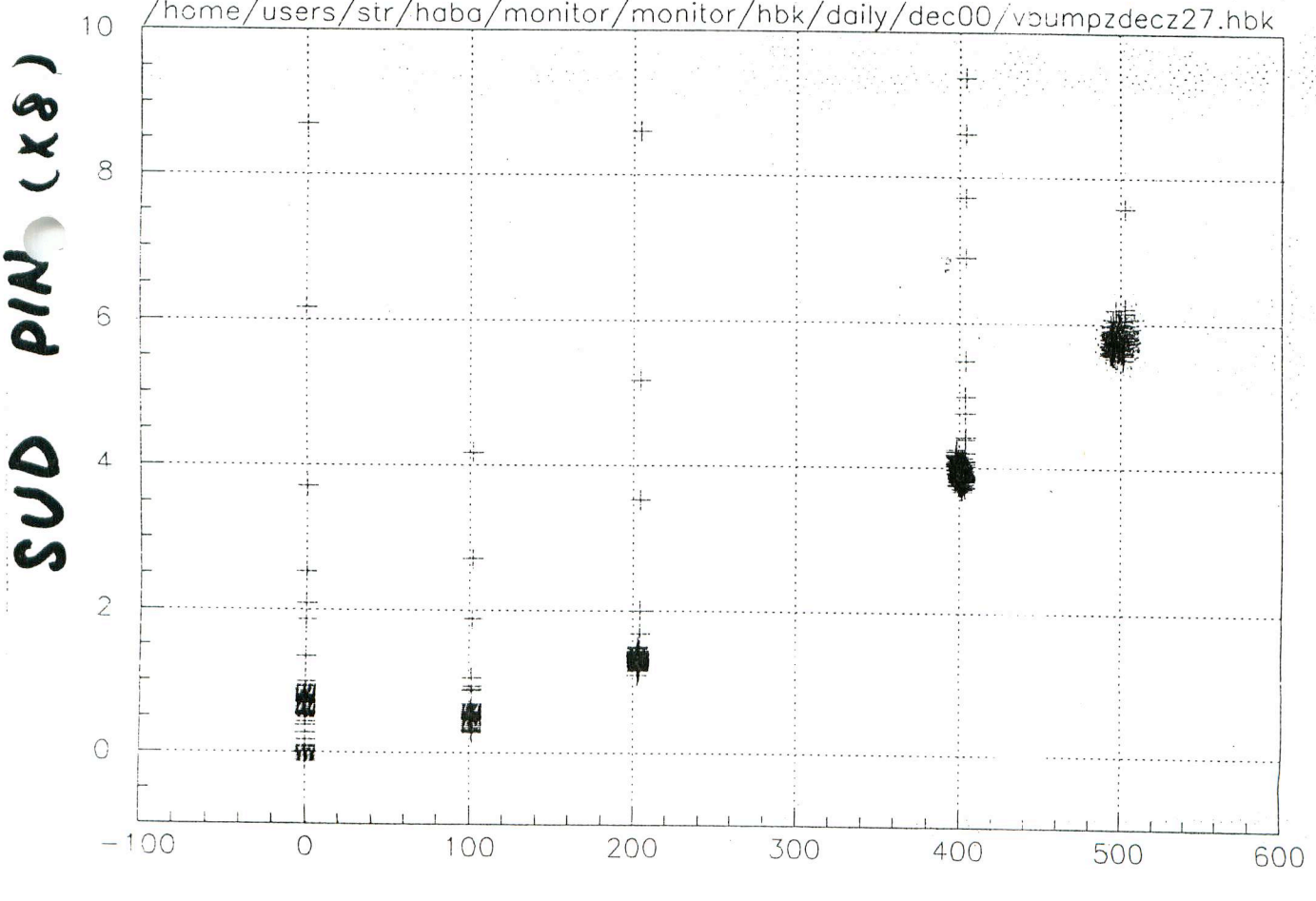
z1/02/22 11.58





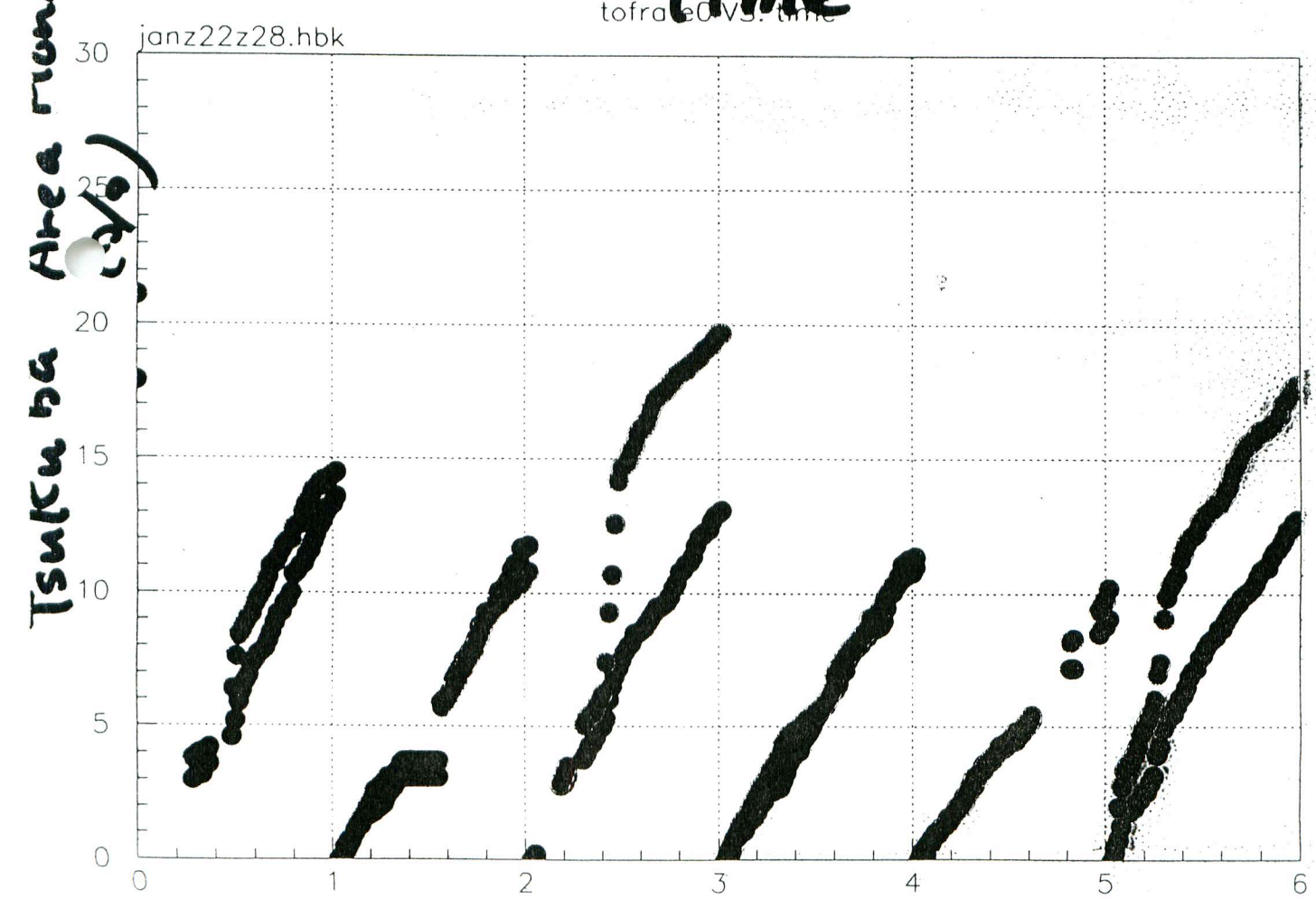

/125.00K/vbumpzdecz27.hbk
30
25
20
15
10
5
0
−5
−100
0
100
200
300
400
500
600
700
2000
Dec27
2000
Oct25
cdccurr0 VS. beamcurl

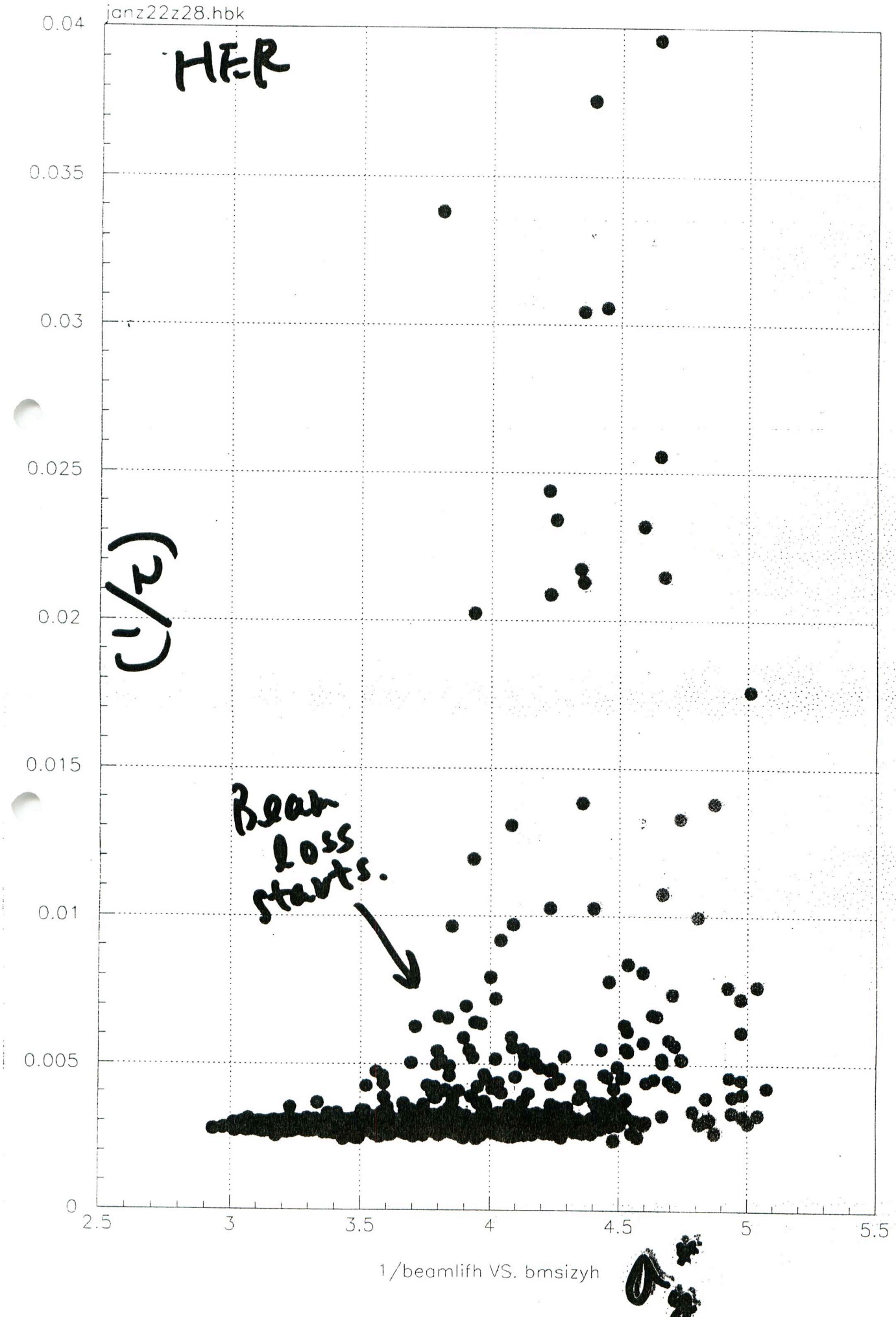

/home/users/str/haba/monitor/monitor/hbk/daily/dec00/vbumpzdecz27.hbk
CDC current
12
10
8
6
4
2
0
−2
−100
0
100
200
300
400
500
600
Ie-
cdccurr0 VS. beamcurh


/home/users/str/haba/monitor/monitor/hbk/daily/dec00/vbumpzdecz27.hbk
SVD PIN (x8)
10
8
6
4
2
0
−100
0
100
200
300
400
500
600
svdpin0+svdpin1 VS. beamcurh

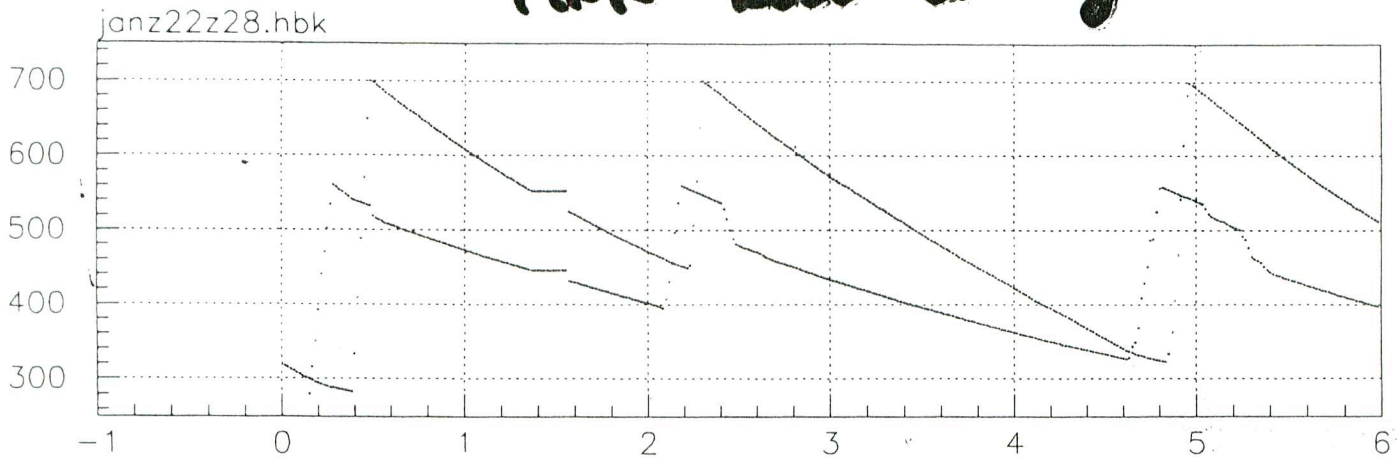
HER Loss

z1/02/21 12.15

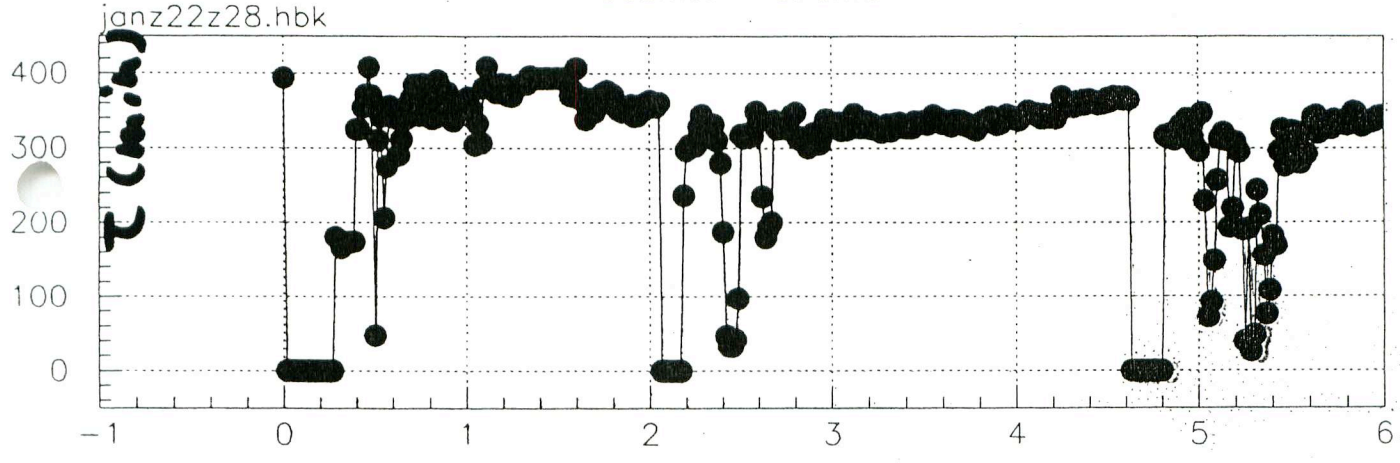



janz22z28.hbk
HER
(1/τ)
Beam loss starts.
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
2.5
3
3.5
4
4.5
5
5.5
1/beamlifh VS. bmsizyh

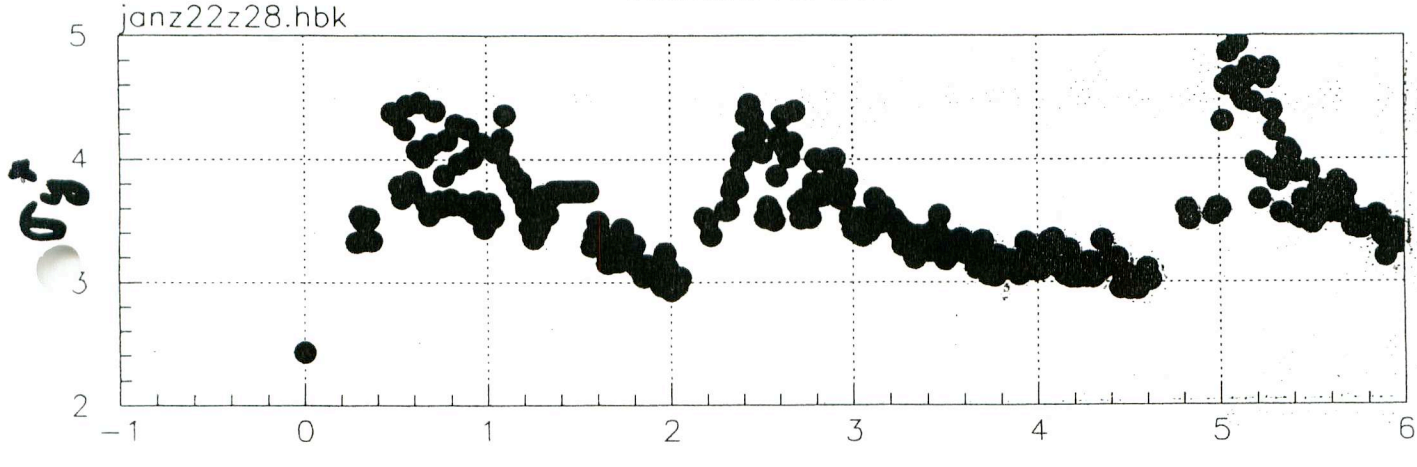
HER Loss & σ_y^*



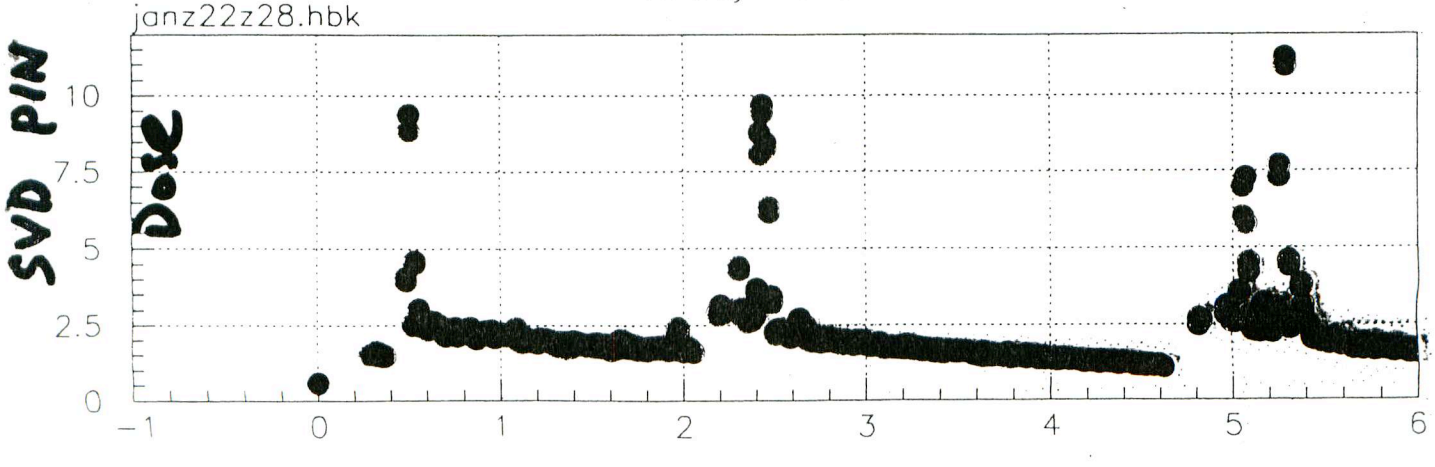
beamcurl VS. time



beamlifh VS. time

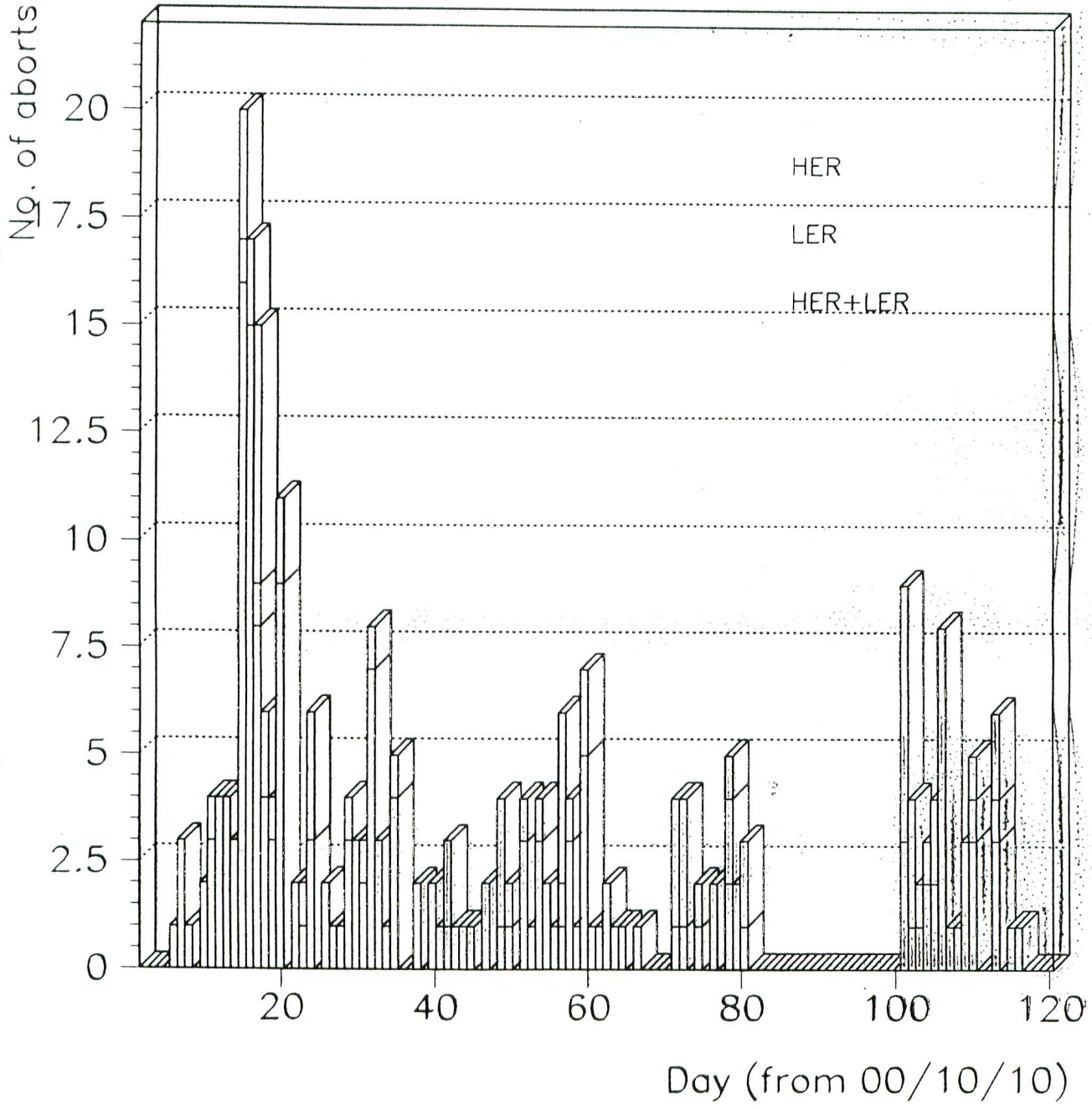


bmsizyh VS. time



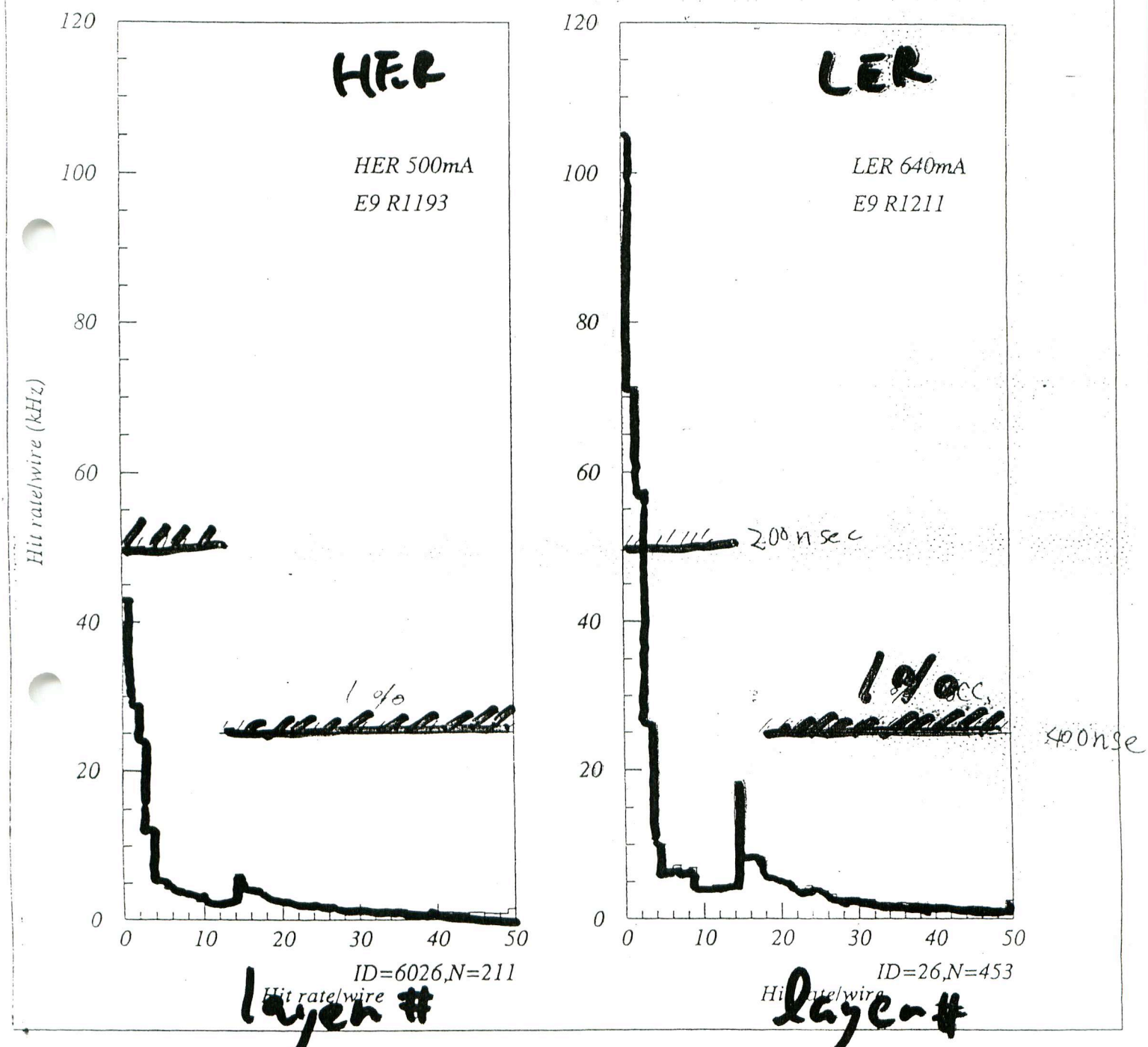
svdpin0 VS. time

Belle Abort become rare

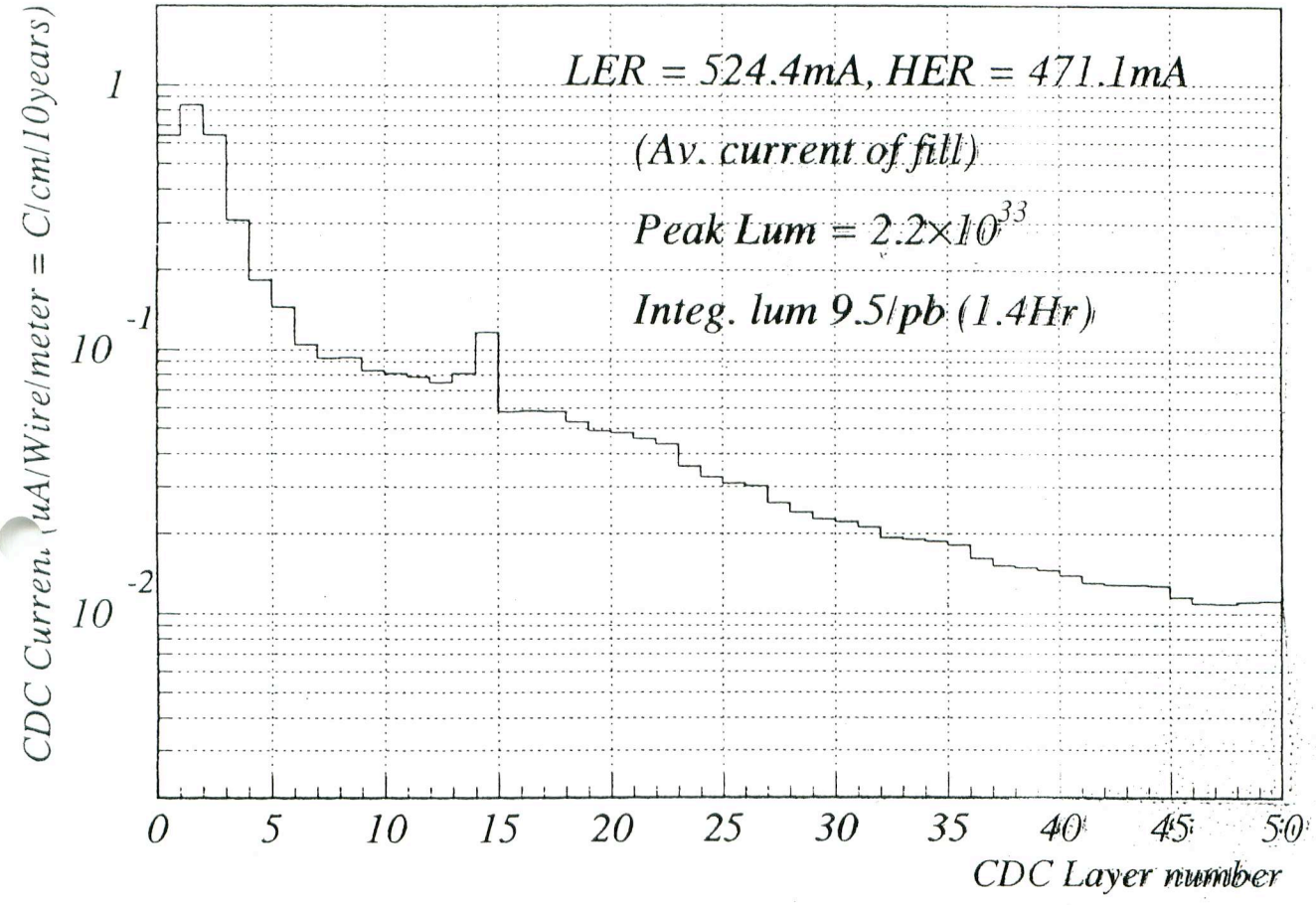


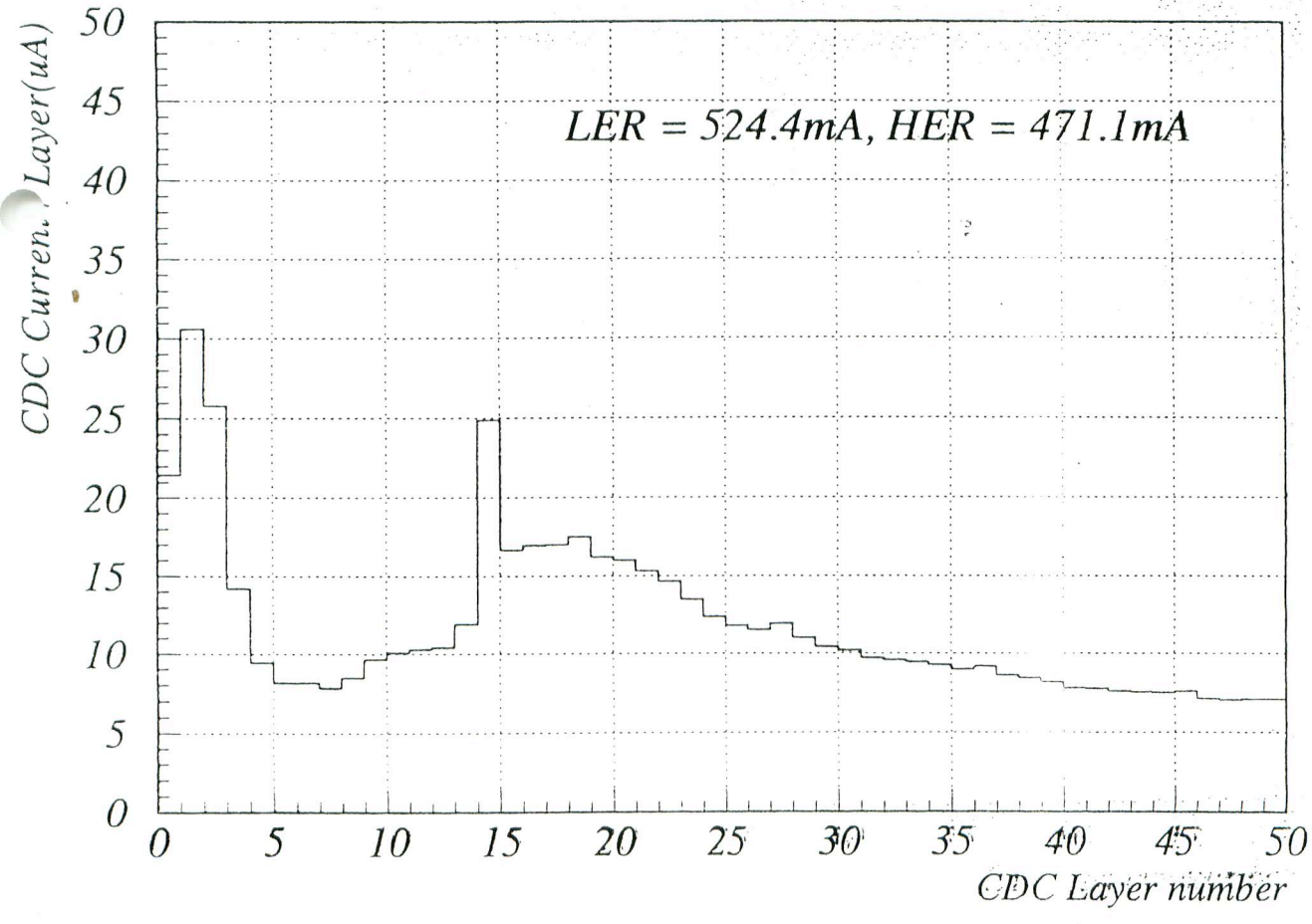
CDC

Hit rate / Occupancy

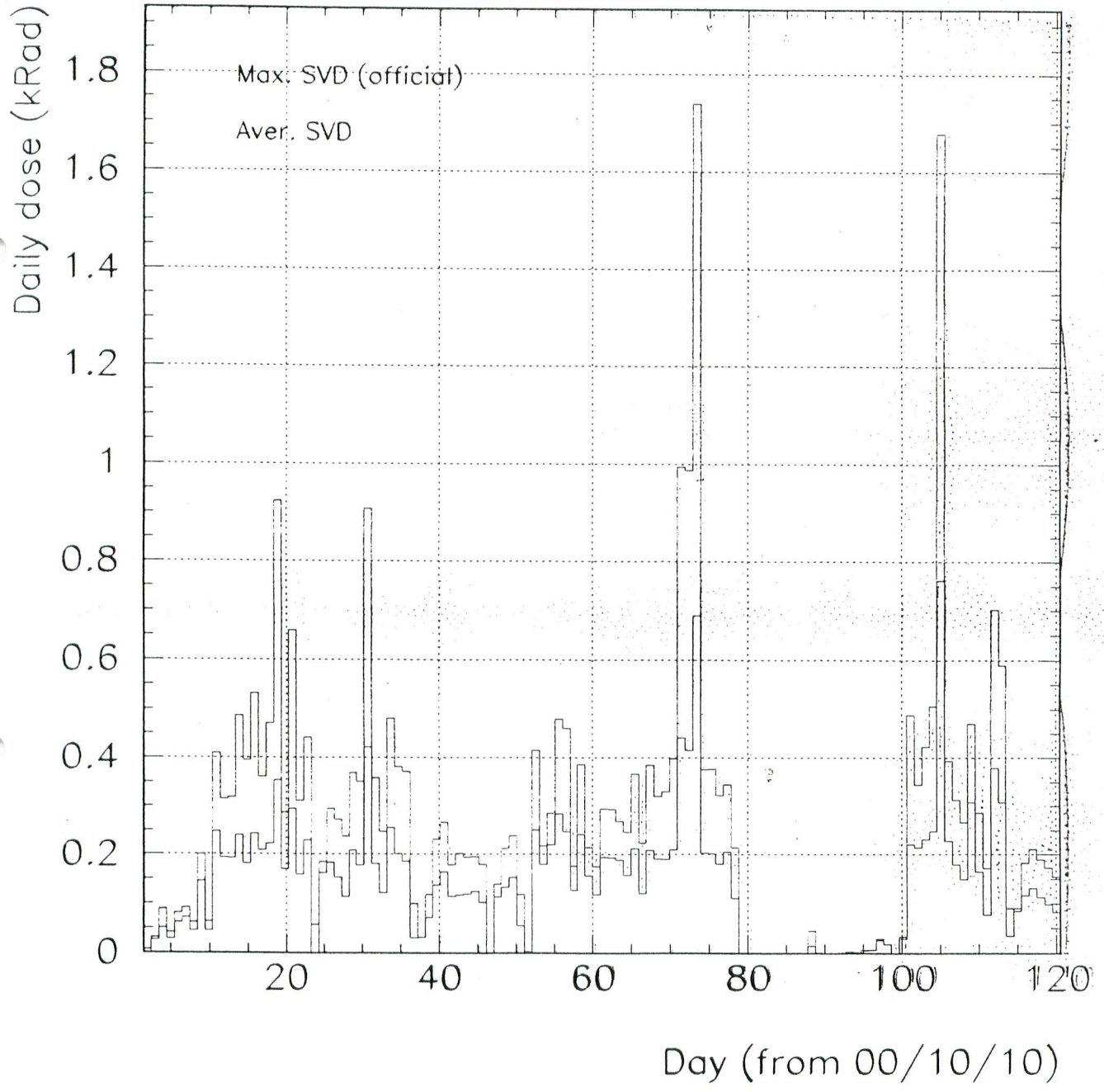


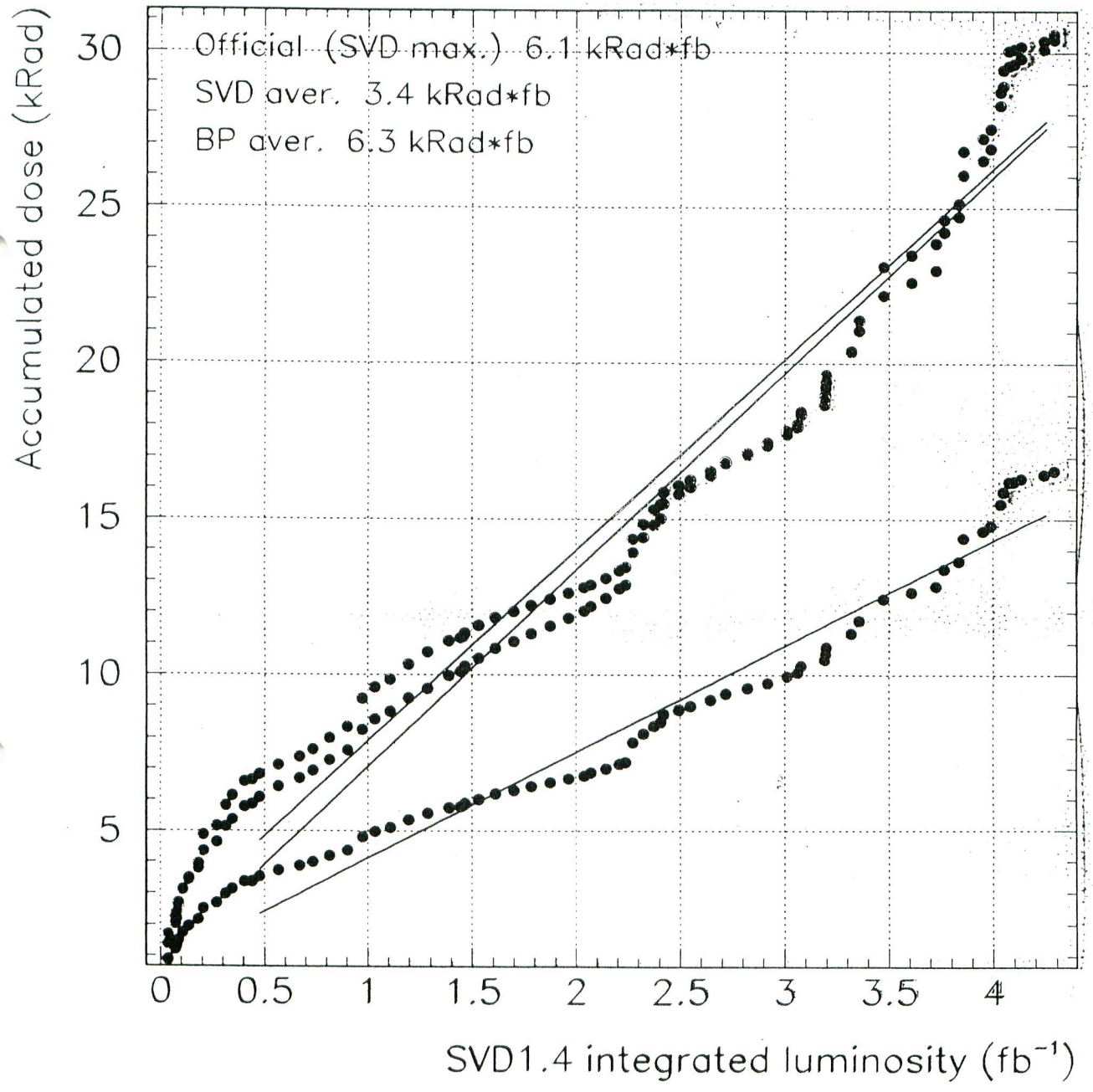
CDC Current draw vs Layer (e9r1181/2000.12.27)

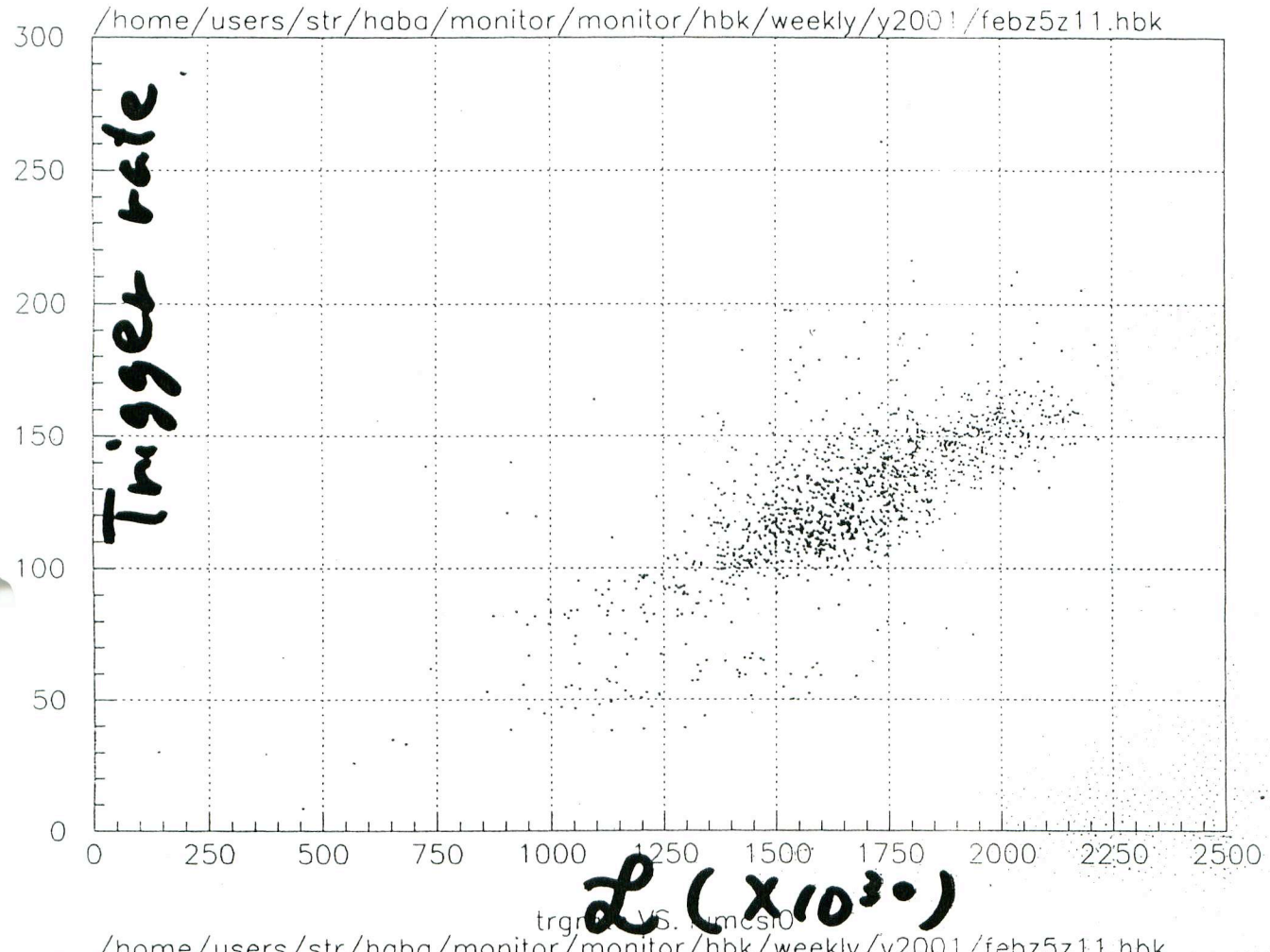




daily dose


Daily dose (kRad)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Max. SVD (official)
Aver. SVD
20
40
60
80
100
120
Day (from 00/10/10)


Official (SVD max.) 6.1 kRad*fb
SVD aver. 3.4 kRad*fb
BP aver. 6.3 kRad*fb
Accumulated dose (kRad)
30
25
20
15
10
5
0
0.5
1
1.5
2
2.5
3
3.5
4
SVD1.4 integrated luminosity (fb^{-1})



$\mathcal{L}$ ($\times 10^{30}$)