PS/LP Noter 89-04 January 1989

Results of MD's in Autumn 1988 on e^+

B. Canard E. Chevalley J.H.B. Madsen (reporting)

K. Priestnall D. Pearce A. Riche

Distribution:

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Chevalley E.
Delahaye, J.P.
Hübner, K.
Kugler, H.
Madsen, J.H.B.
Pearce, D.
Potier, J.P.
Priestnall, K.
Riche, A.
Rinolfi, L.

1. MD 21 October 1988: E. Chevalley, J.H.B. Madsen, A. Riche

1.1 Optimizing the e^+ intensity measured with HIP22 by varying the currents successively in:

SNA01 from 4.0 A to 5.7 A
SNB02 from 14.0 A to 14.6 A
SNC02 from 10.0 A to 11.5 A
SND02 from 115.0 A to 115.0 A

See graphs on Fig. 1

Resulting increase in HIP22:

from 5.4 10^8 to 6.1 10^8 e^+'s
and this for 4.1 10^{11} at ECM01
and 1.5 10^{11} at UMA22

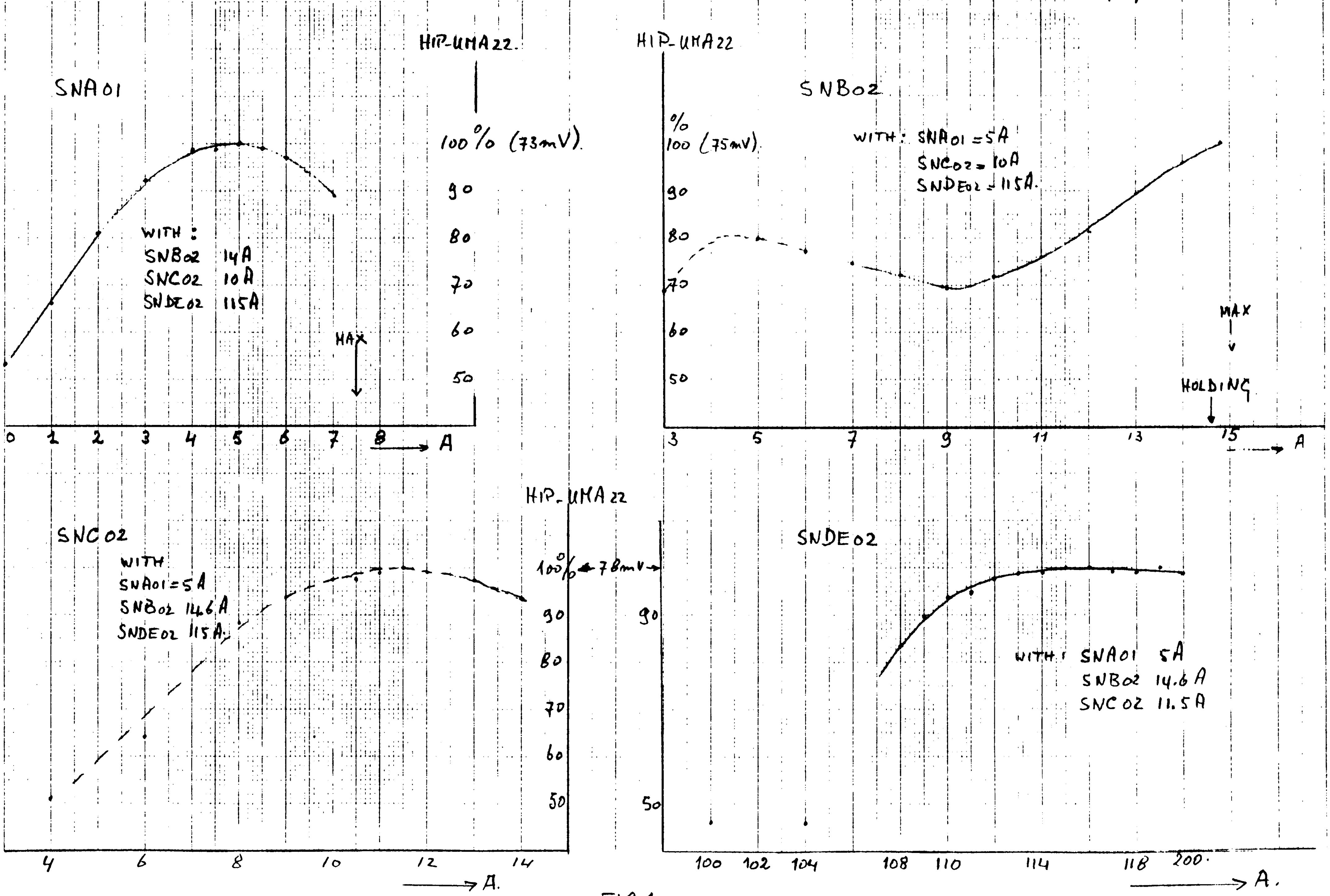
See Fig. 2.

1.2 Before continuing the e^+ optimization an investigation was made on the broad and double peaked beam distribution measured by WL-WBS25. LIL-V steerings and focussing were tried without success (Fig. 3). An explanation provided afterwards (S. Battisti): a modification in the electronics (input of integrator protected by diode) caused wrong results at high beam intensities and furthermore, the long tails found are due to insufficient screening against e^-'s emitted backwards by the converter.

1.3 As intensity effects were suspected, the impulse length was reduced to 10 ns and the tails in the H-plane disappeared but the spot on WBS25 remained large (Fig. 4). Reducing the current further (HV gun from 3.1 kV to 2.6 kV) resulted in smaller spot in H-plane (Fig. 5) and improved the e^+ intensity at HIP22. Explanation: with 3.1. kV we had a bad transmission in LIL-V, effect showing up at analog signal HIP as well.

See Figs. 6, 7, and 8.

21/10/88



SNA01
HIP-UMA22.
100% (73mV).
90
80
70
60
50
WITH :
SNB02 14A
SNC02 10A
SNDE02 115A
MAX
0
1
2
3
4
5
6
7
8
A
HIP-UMA22
SNB02
%
100 (75mV).
90
80
70
60
50
WITH : SNA01 = 5A
SNC02 = 10A
SNDE02 = 115A.
MAX
HOLDING
3
5
7
9
11
13
15
A
SNC02
WITH
SNA01 = 5A
SNB02 14.6A
SNDE02 115A.
HIP-UMA22
100% ← 78mV →
90
80
70
60
50
4
6
8
10
12
14
A.
SNDE02
90
50
WITH : SNA01 5A
SNB02 14.6A
SNC02 11.5A
100
102
104
108
110
114
118
200.
A.

FIG 1

```
LIL UMA                                                 1988-10-21-09:28:35
                        TRAJ.    POSITRONS

  Intensite (E8) Horizontal (mm) Vertical (mm)
 UMA 13 -1850.2            1.1           -2.0
 UMA 15 -1788.9             .9            0.0
 UMA 22 -1823.9            -.3           -1.1
 UMA 25 -1531.8             .3            -.5
 UMA 27   -18.6           -1.7           -1.8
 UMA 29     1.4          -30.2           49.0      WCM Intens.(E8)
 UMA 30     3.8            1.8            4.9
 UMA 31     4.3           -4.3           -1.5
 UMA 32     4.4            5.7            4.6     ECM01   -4107.4
 UMA 33     4.1            -.6            6.9     WCM11   -2440.2
 UMA 34     4.6           -2.2           -5.2     WCM12   -1792.7
 UMA 35     4.1           -5.5           -6.9     WCM14   -1810.1
 UMA 36     4.0           -1.8            -.9     WCM221     -1.7
 UMA 37     4.7            3.6           10.4     WCM37       3.9
 HIM 00     -.1          111.1          111.1     HIM00       7.7
 HIE 22     -.5          111.1          111.1
 HIP 22     6.1            3.9           -1.1         NMEAS 100
                                                        TRIG 0
                                                          DT 0
```

(Fig 2)

CONSOLE - GRAPHIC SYSTEM HARD-COPY

21/OCT/1988-09: 45: 04
YVETTE (LPI)

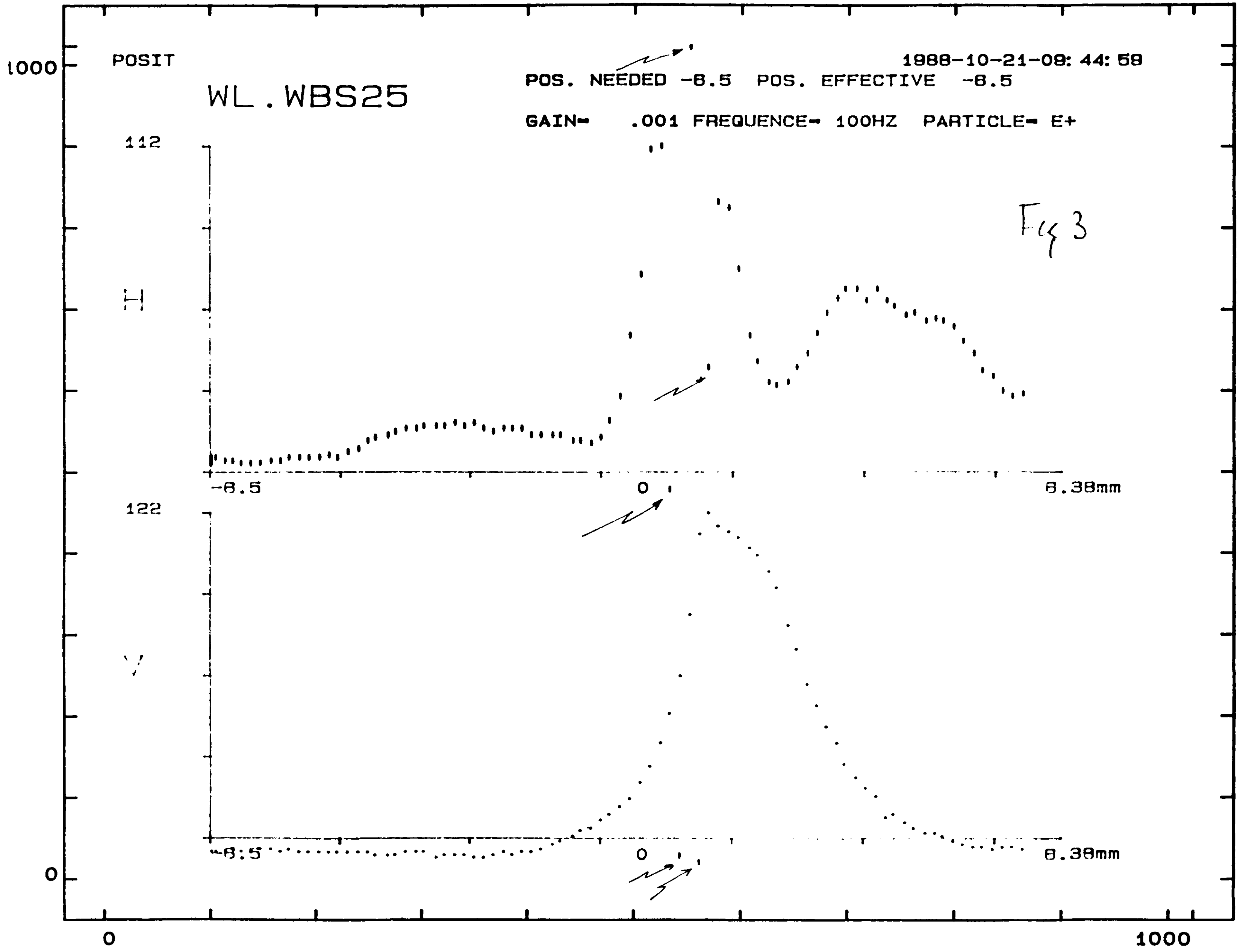
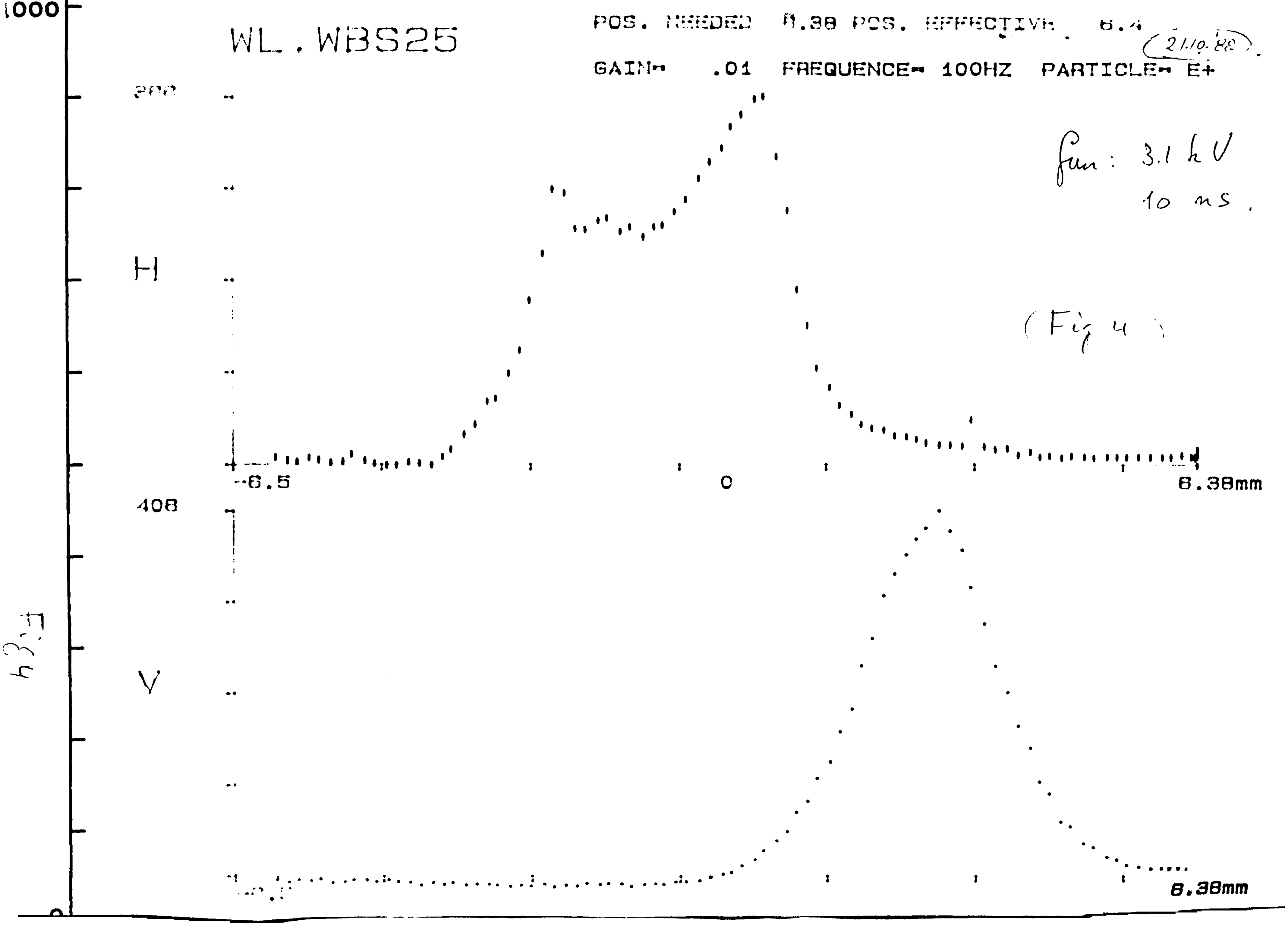


Fig 3

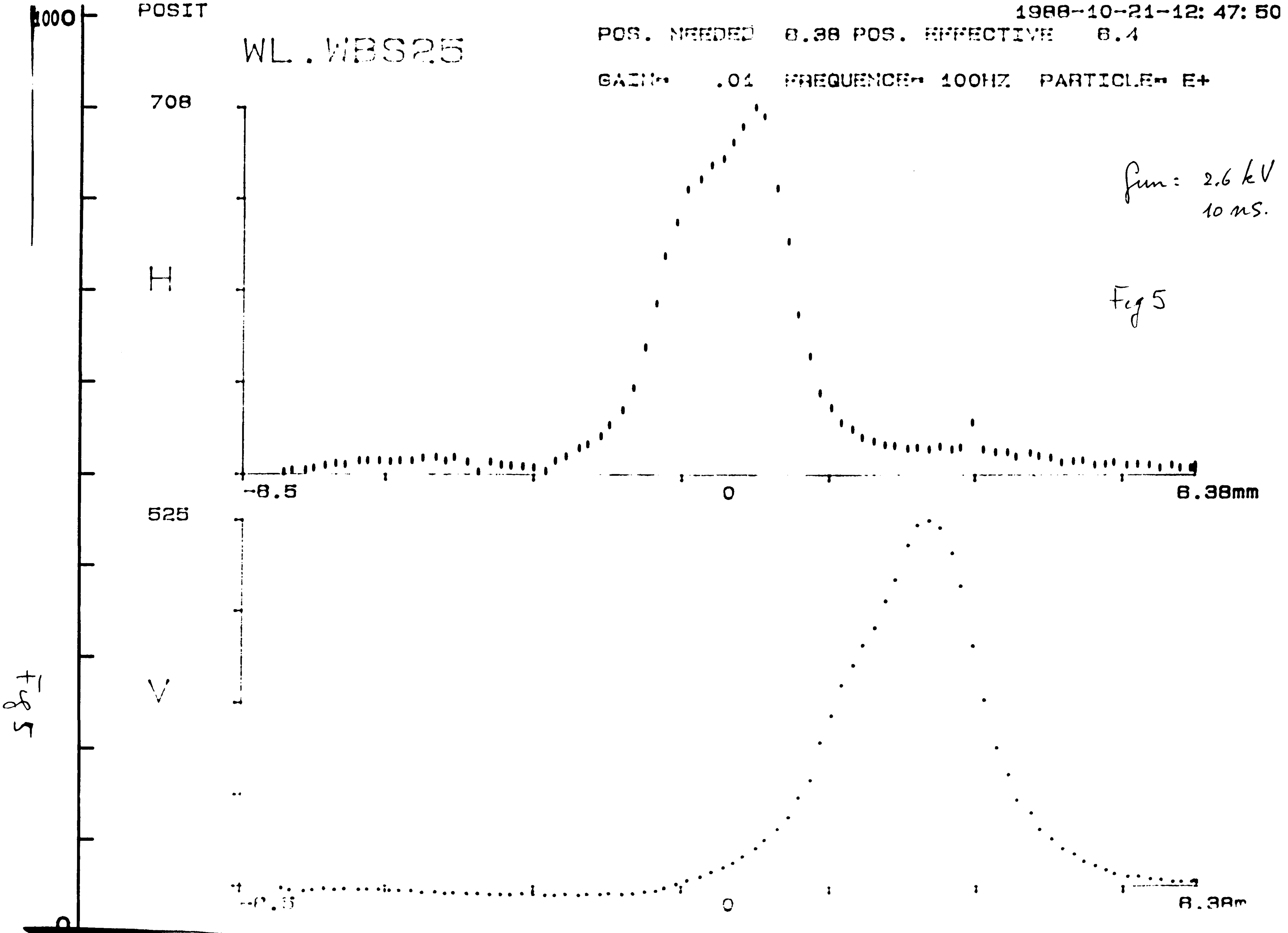


(21.10.88)

Fun: 3.1 kV
10 ns.

(Fig 4)

Fig 4



Gun: 2.6 kV
10 ns.

Fig 5

Fig 5

Jun.

3.1 kV
10 ns

```
LIL UMA                                            1988-10-21-12:43:46
                         TRAJ.     POSITRONS

  Intensite (E8) Horizontal (mm) Vertical (mm)
UMA 13 -1317.0        -1.8          -2.5
UMA 15  -789.1        -1.1           0.0
UMA 22  -592.0        -5.5            .2
UMA 25  -592.0          .6          -2.2
UMA 27    -5.1         4.5          -5.8
UMA 29     -.1       111.1         111.1     WCH Intens.(E8)
UMA 30     1.1        -3.9           8.6
UMA 31     1.3        -2.8          -3.0
UMA 32     1.2         7.9           4.5   ECH01   -2978.5
UMA 33     1.0         -.6          12.5   WCH11   -1795.3
UMA 34     1.6         5.2          -0.2   WCH12   -1289.8
UMA 35     1.0         -.3         -13.0   WCH14   -1150.4
UMA 36      .7       -13.5          -6.3   WCH221       -.7
UMA 37     1.2         3.6          15.6   WCH37         .8
HIH 00     -.1       111.1         111.1   HIH00        1.8
HIE 22     -.1       111.1         111.1
HIP 22     1.8         1.9          -1.9        NMEAS 100
                                                 TRIG 0
                                                  DT 0
```

Fig 6.

40m V peak.

Fig 6

fun 2.6kV
10ns

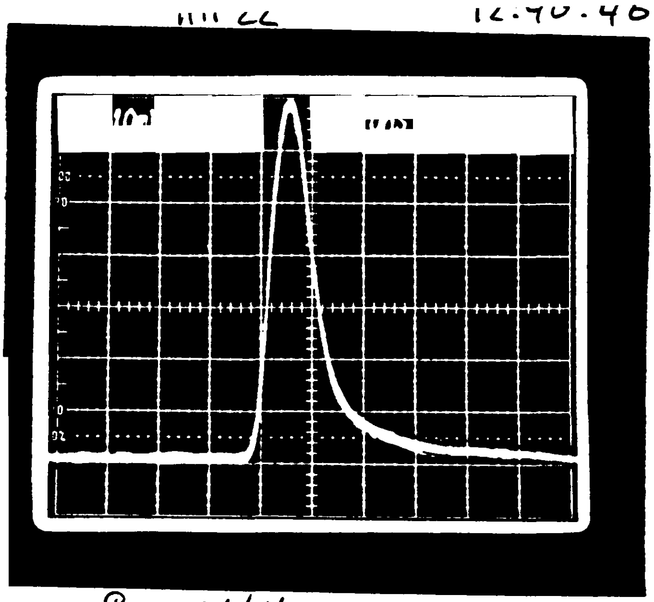
```
LIL UMA                                              1988-10-21-12:46:46
                  TRAJ.    POSITRONS

  Intensite (E8) Horizontal (mm) Vertical (mm)
UMA 13  -885.1          0.0          -2.8
UMA 15  -746.7          -.8            .5
UMA 22  -711.6         -4.1            .4
UMA 25  -687.2           .8          -1.9
UMA 27    -6.3          2.5          -4.6
UMA 29      .5        111.1         111.1     WCM Intens.(E8)
UMA 30     1.8           .6           5.2
UMA 31     2.2         -1.6          -1.6
UMA 32     1.9          5.1           2.8   ECM01  -1753.5
UMA 33     1.6          -.6           6.9   WCM11  -1000.7
UMA 34     2.4          1.5          -6.7   WCM12   -714.6
UMA 35     1.7         -2.8          -6.7   WCM14   -766.9
UMA 36     1.5         -2.9          -2.8   WCM221     -.7
UMA 37     2.0          2.1          11.1   WCM37      1.4
HIB 00     -.1        111.1         111.1   HIM00      2.7
HIE 22     -.1        111.1         111.1
HIP 22     2.5          1.3          -1.3       NMEAS 100
                                                 TRIG 0
                                                  DT 0
```

Fig 7

↓
70mV peak.

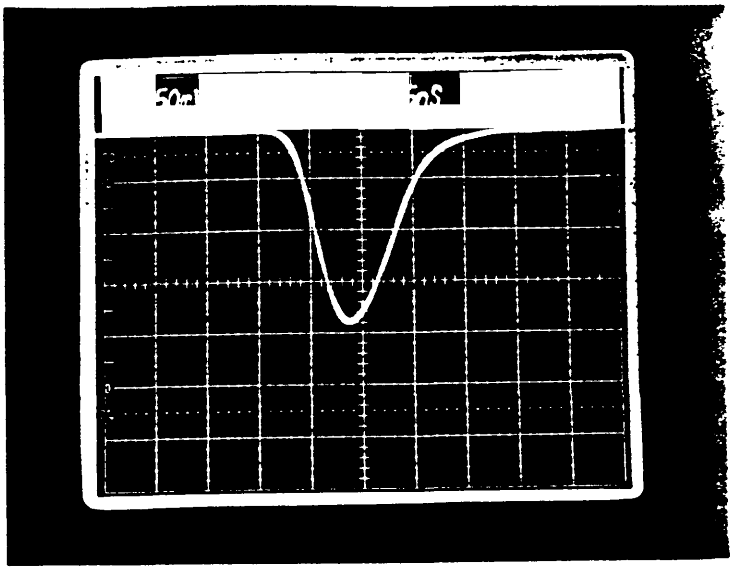
Fy =

HIP22 12:40:40



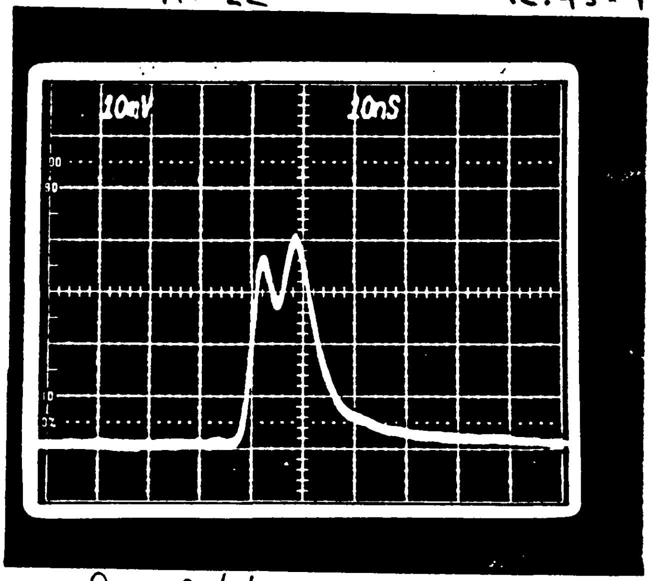
Gun: 2.6kV 10nS.

12:40:6



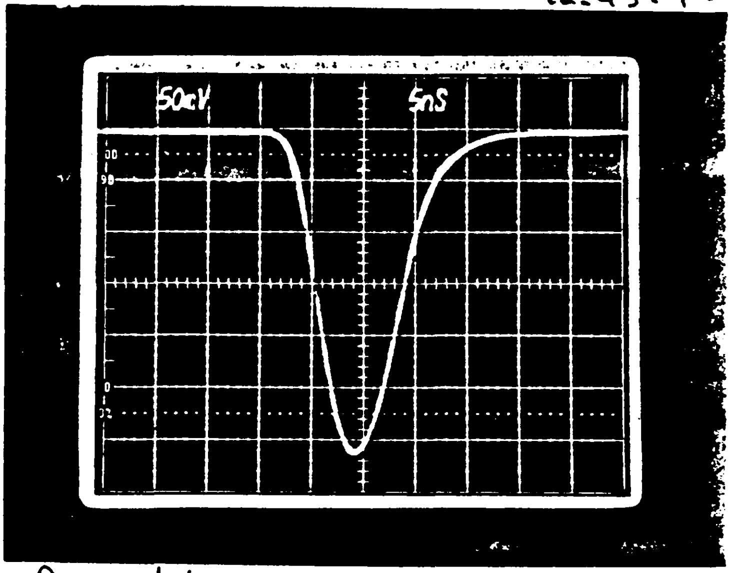
Gun: 2.6kV 10nS. WCM11

HIP22 12:43:4



Gun 3.1kV 10nS.

12:43:46.



Gun 3.1kV 10nS. WCM11

2. MD 3 Nov. 88. J.H.B. Madsen, K. Priestnal, A. Riche.

2.1 LIL had been optimized for e^+ production.

G. Metral reported for WL-UMA25 $2.74\ 10^{11}$ on HIP22 $9.4\ 10^{8}$ (pulse length 25 ns). Conversion eff. $3.4\ 10^{-3}$ (unresolved).

2.2 Aim. set LIL-V beam parameters close to the nominal values.

With gun settings
70 kV
1.2 " Polar
2.9 " HT
17. A heating
15 ns pulse length setting.

Beam at WL UMA25 800 mV ≡ 2.4 A and $1.8\ 10^{11}$ e's.

MSH15 205 MeV central E
220 " max. E

pulse length 12 ns FWHH.

HIP22 $6.8\ 10^{8}$ Conv. eff. $3.8\ 10^{-3}$ (unres.).

See Fig 1 & 2.

Trial : move beam vert. as on WBS25 +2.3 mm, used DQL 13 V.
The movement of the beam provoked an increase in the vacuum pressure at the converter resulting in switching off SNP25.
Thus: beam hitting collimator inside converter.

2.3 Finding set SNP25 - SNL25 - SNL26 for max. HIP22.

Gun settings as 2.2.

With current in SNL25 = SNL26 we find best result for 650 A.

See Fig 3. Note: no need to use SNP25 above 3 kA!

With some knob fiddling max. e^+ with:

SNP25 / SNL25 / SNL26 : 2.8 kA / 625 A / 675 A / HIP22 = 120 mV
[Starting conditions : 2.8 kA / 700 A / 700 A / " = 100 mV]

Conversion eff. HIP22/UMA25	based on number of particles	peak current	
RESOLVED	$3.4\ 10^{-3}$	$3.3\ 10^{-3}$	FIG 4
UNRES.	$4.15\ 10^{-3}$	$3.9\ 10^{-3}$	FIG 5

2.4. Put diaphragm at outlet of gun V in the beam. (settings as 2.3)

Aperture diaphragm : ϕ 3 mm.

Keeping other settings constant, increase gun HV in order to obtain about 2.5 A at WL-UMA25. Achieved with HVmax = 3.92 kV (interlock setting) ≃ 2.4 A.

	Gun HV kV	ECM mV	ECM A	UMA22 mV	UMA22 A	HIP22 mV	HIP22 mA	conversion eff. based on peak current
without slits [unresolved]	2.9	230	4.6	260.	.78	55	3.5	4.4 10^{-3}
	3.2	350	7.0	400	1.2	75	4.7	3.9 "
	3.5	400	8.0	500	1.5	95	6.05	4.0 "
	3.75	460	9.2	560	1.68	110	693	4.1 "
	≃3.92 MAX	525	10.5	760	2.28	150	945	4.1 "
SEE FIG 6								
FIG 7 }	≃3.92 MAX			790	2.37	150	945	4.0 "
	"			n° part.	1.67 10"		7.4 10"	4.4 " n° part.
resolved	"	525	10.5	760	2.28	118	7.43	3.3 peak cur.
	Change pre-buncher setting from att 35, ϕ 45 to att 40, ϕ 65.							
resolved	3.92 max			800	2.4	124	7.8	3.3 peak cur.
	Optimized HIP22 with steering H&V in LIL-V Best							
resolved	3.92 max			800	2.4	135	8.5	3.5 peak cur.

Conclusion : the conversion eff is with diaphragm practically the same as without. (conv. eff. ≥ 4 ± 5 %).

Fig 8 : large horizontal tail on WBS25 (instrumental error) for max. e^+ production beam vert. at + 2.2 mm.

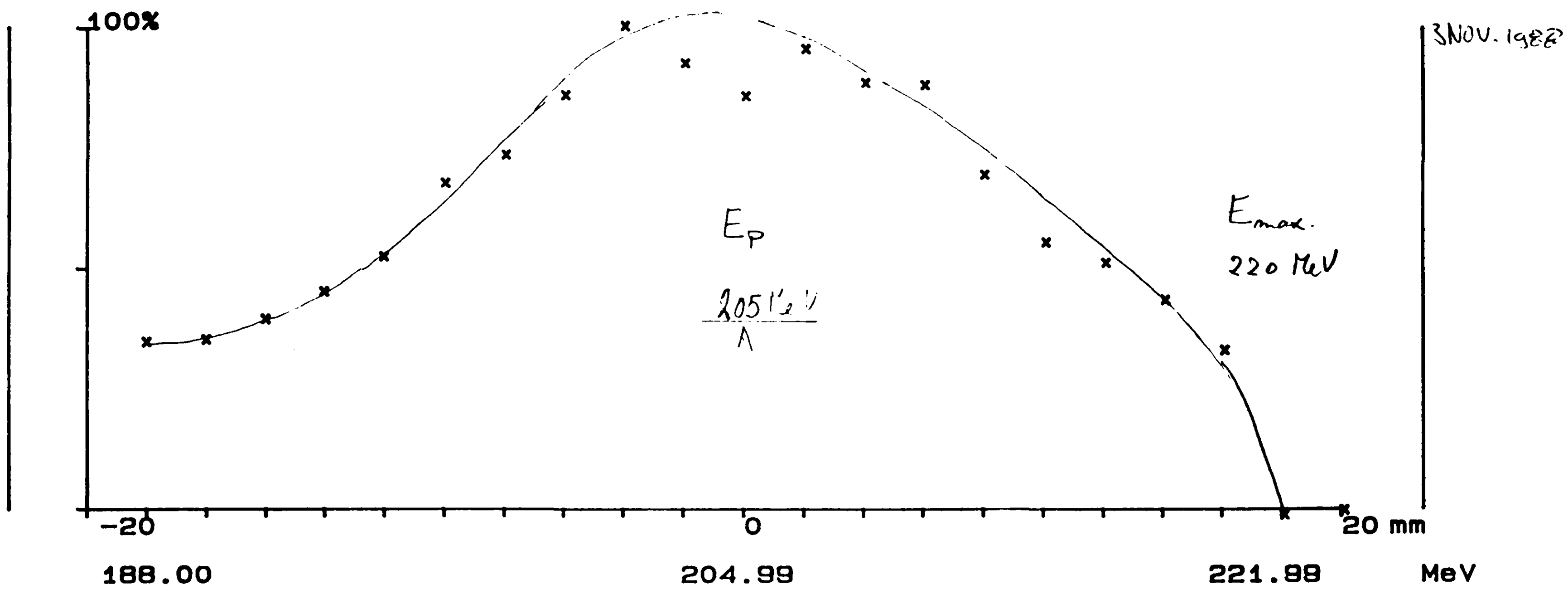
Fig 9 E and ΔE/E of e^+ beam at HIP. MSH20.

2.5 Relation pulse length and e^+ production
Conditions : diaphragm out. Gun : 70 kV, 1.2 kV Polar, 2.9 kV HT, 17 A heat.
Other settings as at end 2.4.

	pulse length ns	ECM A	ECM . 10^9	UMA 25 A	UMA 25 . 10^9	HIP22 mA	HIP22 . 10^8	Conversion eff. peak curr.	Conversion eff. n° part.
resolved	15 ns	4.4	3.9	2.4	1.9	6.6	5.4	2.75 10^{-3}	2.8 10^{-3}
	20 "	"	5.2	"	2.4	6.3	6.75	2.6 "	2.8 "
	25 "	"	6.45	"	2.65	6.3	7.55	2.6 "	2.8 "
unresolved	25 "	4.2	6.44	"	2.70	8.82	10.9	3.7 "	4.0 "

Conversion eff. independent pulse length.
Low value of conv. eff. shows that upon changing gun characteristics one should check optimization.

BEAM PROFILE MEASUREMENT - VL.MSH15



Gun settings: 70kV
1.2 " Polar
2.9 " HV
17 A Heating
15 ns pulse length.

WL-UMA25 = 2.4 A peak
= 1.8 10^{11} e's

Central Energy 204.99 MeV

Digital Value at 100% 983 (sat. 2047)

Intensity (UMA meas.) 1752.47 1E8 part.

Number of measurements 97

FIG 1

Gain is .01

Scraper VL.SLV12 (Aperture) : 49.9 (49.9) mm

(Position) : 0 (0) mm

0

0 1000

Fun 15ms.
70kV
2.9kV HT
1.2kV Pola
17 A Ck

```
LIL UHA                                              1988-11-03-06:09:35
                    TRAJ.    POSITRONS

    Intensite (EB) Horizontal (mm) Vertical (mm)
   UHA 13 -2836.0          0.0           -.7
   UHA 15 -2004.8          1.3          -1.3
   UHA 22 -2112.8           .5          -1.4
   UHA 25 -1796.8           .8          -1.1
   UHA 27   -19.2         -1.1          -6.8
   UHA 29      .6        -67.9          31.9    WCM Intens.(EB)
   UHA 30     4.3           .6            .3
   UHA 31     4.7          -.6            .6
   UHA 32     4.8          3.1           3.4   EOM01  -4371.6
   UHA 33     4.6          -.6           4.7   WCM11  -2544.8
   UHA 34     5.2         -1.1          -5.3   WCM12  -2891.6
   UHA 35     4.2          -.3          -2.7   WCM14  -2856.7
   UHA 36     4.4           .2            .3   WCM21      -.5
   UHA 37     4.7          0.0          18.7   WCM37      4.3
   HIN 00     0.0        111.1         111.1   BBM00      6.9
   HIE 22     -.7          0.0          -6.6
   HIP 22     6.8         10.2           3.6      NMERS 10
                                                   TRIG 1
                                                     DT 0
```

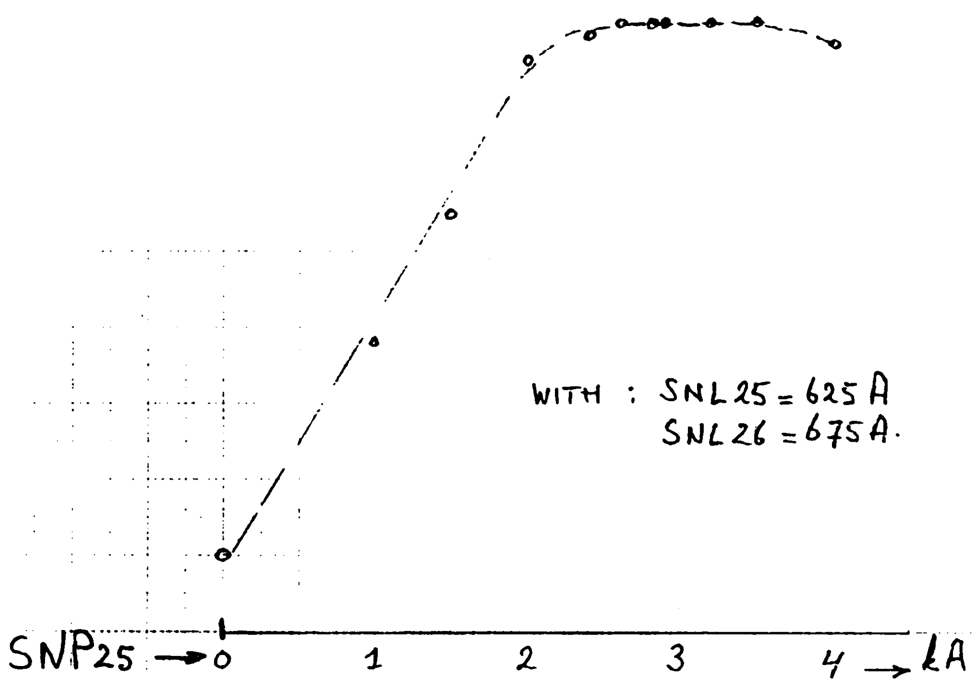
800 mV — (beside UHA 25)

— 270 mV (beside WCM14)

FIG 2

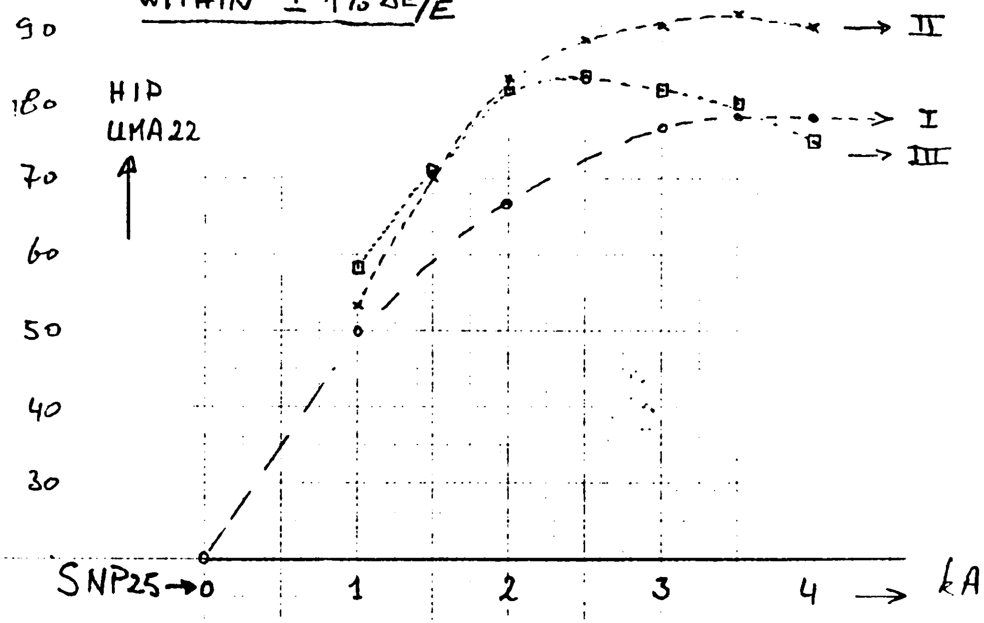
12.5 Hz.
(same on 100 Hz)

3 NOV.'88



WITH : SNL25 = 625 A
SNL26 = 675 A.

100% = 120 mV (7.6 mA).
WITHIN ± 1% ΔE/E



I : SNL25 & 26 600 A
II : " " 650 A
III " " 700 A.

Beam energy on converter : $E_{max} = 220 keV$, $E_p = 205 keV$ (Fig 1)

WL-UMA25 = 780 mV (≡ 2.34 A) ; 1.78 10^{11} e^-'s

HIP-UMA22 = 118 mV (≡ 7.4 mA) ; 6.0 10^8 e^+'s.

HIP-SLH20 AP : 23 mm ± 1% ΔE/E
POS : 5 mm

FIG 3.

Slits in ±1% ΔE/E
SNP 2.8 kA
SNL 25 625 A
SNL 26 675 A

```
LIL UHA                                          1988-11-03-07:43:18
               TRAJ.     POSITRONS

      Intensite (E8) Horizontal (mm) Vertical (mm)
     UHA 13 -1998.4        0.0        -1.0
     UHA 15 -1978.2        1.3        -1.6
     UHA 22 -2076.4         .3        -1.6
     UHA 25 -1775.6         .8        -1.4
     UHA 27   -15.2       -1.0        -0.4
     UHA 29     3.1      -13.6        12.0    WCM Intens.(E8)
     UHA 30     5.9        1.4         1.0
     UHA 31     6.0        -.4         1.3
     UHA 32     6.0        1.7         4.5  ECM01  -4347.6
     UHA 33     5.9        -.6         3.7  WCM11  -2589.9
     UHA 34     6.6        -.3        -4.9  WCM12  -2074.2
     UHA 35     5.6        -.3         -.3  WCM14  -2039.3
     UHA 36     5.7       -1.5         2.0  WCM221     -.5
     UHA 37     6.6         .6         7.9  WCM37      5.5
     HIM 00     -.2      111.1       111.1  HIM00      7.8
     HIE 22    -1.4        5.5        -9.0
     HIP 22     6.0       10.9         3.4      NMERS 10
                                                 TRIG 1
                                                  DT 0
```

15 ms.

780 mV – UHA 25
≡ 2.28 A

118 mV. – HIP 22
≡ 7.[illegible]

(Fig 4)

Semigud off -
Slih off.

15ns.

SNP 2.0 kA
SNL25 625
26 675

Canon 2.5kV HT

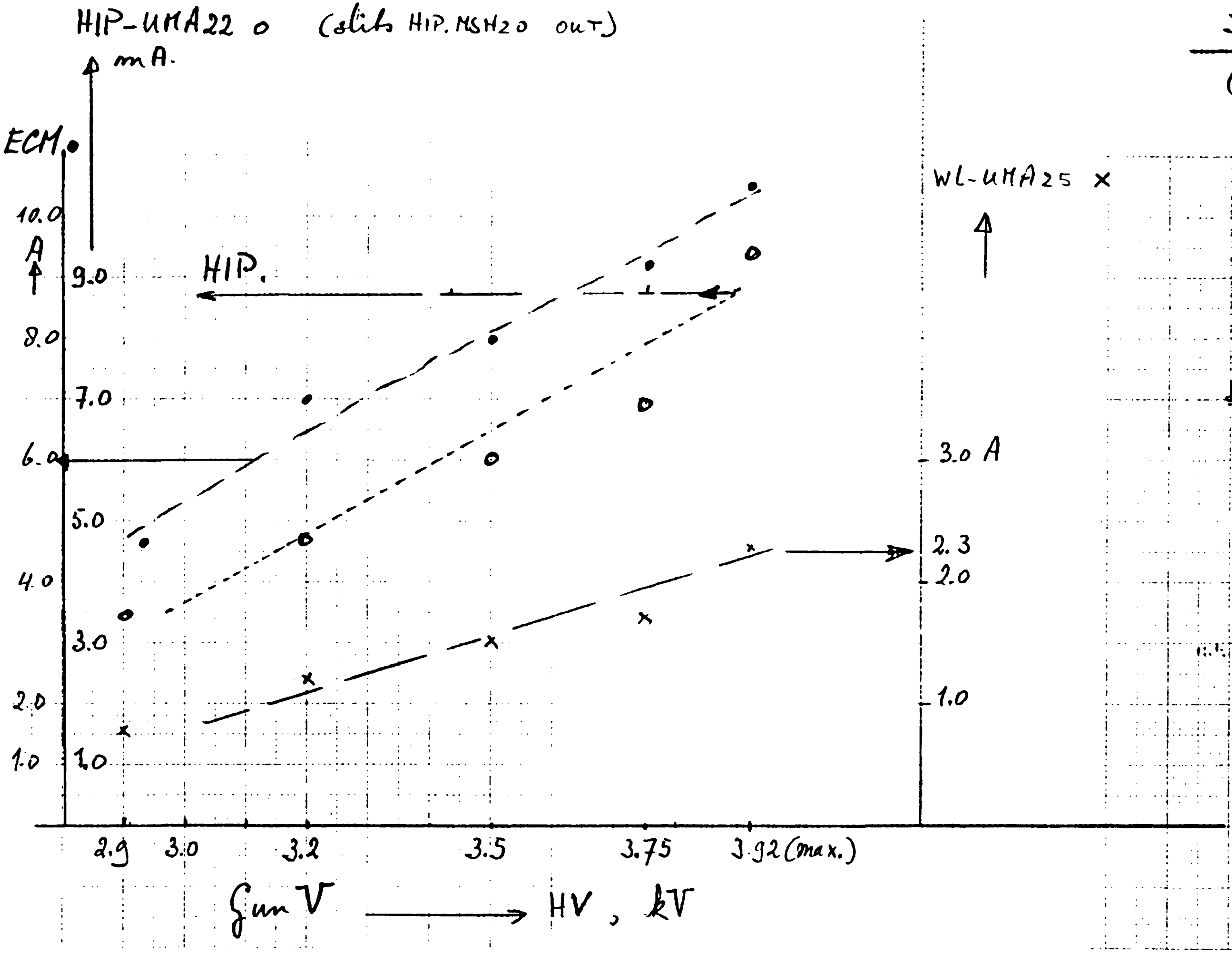
```
LIL UHA                                              1988-11-03-07:51:42
                  TRAJ.   POSITRONS

   Intensite (EB) Horizontal (mm) Vertical (mm)
 UHA 13 -2000.1          0.0           -.9
 UHA 15 -1983.5          1.1          -1.6
 UHA 22 -2002.4           .4          -1.7
 UHA 25 -1783.0           .7          -1.3
 UHA 27   -15.4          -.9          -8.2
 UHA 29     3.0        -14.2          13.8    WCH Intens.(EB)
 UHA 30     5.8          1.4            .3
 UHA 31     5.9         -1.7           1.4
 UHA 32     5.9          1.7           3.6  BCH01  -4371.6
 UHA 33     5.9         -1.4           3.1  WCH11  -2509.9
 UHA 34     6.5          -.3          -4.9  WCH12  -2074.2
 UHA 35     5.5         -1.1          -1.1  WCH14  -2039.3
 UHA 36     5.5         -1.5            .3  WCH221      -.5
 UHA 37     6.4          0.0           7.2  WCH37       5.5
 HIH 00     -.1        111.1         111.1  HIH00       7.8
 HIE 22    -1.4          8.3          -6.0
 HIP 22     7.4         14.0           3.2      NMEAS 10
                                                 TRIG 1
                                                  DT 0
```

780 mV
≡ 2.28 A

140 mV
≡ 8.82 mA

Fig 5

3 NOV. '88



DIAPHRAGM GUN-V IN.

Gun VHV : 70 kV.

POLAR : 12 kV.

HEATING 17.0 A.

PULSE LENGTH 15 ms

DIGITAL : UMA 25 = 1.66 10^{11}

HIP = 7.4 10^{8}

Conversion eff. : 4.45 10^{-3}.

UNRESOLVED.

FIG 6

Diaphragme in
Stubs out.
Gun 3.92 kV (max) 70kV
1.2 " polar.
17. A

```
LIL UHA                                       1988-11-03-10:13:00
                    TRAJ.   POSITRONS

  Intensite (E8) Horizontal (mm) Vertical (mm)
 UHA 13 -1837.2         0.0          -1.0
 UHA 15 -1858.2         1.3          -1.6
 UHA 22 -1936.6          .4          -1.6
 UHA 25 -1663.8         1.0          -1.4
 UHA 27   -24.6        -1.0          -0.8
 UHA 29     3.0       -14.2          12.9     WCM Intens.(E8)
 UHA 30     5.6          .6           -.5
 UHA 31     5.9         -.5           1.4
 UHA 32     5.8         1.7           3.6   ECM01  -9151.6
 UHA 33     5.6         -.6           3.2   WCM11  -2881.6
 UHA 34     6.3         -.3          -3.8   WCM12  -1865.0
 UHA 35     5.4         -.3           -.3   WCM14  -1899.9
 UHA 36     5.2        -2.6           2.1   WCM221      -.5
 UHA 37     6.2         0.0           6.7   WCM37       5.2
 HIH 00     -.1       111.1         111.1   HIH00       7.0
 HIE 22    -1.2         6.7          -0.2
 HIP 22     7.4        12.6           3.2       NHERS 10
                                                 TRIG 1
                                                  DT 0
```

15 n 3.

790mV -- UHA 25
= 2.37 A.

(Stubs in) 150mV — HIP 22
= 9.45 mA.

Fig 7

CONSOLE - GRAPHIC SYSTEM HARD-COPY

03/NOV/1988-09:24:19
YVETTE (LPI)

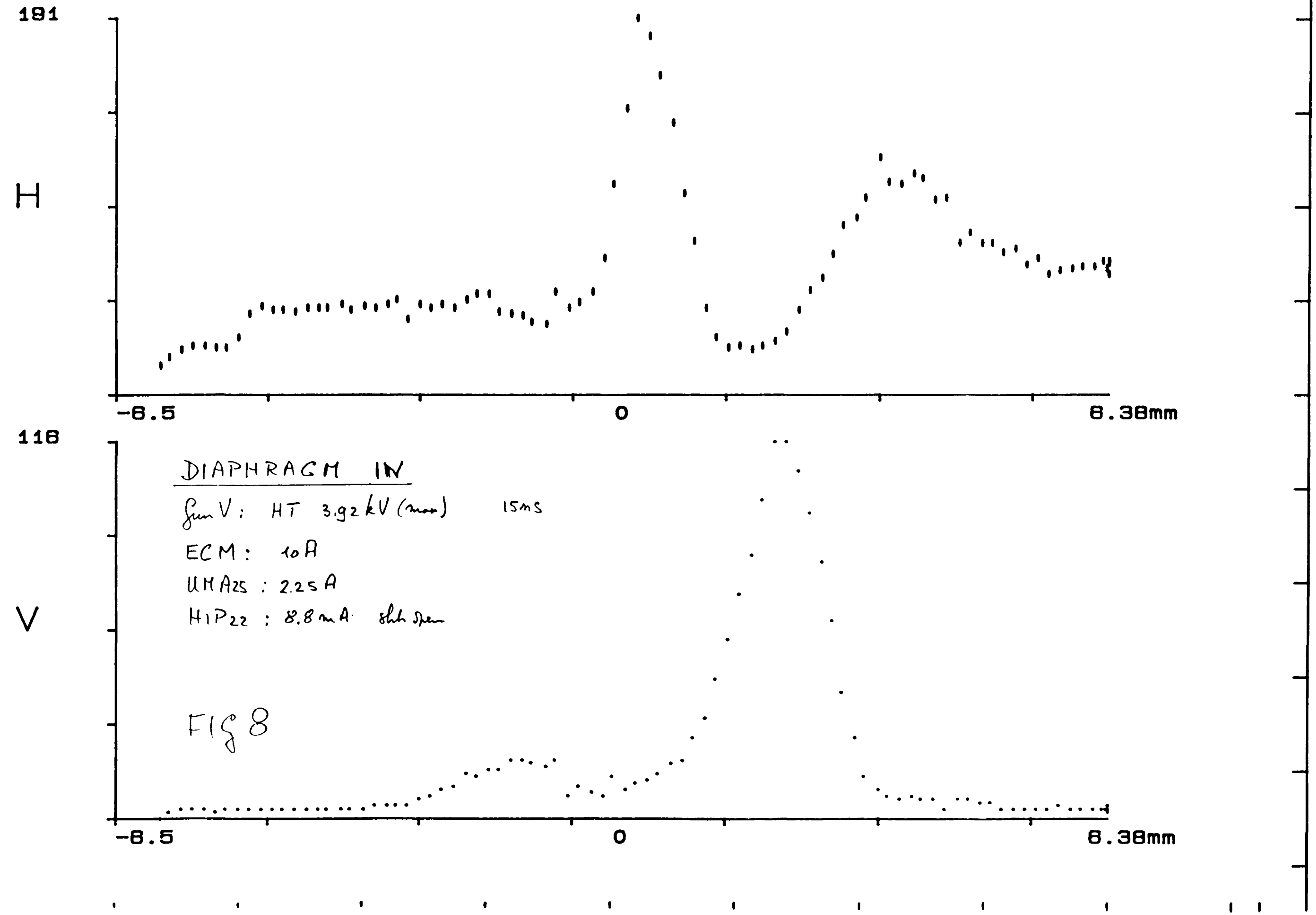
ELECT

1988-11-03-09: 24: 14

WL.WBS25

POS. NEEDED 8.38 POS. EFFECTIVE 8.4

GAIN= .001 FREQUENCE= 100HZ PARTICLE= E+



DIAPHRAGM IN

Gun V : HT 3,92 kV (max) 15ms

ECM : 10 A

UMA25 : 2.25 A

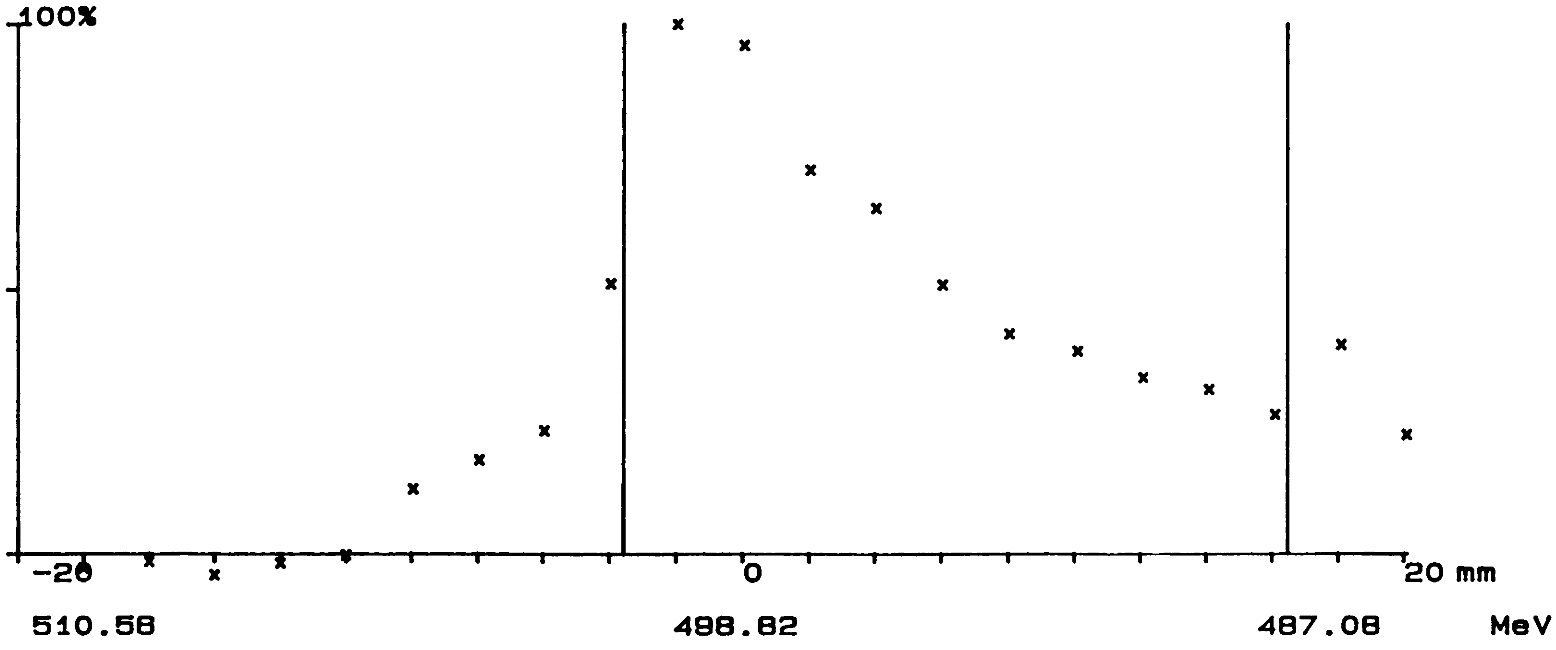
HIP22 : 8.8 mA slit open

FIG 8

CONSOLE - GRAPHIC SYSTEM HARD-COPY

05/NOV/1988-09:53:25
YVETTE (LPI)

×BEAM PROFILE MEASUREMENT - HIP.MSH20



Central Energy 498.82 MeV

Digital Value at 100% 1427 (sat. 2047)

Intensity (UMA meas.) 8.151 1E8 part.

Number of measurements 81

Gain is 1

Scraper HIP.SLH20 (Aperture) : 20 (20) mm

(Position) : 8.4 (8.4) mm

DIAPHRAGM IN

Gun : HT 392kV 15ns.

ECM : 10A

UMA25 : 225A

HIP : 8.8mA slits open

6.9mA within $\pm 1\%$ $\Delta E/E$

Fig 9

③ 15 NOV. MD: A. Riche, J.H.B. MADSEN, D. Pearce.

3.① Test linearity VL-MSH15.

With a low intensity beam (130 mA at WCM12,14 ; corresponding to ≃ 2.6nC) tried to obtain small ΔE/E. KLY03 and 13 at 188kV and 257kV resp.

Pre-buncher att 40, phase 45.

With three settings of VL-BSP15 (261.385A, +14A, +11A) the profile on MSH15 changes from right - middle - left.

E_p : energy at center of intensity distribution
ΔE : energy span containing 80% of beam.

Setting BSP15	E_{max}	E_p	ΔE	ΔE/E_p	2.6nC.
261. - A	223.2 KeV	218.5 KeV	5.2 KeV	2.4 %	
275. "	224.4 "	218.9 "	5.5 "	2.5 %	
286. "	224.6 "	219.8 "	6.5 "	3.0 %	

Thus: Spectrometer linearity is good.

3.② Effect beam loading.

With RF settings used above, increase the beam intensity.

Beam charge in nC.	E_{max}	E_p	ΔE	ΔE/E_p	WCM 14
2.6 nC	224.4 KeV	218.9 KeV	5.5 KeV	2.5 %	130 mA
17. "	223.2 "	212. "	12.2 "	5.7 "	0.8 A.
30. "	223.3 "	206.6 "	18.5 "	9.0 %	1.3 A.
40. "	224.0 "		> 25 "	(off scale).	2.0 A.

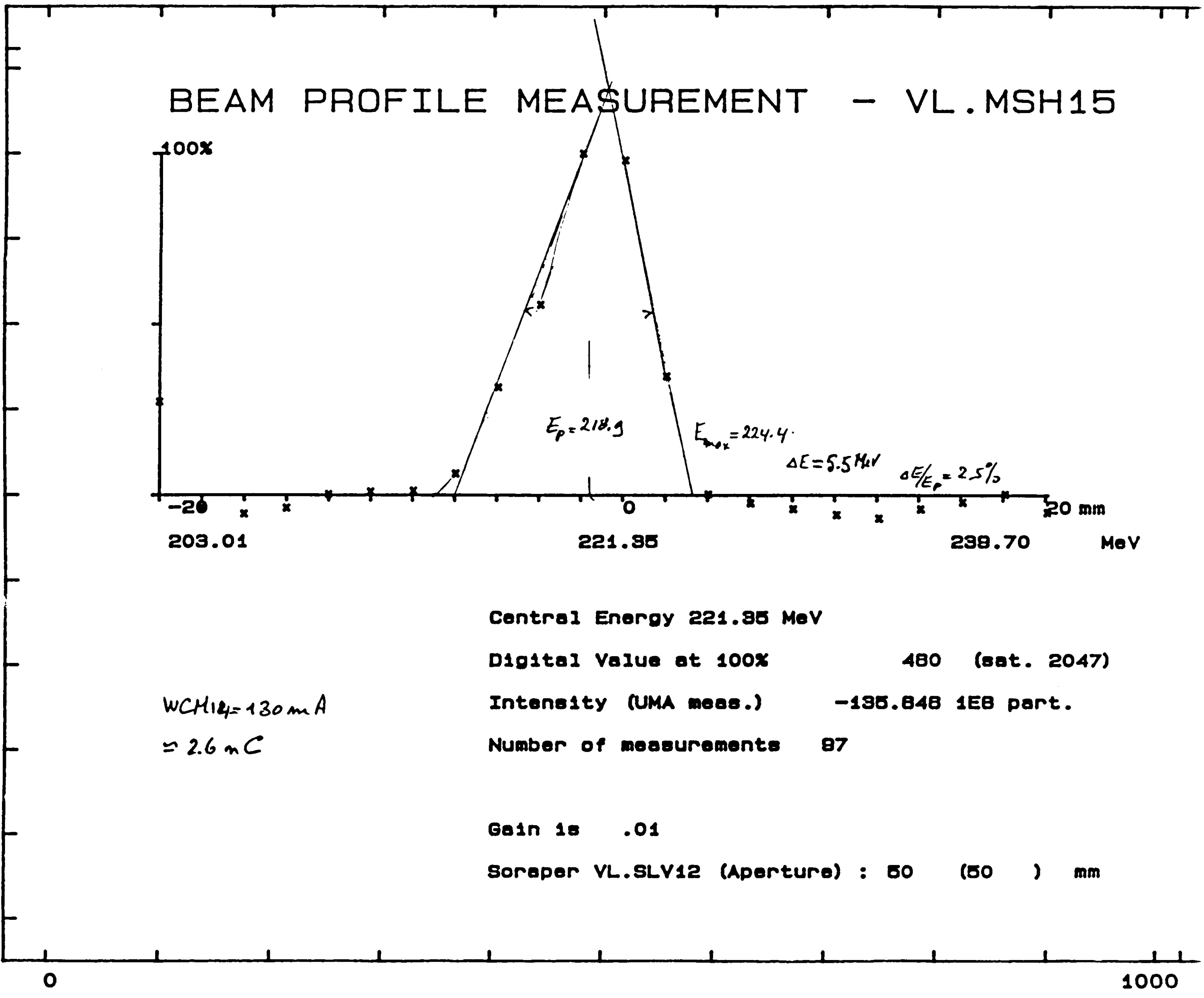
Note: the nominal LIL-V beam on the converter is 30nC and 200 KeV.

See Fig 1 to 5

Fig
1

CONSOLE - GRAPHIC SYSTEM HARD-COPY

15/NOV/1988-18:38:27
YVETTE (LPI)



BEAM PROFILE MEASUREMENT - VL.MSH15

Central Energy 221.35 MeV

Digital Value at 100% 480 (sat. 2047)

Intensity (UMA meas.) -135.848 1E8 part.

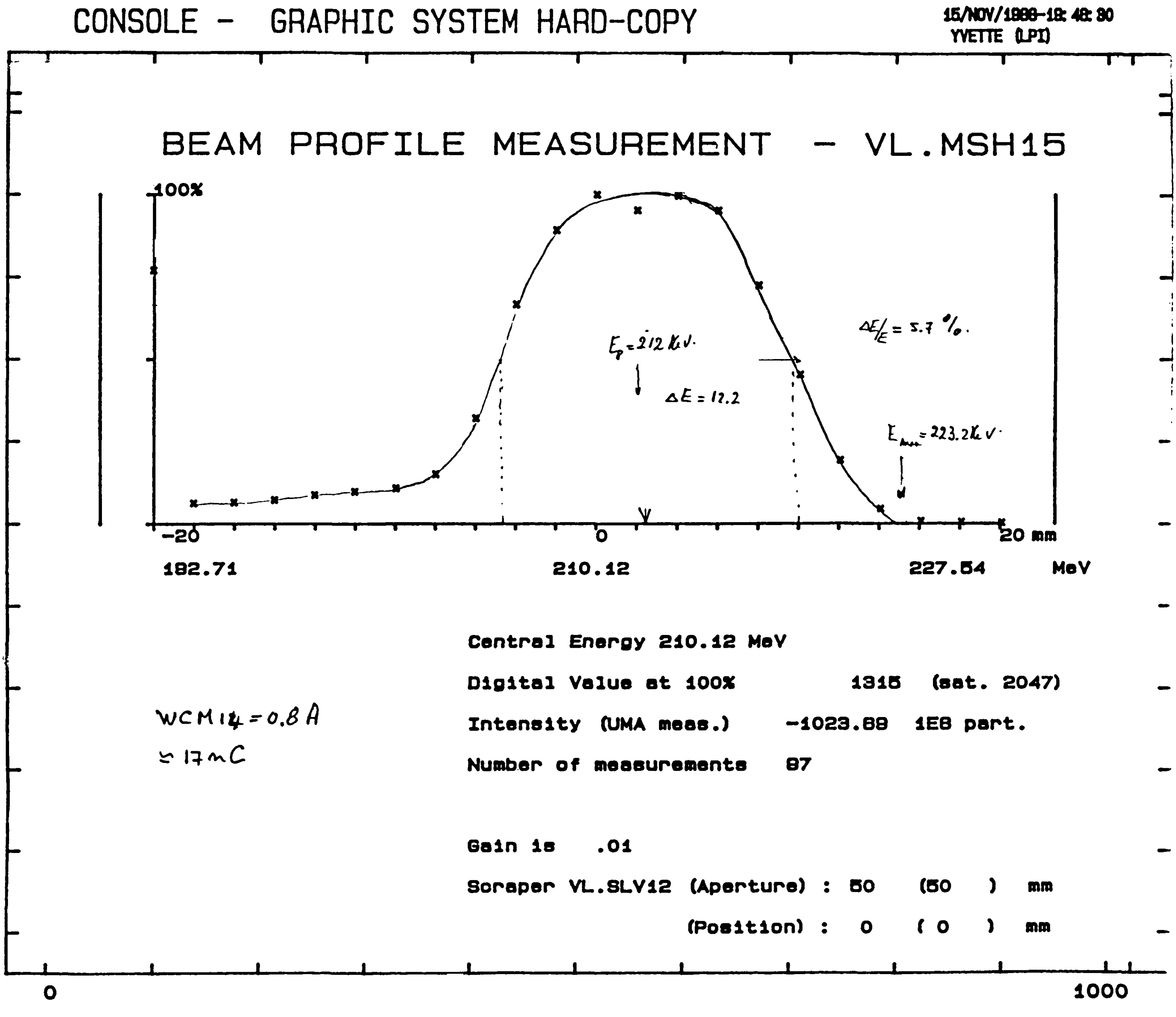
Number of measurements 97

WCH14 = 130 mA
≃ 2.6 nC

Gain is .01

Scraper VL.SLV12 (Aperture) : 50 (50) mm

Fig 2



CONSOLE - GRAPHIC SYSTEM HARD-COPY

15/NOV/1988-18:48:30
YVETTE (LPI)

BEAM PROFILE MEASUREMENT - VL.MSH15

Central Energy 210.12 MeV

Digital Value at 100% 1315 (sat. 2047)

Intensity (UMA meas.) -1023.88 1E8 part.

Number of measurements 87

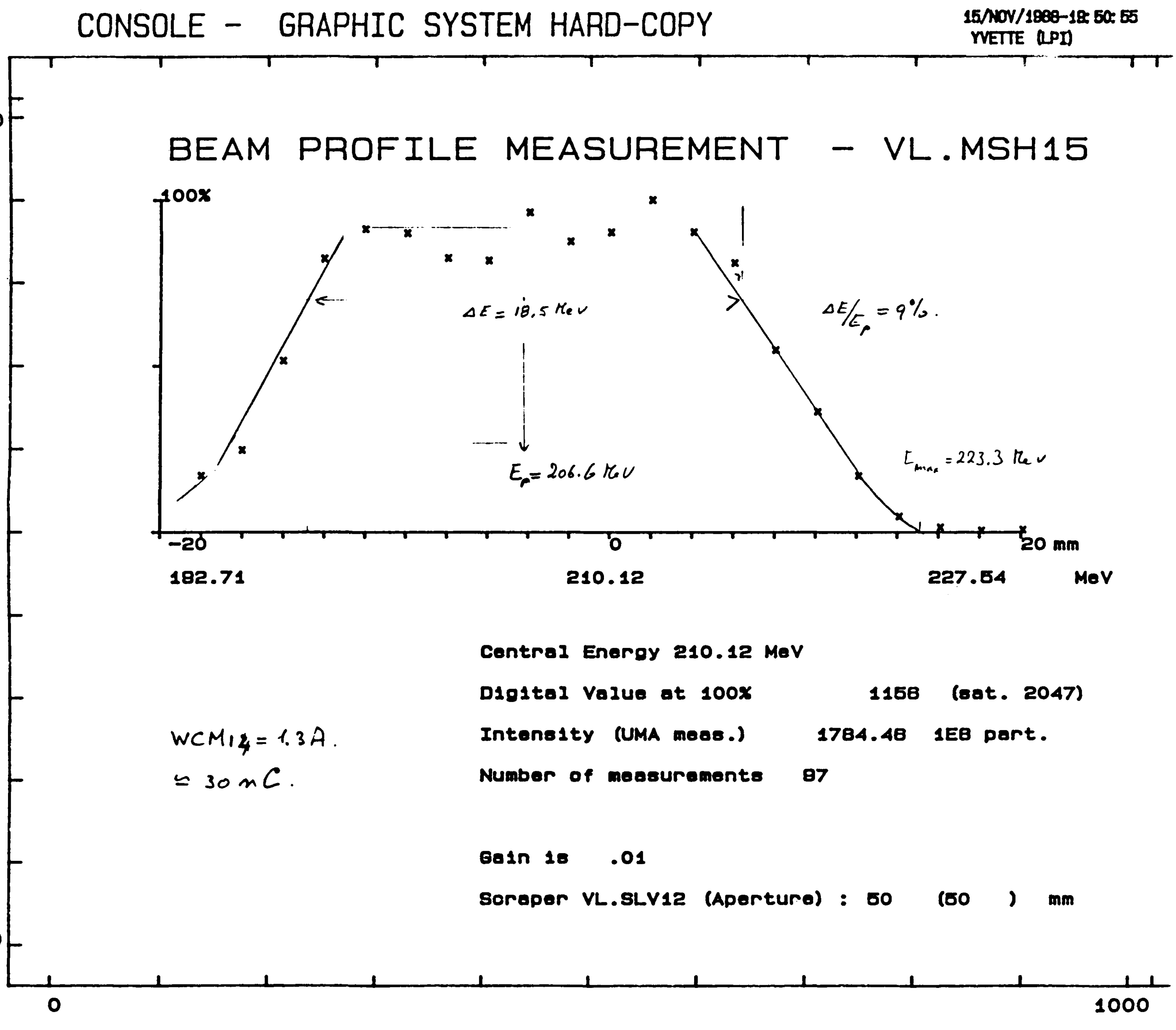
Gain is .01

Scraper VL.SLV12 (Aperture) : 50 (50) mm

(Position) : 0 (0) mm

WCM14 = 0.8 A
≃ 17 mC

Fig 3



CONSOLE - GRAPHIC SYSTEM HARD-COPY

15/NOV/1988-18:50:55
YVETTE (LPI)

BEAM PROFILE MEASUREMENT - VL.MSH15

$\Delta E = 18.5$ MeV

$E_p = 206.6$ MeV

$\Delta E / E_p = 9\%$.

$E_{max} = 223.3$ MeV

Central Energy 210.12 MeV

Digital Value at 100% 1158 (sat. 2047)

Intensity (UMA meas.) 1784.48 1E8 part.

Number of measurements 87

Gain is .01

Scraper VL.SLV12 (Aperture) : 50 (50) mm

WCM14 = 1.3A.

≃ 30 nC.

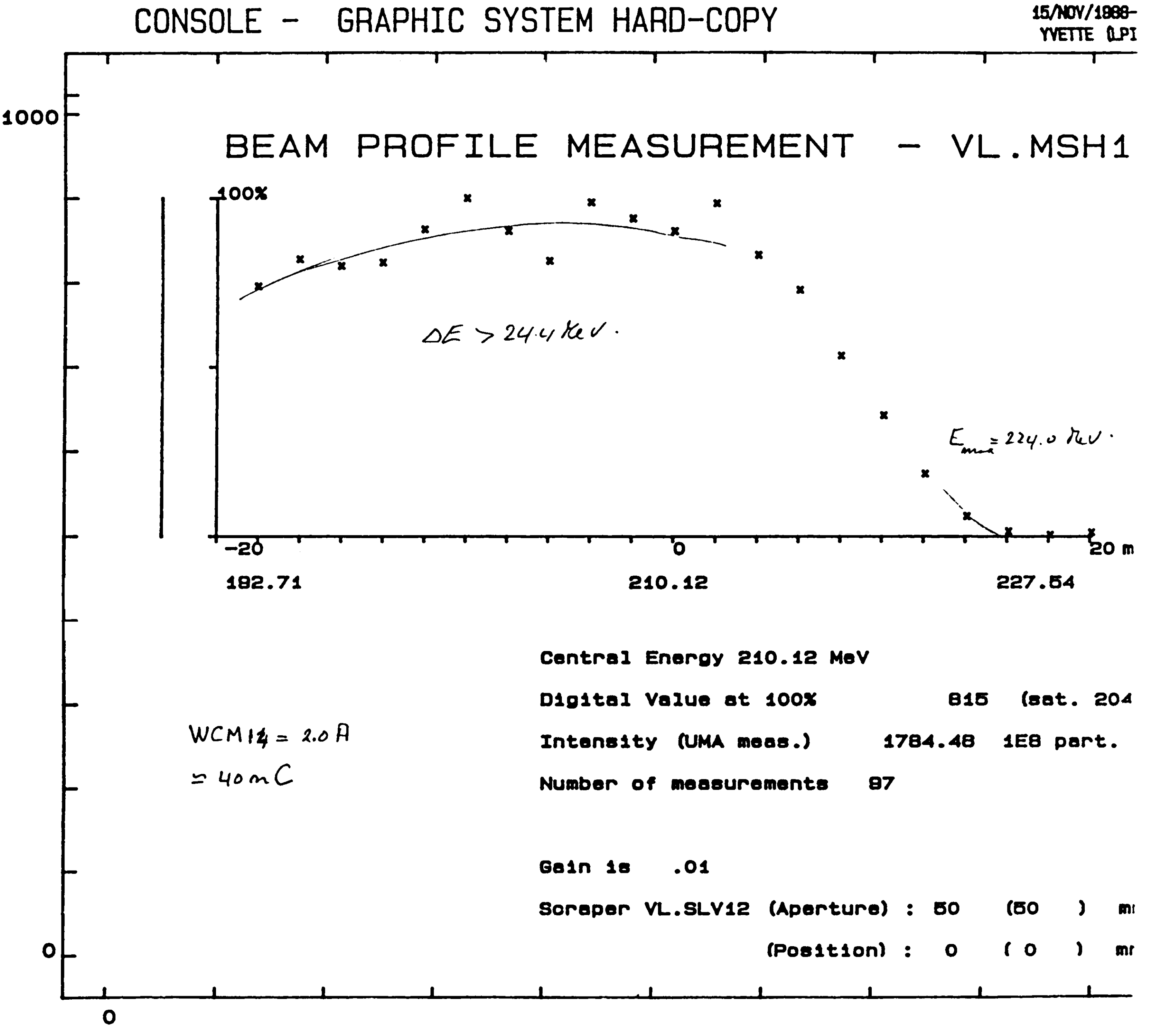
④

```
LIL UMA                                     1988-11-15-19:52:12
                  TRAJ.    POSITRONS

  Intensite (E8) Horizontal (mm) Vertical (mm)
UMA 13 -1869.5          0.0          -1.3
UMA 15 -1754.2           .9          -2.0
UMA 22    -6.0        111.1         111.1
UMA 25     0.0        111.1         111.1
UMA 27     -.1        111.1         111.1
UMA 29     0.0        111.1         111.1     WCM Intens.(E8)
UMA 30     0.0        111.1         111.1
UMA 31      .1        111.1         111.1
UMA 32      .1        111.1         111.1   ECM01   -4179.5
UMA 33      .1        111.1         111.1   WCM11   -2370.5
UMA 34     0.0        111.1         111.1   WCM12   -1812.7
UMA 35     0.0        111.1         111.1   WCM14   -1830.1
UMA 36     0.0        111.1         111.1   WCM221       -.2
UMA 37     0.0        111.1         111.1   WCM37        -.3
HIM 00     0.0        111.1         111.1   HIM00        -.3
HIE 22     0.0        111.1         111.1
HIP 22     0.0        111.1         111.1      NMEAS 100
                                                 TRIG 0
                                                  DT 0
```

130mV
170mV
130mV
130mV
FWHM. 20ns.

Take 1.85 10^{11} -> 30nC

Fig 5



CONSOLE - GRAPHIC SYSTEM HARD-COPY

15/NOV/1988-
YVETTE (LPI

BEAM PROFILE MEASUREMENT - VL.MSH1

ΔE > 24.4 MeV.

E_{max} = 224.0 MeV.

WCM14 = 2.0 A
≃ 40mC

Central Energy 210.12 MeV

Digital Value at 100% 815 (sat. 204

Intensity (UMA meas.) 1784.48 1E8 part.

Number of measurements 87

Gain is .01

Scraper VL.SLV12 (Aperture) : 50 (50) m

(Position) : 0 (0) m

④

Klystrons for 703 MeV e^- with LIL-V 240 MeV (with VL-HSI-15)
for BSH = 244.5 A thus LIL-W 463 MeV

MDK25 OFF. 18 NOV'88 JHBM.

Parameter	MDK27	MDK31	MDK35
setting	1/2 + 1/8	1/2 1/8 1/16 1/32 1/64 1/128	1/2 1/8 1/16 1/32 1/64
U_K kV	234	251	262
I_K A	215		237
PPI V	1.8	1.55	1.55
PKI V	1.7	2.1	2.30
PSI-1 V	0.48	2.2	2.0
ΔE per klystron. MeV	146 MeV	203 MeV	103 MeV

with LIPS timings optimized.

Calibration used = BSH 208.5 A ≡ 600 MeV
" 173.5 A ≡ 500 " → 1 A ≡ 2.857 MeV.

ΔE per klystron measured by switching off one klystron at the time.

Each time beam centered on HIM-MTV00 and UMA37. (not always perfect).
" " phases checked / optimized.

Note : $\Sigma \Delta E$ 27/31/35 = 452 MeV thus 11 MeV less then with all on (but this is within measuring error).

Lowered energy from 703 MeV by : MDK31 → 1/2 + 1/8 ΔE −46 MeV.

U_K 218 kV
I_K 206 A
PPI 1.55 V
PKI 1.55 V
PSI 1.70 V

Result : $\Sigma \Delta E$ 27/31/35 = 417 MeV.

MDK27 → 1/2 + 1/16 ΔE −23 MeV

U_K 214 kV
I_K 190 A
PPI 1.8 V
PKI 1.3 V
PSI 0.35 V

with MDK35 unchanged.

Result : $\Sigma \Delta E$/27/31/35 = 394 MeV
LIL-V 240 "
634 MeV.

Adjusted to 600 MeV by timing phase inversion LIPS27 & 31.

⑤ LIL-MD 11 Dec 88 par B Canard.

20.12.88
JHBM

But : chercher max sur HIP.UMA22 avec nombre et force minimum dans LIL-W steering; courbes de sensibilités.
chercher max transmission e^-

5. 1) LIL-V : faisceau Emax ≃ 227 MeV, pulse longeur ≃ 20ns ("25ns"),
intensité sur VL-UMA15 ≃ $1.75\ 10^{11}$ e's per pulse (= 28nC, 1.4A)
VL-UMA25 = $1.33\ 10^{11}$
Avec tout les steering > ACS26 à zero : $HIP_{22} = 4.2\ 10^8$
" $= 3.2\ 10^8$ dans ± 1% ΔE/E.

5. 2) Tests sensibilités des éléments de guidage dans LIL-W, > ACS26.
En mettant tout les éléments à zero, l'effet de chaque element était mesuré. (voir Fig: 1 et 2)

Plan horizontale =	DQL272H	Vert. DQNH273V
	DQL284H & DQL28H	DQNF283V
	DQNF313H	DQNF291V
	DQNF302H	DQNF301V
		DQNF312V

Alors : guidage > ACS31 pas necessaire pour max. HIP22. (mais pour centré faisceau à la sortie ACS36)

5. 3) Recherche $HIP_{22}^{\text{max.}}$ avec minimum nombre des éléments de guidage.

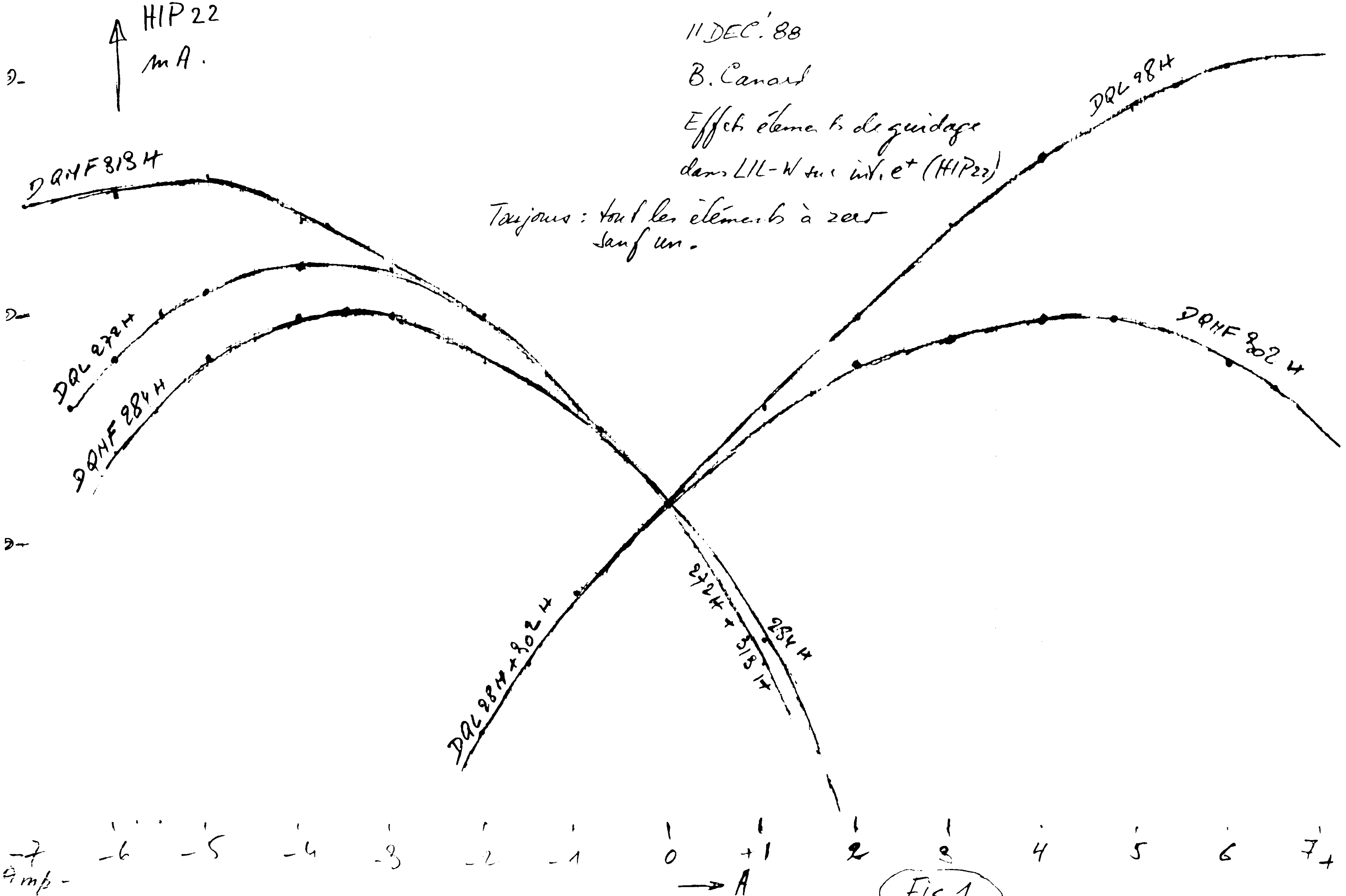
Avec DQL272H	− 3.5 A (CCV)		DQL271V	? (9999 . . !)
DQNF271H	− 0.5 A	"	DQNM273V	2.0 A
DQL28H	6.0 A	"	les autres	0.0
les autres H	0.0			

Une fois de plus constaté que pour HIP22 max. en total cinq elements de guidage suffisent.

Voir Fig 3 - pour LIL-UMAs → UMA25 : $1.35\ 10^{11}$ } conv. eff : $5.4\ 10^{-3}$ unités.
HIP22 : $7.3\ 10^8$ }
but some doubts on value UMA25
WCM14 = $1.865\ 10^{4}$ } conv. eff $3.9\ 10^{-3}$ unités.
HIP22 : $7.3\ 10^8$ }

Fig 4 typique pour ΔE/E.

± 1% → UMA25 & WCM14 as above } conv. eff. $3.7\ 10^{-3}$ nis
HIP22 : $5.0\ 10^8$ } or 2.7 "



11 DEC. '88

B. Canard

Effets éléments de guidage dans LIL-W sur int. e^+ (HIP22)

Toujours : tous les éléments à zéro sauf un.

Fig 1

11 Dec. '88

B. Canard.

Effets éléments de guidage dans LIL-W sur intensité e+ (HIP22).

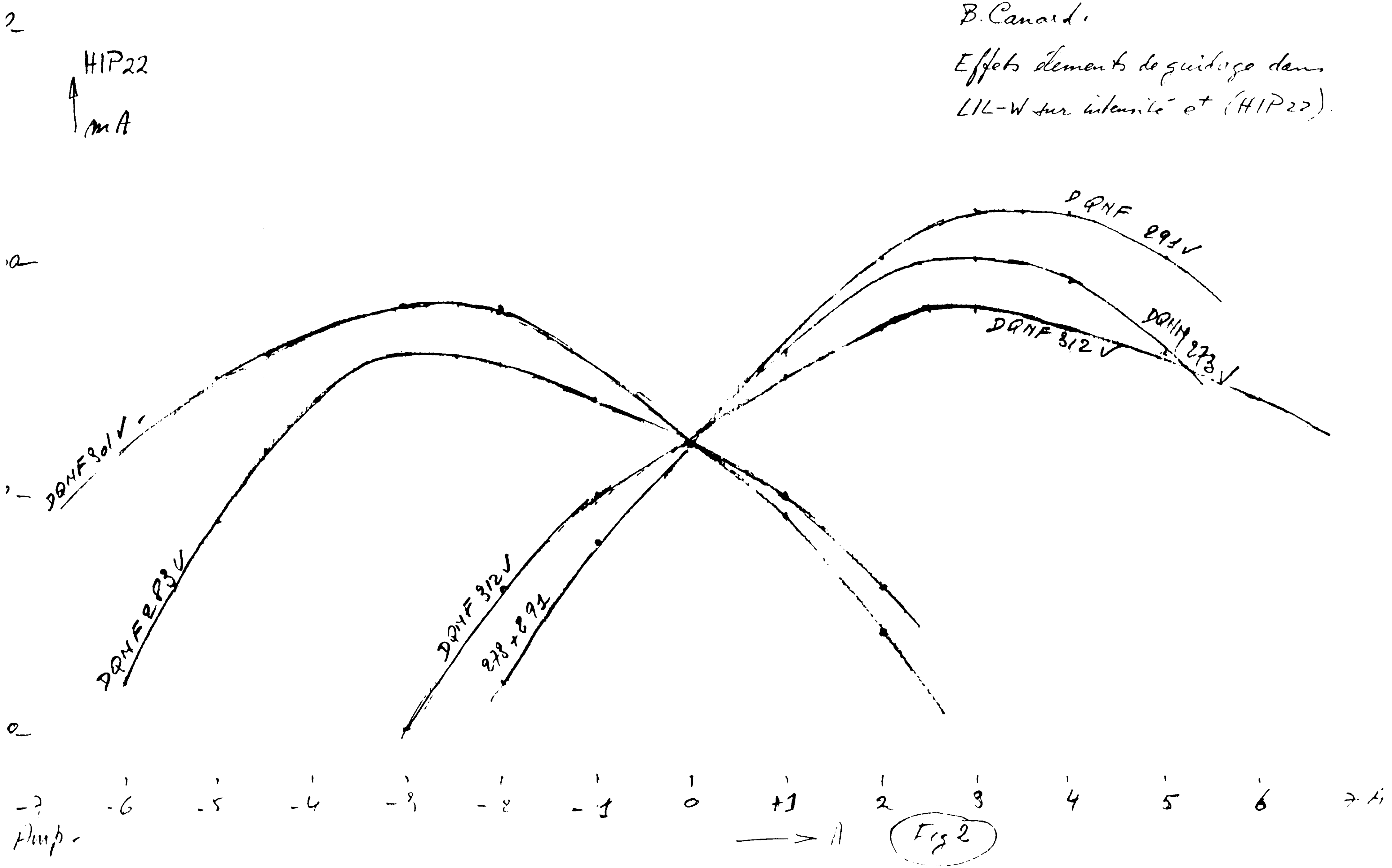


Fig 2

B. Canard.

```
LIL UMA                                                1988-12-11-20:20:51
                    TRAJ.    POSITRONS

  Intensite (EB) Horizontal (mm) Vertical (mm)
UMA 13 -1847.6             1.3            -.2
UMA 15 -1774.0             -.5           -1.9
UMA 22 -1882.3             0.0           -3.0
UMA 25 -1351.5            14.6          -14.0
UMA 27   -11.5            -4.6           -1.1
UMA 29     3.9             -.2            4.3     WCM Intens.(EB)
UMA 30     5.4             1.5            1.1
UMA 31     5.4            -3.3            1.4
UMA 32     5.3             5.3            3.1   ECM01   -4107.4
UMA 33     5.5              .2            3.9   WCM11   -2335.6
UMA 34     5.5            -3.4             .4   WCM12   -1917.3
UMA 35     5.5            -5.0           -1.9   WCM14   -1865.0
UMA 36     5.7             -.6             .3   WCM221       .2
UMA 37     5.9              .7            2.6   WCM37       5.2
HIM 00      .3           111.1          111.1   HIM00       9.0
HIE 22    -2.1            13.2           -2.0
HIP 22     7.3             9.8            2.3       NMEAS 100
                                                     TRIG 0
                                                       DT 0
```

Fig 3

Sans slits (unresolved)

```
LIL UMA                                               1988-12-11-11:18:48
                        TRAJ.    POSITRONS

   Intensite (E8) Horizontal (mm) Vertical (mm)
 UHA 13 -1219.4          1.8          -1.0
 UHA 15 -1166.2          1.0          -1.9
 UHA 22 -1202.0          1.0          -2.5
 UHA 25  -794.9           .3          -1.7
 UHA 27    -9.5          1.8          -7.4
 UHA 29      .9        -41.8         -14.9      WCM Intens.(E8)
 UHA 30     2.4         -1.4           6.4
 UHA 31     2.5         -2.8          -3.2
 UHA 32     2.3          8.1           6.1   ECM01   -2738.3
 UHA 33     2.2          -.6          11.2   WCM11   -1516.4
 UHA 34     3.0          -.3          -6.9   WCM12   -1255.0
 UHA 35     2.2         -6.1          -5.4   WCM14   -1220.1
 UHA 36     2.4         -1.7          -1.6   WCM221      -.2
 UHA 37     2.7          0.0           3.7   WCM37       2.2
 HIM 00     0.0        111.1         111.1   HTM00       4.5
 HIE 22     -.7          6.1         111.1
 HIP 22     3.9          0.0           3.5      NMEAS 100
                                                  TRIG 0
                                                   DT 0
```

15m
pulse length setting

Fig 4.

4.2 mA —
without slits.

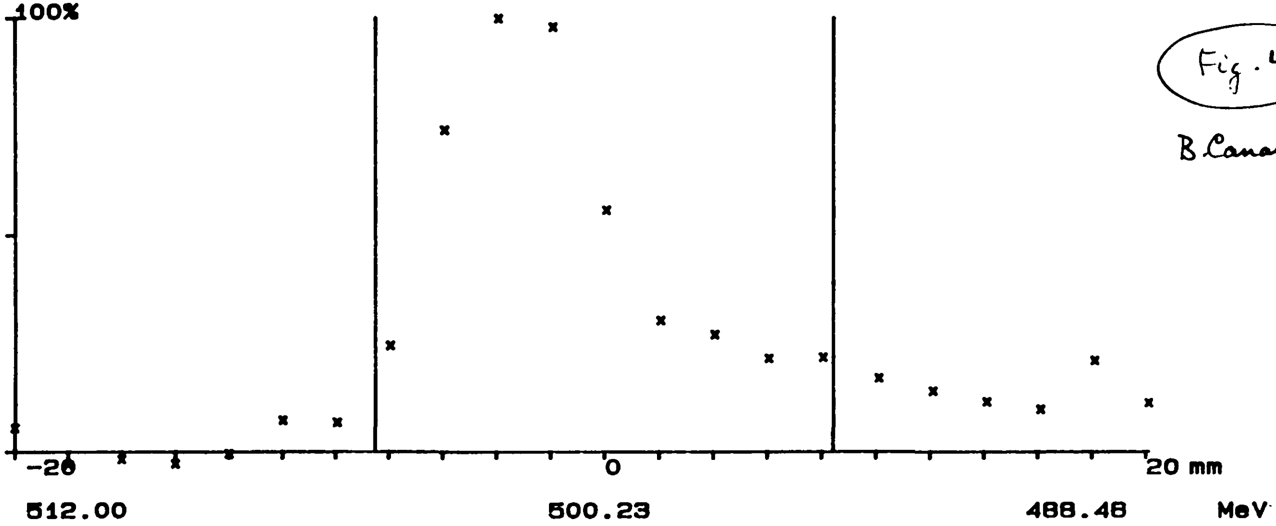
CONSOLE - GRAPHIC SYSTEM HARD-COPY

11/DEC/1988-17:34:04
YVETTE (LPI)

BEAM PROFILE MEASUREMENT - HIP.MSH20

Fig. 4

B. Canard.



HIP22 : 5.10^8 without slits
: $7.3\,10^8$ with slits at ± 1%

WCM14 = $1.865\,10^{11}$
UMA22 = $1.35\,10^{11}$

Central Energy 500.23 MeV
Digital Value at 100% 1143 (sat. 2047)
Intensity (UMA meas.) -.511 1E8 part.
Number of measurements 80

Gain is 1
Scraper HIP.SLH20 (Aperture) : 18.8 (18.8) mm
(Position) : -.1 (-.1) mm

avec les steerings,
et vérifié que pour Tmax le HIP22 est max. également.

---

⑥① La recherche a montré que les steerings étaient déjà bien ajusté.

Petit gain avec une changement sur DHZ11 et DQL14V :

départ $T = 76\%$ ($UMA22/WCM11 = 1967 \cdot 10^8 / 2597 \cdot 10^8$) ~~Setting pulse length~~ : 25 ms
$HIP22 = 6.4\ 10^8$

après optim. $T = 79\%$ ($2034 \cdot 10^8 / 2563\ 10^8$) Voir Fig 1
$HIP22 = 6.6\ 10^8$ (LIL-W optimized previously by operation)

avec DHZ11 = -1.1 A / DVT11 = 1.46 / DQS12H = 6 A / DQL12V = -2.25 A / DQS13H = 5.8 A
DQL13V = 2.0 A / DQS14H = 0. A / DQL14V = 0. A / DHZ14 = 0 A / DVT14 = 0 A /
DQL152H = 0.2 A / DQL153V = -7.0 A
DHG031 = 2.5 A
DVG031 = -0.04 A.

Position faisceau sur WBS25 + 0.4 mm H Fig 2
+ 2.0 " V.

E et ΔE/E : Fig 3.

---

6 2 L'influence DHG031 et DVG031

DHG031 DVG031	2.5 A 100% -0.04 ..	1.8 A 75% -0.03 ..	1.2 A 50% -0.02 A	0 A 0% 0 ..
WCM11	$2.6\ 10^{11}$	$2.5\ 10^{11}$	$2.5\ 10^{11}$	$2.5\ 10^{11}$
UMA22	$2.03\ 10^{11}$ 100%	$1.91\ 10^{11}$ 94%	$1.75\ 10^{11}$ 86%	$1.1\ 10^{11}$ 54%
HIP22	$6.6\ 10^8$ 100% 4.6 mA	$5.7\ 10^8$ 86% 4.2 mA	$5.0\ 10^8$ 76% 3.6 mA	$2.5\ 10^8$ 38% 1.85 mA
%	3.5 ..	3.35 ..	2.7	1.35
WBS25 H V	+ 0.4 mm + 2.0 mm	+ 0.43 mm + 1.55 ..	+ 0.68 mm + 1.55	+ 0.9 mm + 0.93 ..

Transmission dans LIL baisse avec DHG/DVG031 et en même temps la position

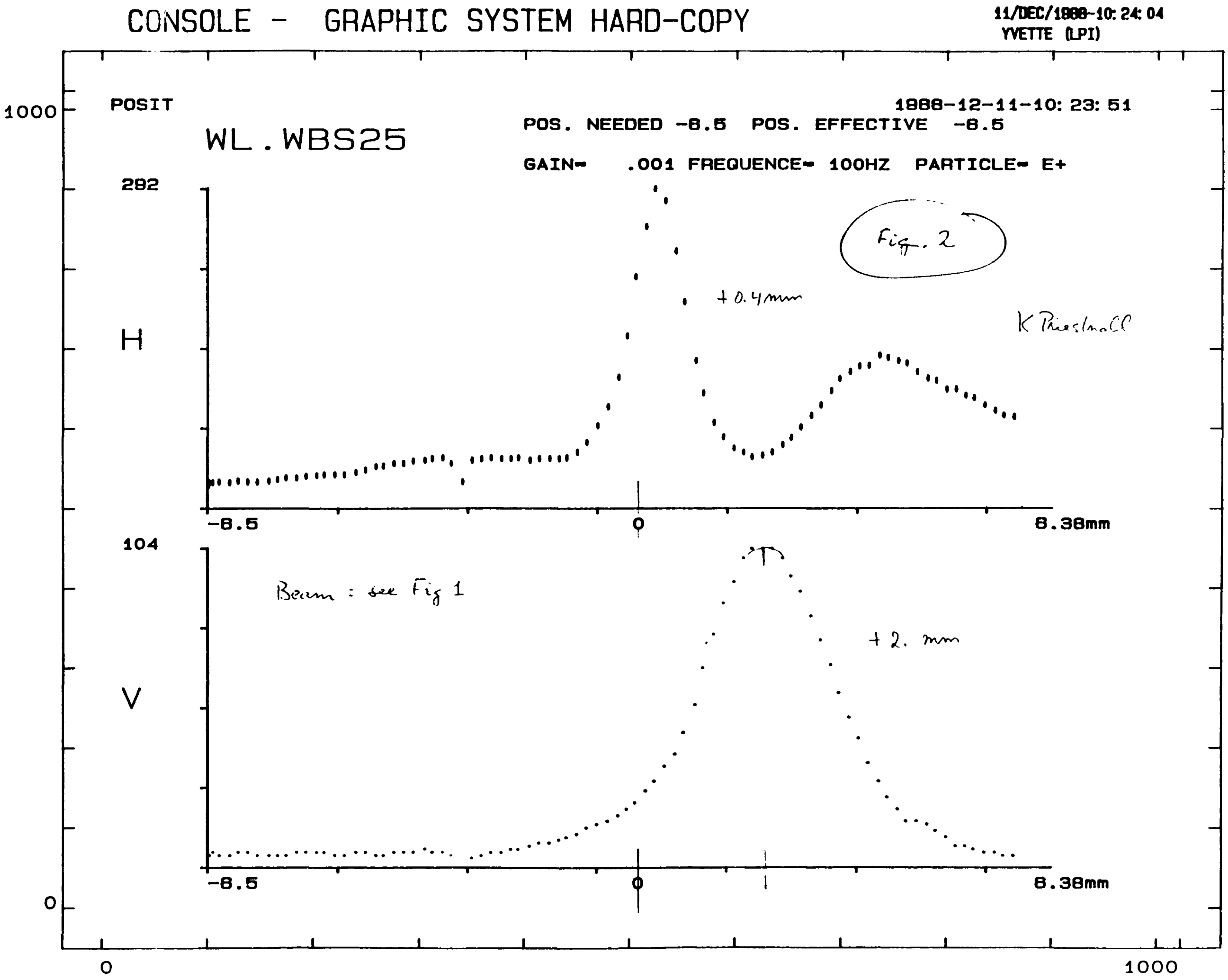
```
LIL UMA                                               1988-12-11-10:26:58
                        TRAJ.   POSITRONS

  Intensite (E8) Horizontal (mm) Vertical (mm)
UMA 13 -2857.5          1.6          -.7
UMA 15 -1940.8           .2         -2.2
UMA 22 -2834.1           .9         -2.9
UMA 25 -1280.6           .2         -1.5
UMA 27   -15.4          -.2         -6.2
UMA 29     2.3        -15.6        252.7     WCM Intens.(E8)
UMA 30     4.0          -.6          5.0
UMA 31     4.1         -1.6         -1.6
UMA 32     4.1          8.1          6.3    ECM01   -4443.7
UMA 33     4.1          -.6          9.0    WCM11   -2562.8
UMA 34     4.8         -2.1         -5.0    WCM12   -2091.6
UMA 35     4.1         -5.5         -6.0    WCM14   -2856.7
UMA 36     4.4           .2          -.3    WCM221       -.2
UMA 37     4.6          3.0          3.2    WCM37        4.0
HIH 00     0.0        111.1        111.1    HIH00        8.6
HIE 22    -1.2         13.5          0.0
HIP 22     6.6          1.6          3.1       NMEAS 100
                                                TRIG 0
                                                 DT 0
```

Fig 1

4.6mA — without slits

LIL-V steerings optimized

max. transmission up to UMA13.



CONSOLE - GRAPHIC SYSTEM HARD-COPY

11/DEC/1988-10: 24: 04
YVETTE (LPI)

POSIT

WL.WBS25

1988-12-11-10: 23: 51
POS. NEEDED -8.5 POS. EFFECTIVE -8.5
GAIN= .001 FREQUENCE= 100HZ PARTICLE= E+

Fig. 2

+0.4mm

K Priestnall

Beam : see Fig 1

+2. mm

CONSOLE - GRAPHIC SYSTEM HARD-COPY

11/DEC/1988-10:13:27
YVETTE (LPI)

BEAM PROFILE MEASUREMENT - VL.MSH15

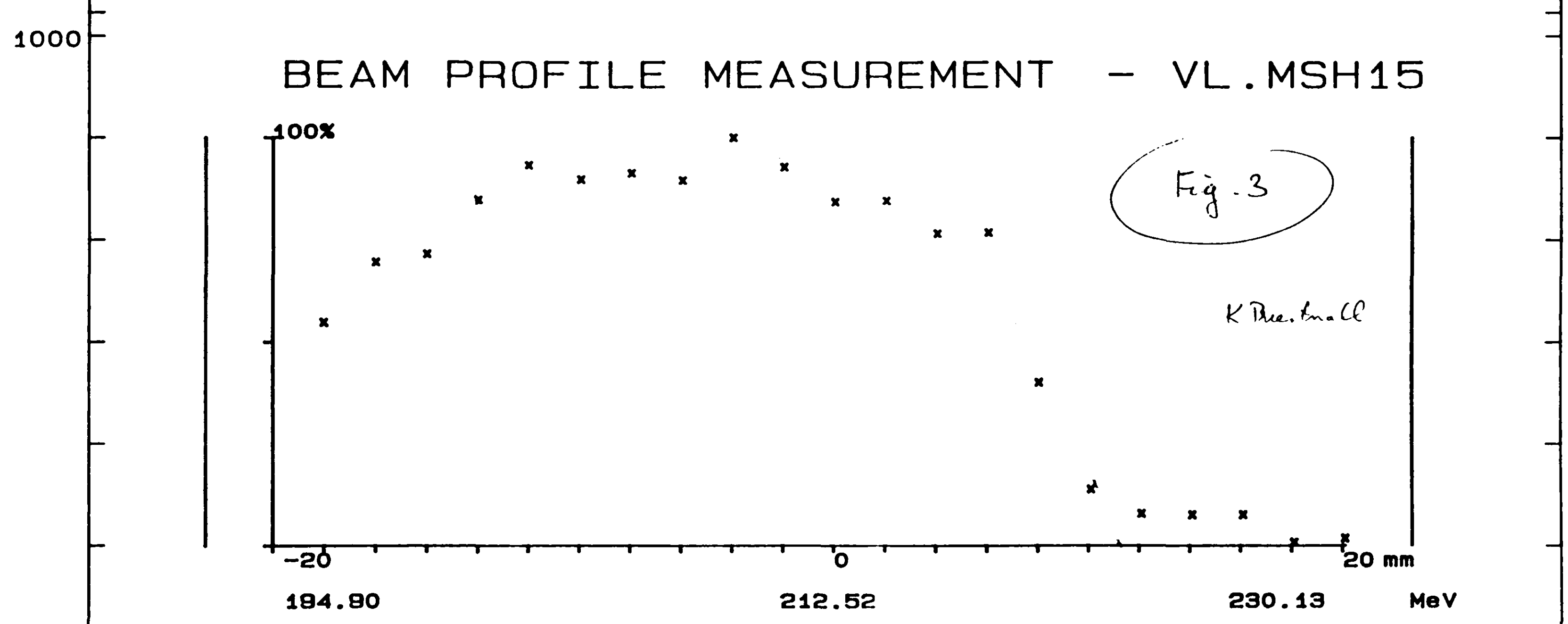


Fig. 3

K Bre. tmall

Beam: see Fig 1

Central Energy 212.52 MeV

Digital Value at 100% 1108 (sat. 2047)

Intensity (UMA meas.) 1387.81 1E8 part.

Number of measurements 87

Gain is .01

Scraper VL.SLV12 (Aperture) : 48.8 (48.8) mm

(Position) : 0 (0) mm