

MEMORANDUM

4 Juillet 1989

A: S.Battisti , P.Tétu
 De: C.Dutriat
 Copies: J.P.Delahaye , H.Koziol , K.H.Schindl
 Sujet: **TESTS LPI JUIN 1989**

1. SEMGRID**a. V - MSII 15 :**

- Fonctionnement correct (1a)
- Display UMA correspondant (1b)
- Affichage TV par dico - dime incomplet et inversé (1c)

b. IIIF - MSII 20 :

- Fonctionnement correct (2a)
- Display UMA correspondant (2b)
- Affichage TV (2c)
- Vérification de l'énergie moyenne par rapport à l'acceptance de EPA : les dipôles sont alimentés à 436 Ampères , ce qui correspond à une énergie de 500 Mev . (2d)
- Remarque : la précision en valeur absolue de l'acceptance de EPA n'est pas meilleure que 0,5% . La concordance est excellente .

c. IIII - MSII 20 :

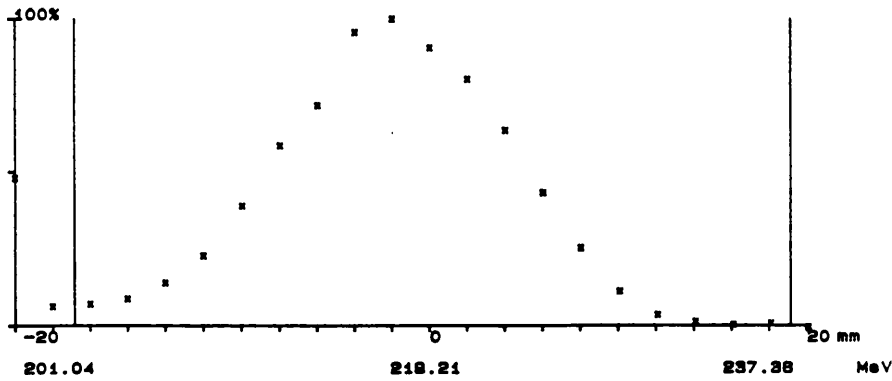
- Display et indication d'énergie corrects (3)

2. TESTS WBS - SCAN**a. WBS 25 :**

- Mesure du bruit sans faisceau (4)
- Positionnement : à partir des courbes 5 à 14 a et b , on constate un décalage moyen de +1,9mm dans les 2 plans entre WBS 25 et UMA 25 (voir tableau No 1) . Les variations autour de ces valeurs sont de ± 1 mm. L'erreur sur les UMA est estimée à $\pm 0,5$ mm. L'erreur d'évaluation de la position moyenne du WBS à $\pm 0,25$ mm. Tout se passe comme si le centre mécanique du WBS se trouve à 3mm. du centre théorique du faisceau (voir tableau No 2) . Il est improbable que cela soit dû à une erreur mécanique .

1a

BEAM PROFILE MEASUREMENT - VL.MSH15

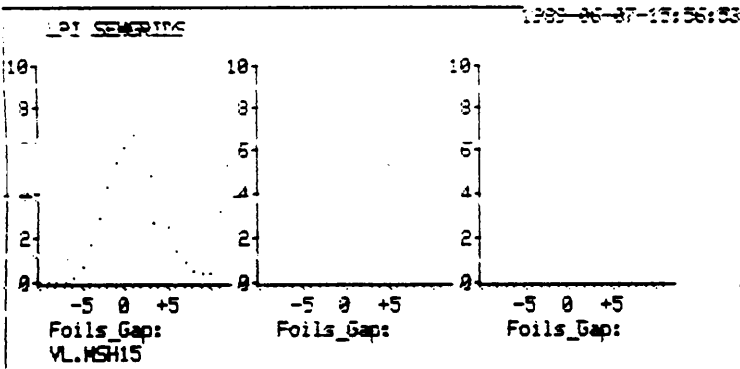


Central Energy 218.21 MeV
 Digital Value at 100% 1381 (sat. 2047)
 INTENSITY (UMA meas.) -933.1 1EB part.
 Number of measurements 100
 Gain is .01
 Scraper VL.8LV11 (Top) : 18.0(-18.5) mm
 (Bottom) : -18.8(18.5) mm

0

1000

1c



Seagrid	VL.MSH15	Plane:
Gain MM	.010	Ring:
Gain SW		User: @electron
In/Out	in	Average:100(100)
Mean		Start/Stop:
2 Sigma		
Exit 95		
Noise		Errors:
Average:	() Gain MM:	

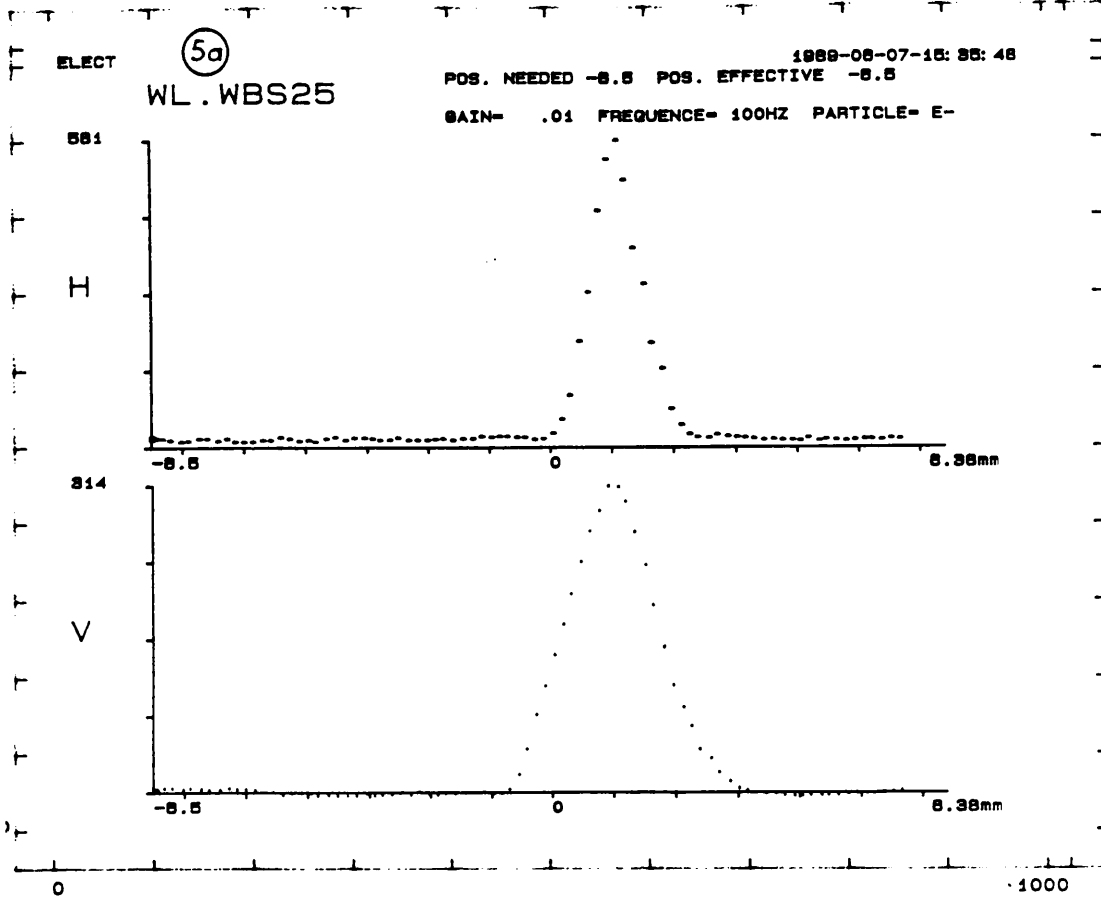
LIL UMA

1b

TRAJ. ELECTRONS

1988-06-07-15:57

	Intensity(EB)	Horizontal(mm)	Vertical(mm)	
UMA 13	-927.8	.7	.1	
UMA 15	-933.1	1.5	.1	
UMA 22	0.0	111.1	111.1	
UMA 25	0.0	111.1	111.1	
UMA 27	-.3	111.1	111.1	
UMA 29	0.0	111.1	111.1	
UMA 30	0.0	111.1	111.1	
UMA 31	0.0	111.1	111.1	
UMA 32	0.0	111.1	111.1	ECH01 -3939.6
UMA 33	0.0	111.1	111.1	MCH11 -4292.4
UMA 34	0.0	111.1	111.1	MCH12 -941.2
UMA 35	0.0	111.1	111.1	MCH14 -976.1
UMA 36	-.3	111.1	111.1	MCH37 0.0
UMA 37	0.0	111.1	111.1	HIP00 .6
H1H 00	.7	111.1	111.1	
H1E 22	0.0	111.1	111.1	
H1P 22	0.0	111.1	111.1	NME05 100



LIL UMA (5b)

TRAJ. ELECTRONS

1989-06-27-15:37:53

	Intensite(E8)	Horizontal(mm)	Vertical(mm)	
UMA 13	-213.2	1.3	.1	
UMA 15	-431.9	1.3	-.1	
UMA 22	-197.6	.2	.2	
UMA 25	-195.5	-1.6	-2.1	
UMA 27	-1.4	111.1	111.1	
UMA 29	0.0	111.1	111.1	
UMA 30	0.0	111.1	111.1	
UMA 31	0.0	111.1	111.1	
UMA 32	0.0	111.1	111.1	
UMA 33	0.0	111.1	111.1	
UMA 34	0.0	111.1	111.1	
UMA 35	0.0	111.1	111.1	
UMA 36	-1.3	111.1	111.1	
UMA 37	0.0	111.1	111.1	
UMA 38	0.0	111.1	111.1	
UMA 39	0.0	111.1	111.1	
UMA 40	0.0	111.1	111.1	
UMA 41	0.0	111.1	111.1	
UMA 42	0.0	111.1	111.1	
UMA 43	0.0	111.1	111.1	
UMA 44	0.0	111.1	111.1	
UMA 45	0.0	111.1	111.1	
UMA 46	0.0	111.1	111.1	
UMA 47	0.0	111.1	111.1	
UMA 48	0.0	111.1	111.1	
UMA 49	0.0	111.1	111.1	
UMA 50	0.0	111.1	111.1	
UMA 51	0.0	111.1	111.1	
UMA 52	0.0	111.1	111.1	
UMA 53	0.0	111.1	111.1	
UMA 54	0.0	111.1	111.1	
UMA 55	0.0	111.1	111.1	
UMA 56	0.0	111.1	111.1	
UMA 57	0.0	111.1	111.1	
UMA 58	0.0	111.1	111.1	
UMA 59	0.0	111.1	111.1	
UMA 60	0.0	111.1	111.1	
UMA 61	0.0	111.1	111.1	
UMA 62	0.0	111.1	111.1	
UMA 63	0.0	111.1	111.1	
UMA 64	0.0	111.1	111.1	
UMA 65	0.0	111.1	111.1	
UMA 66	0.0	111.1	111.1	
UMA 67	0.0	111.1	111.1	
UMA 68	0.0	111.1	111.1	
UMA 69	0.0	111.1	111.1	
UMA 70	0.0	111.1	111.1	
UMA 71	0.0	111.1	111.1	
UMA 72	0.0	111.1	111.1	
UMA 73	0.0	111.1	111.1	
UMA 74	0.0	111.1	111.1	
UMA 75	0.0	111.1	111.1	
UMA 76	0.0	111.1	111.1	
UMA 77	0.0	111.1	111.1	
UMA 78	0.0	111.1	111.1	
UMA 79	0.0	111.1	111.1	
UMA 80	0.0	111.1	111.1	
UMA 81	0.0	111.1	111.1	
UMA 82	0.0	111.1	111.1	
UMA 83	0.0	111.1	111.1	
UMA 84	0.0	111.1	111.1	
UMA 85	0.0	111.1	111.1	
UMA 86	0.0	111.1	111.1	
UMA 87	0.0	111.1	111.1	
UMA 88	0.0	111.1	111.1	
UMA 89	0.0	111.1	111.1	
UMA 90	0.0	111.1	111.1	
UMA 91	0.0	111.1	111.1	
UMA 92	0.0	111.1	111.1	
UMA 93	0.0	111.1	111.1	
UMA 94	0.0	111.1	111.1	
UMA 95	0.0	111.1	111.1	
UMA 96	0.0	111.1	111.1	
UMA 97	0.0	111.1	111.1	
UMA 98	0.0	111.1	111.1	
UMA 99	0.0	111.1	111.1	
UMA 100	0.0	111.1	111.1	

UM Intens. (E8)

UM01	-384.4
UM11	-313.7
UM12	-226.6
UM14	-226.6
UM27	-1.4
UM38	.0

UM01 100

M E M O R A N D U M

4 Juillet 1989

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 Sujet: **TESTS LPI JUIN 1989**

1. SEMGRID**a. V - MSH 15 :**

- Fonctionnement correct (1a)
- Display UMA correspondant (1b)
- Affichage TV par dico - dime incomplet et inversé (1c)

b. IIP - MSH 20 :

- Fonctionnement correct (2a)
- Display UMA correspondant (2b)
- Affichage TV (2c)
- Vérification de l'énergie moyenne par rapport à l'acceptance de EPA : les dipôles sont alimentés à 436 Ampères , ce qui correspond à une énergie de 500 Mev . (2d)
- Remarque : la précision en valeur absolue de l'acceptance de EPA n'est pas meilleure que 0,5% . La concordance est excellente .

c. IIP - MSH 20 :

- Display et indication d'énergie corrects (3)

2. WIRE - SCAN**a. WBS 25 :**

- Mesure du bruit sans faisceau (4)
- Positionnement : à partir des courbes 5 à 14 a et b , on constate un décalage moyen de +1,9mm dans les 2 plans entre WBS 25 et UMA 25 (voir tableau No. 1) . Les variations autour de ces valeurs sont de ± 1 mm. L'erreur sur les UMA est estimée à $\pm 0,5$ mm. L'erreur d'évaluation de la position moyenne du WBS à $\pm 0,25$ mm. Tout se passe comme si le centre mécanique du WBS se trouve à 3mm. du centre théorique du faisceau (voir tableau No 2) . Il est improbable que cela soit dû à une erreur mécanique .

- Proposition : modifier le logiciel .
 - Parasite à haute intensité avec convertisseur : tableau No 3 . Deux paramètres influencent la production de parasites :
 - la tension de polarisation (surtout sur le plan vertical)
 - l'intensité du faisceau (surtout sur le plan horizontal)
 - Mesure à basse intensité sans convertisseur : position du faisceau déviée par DIHZ 14 et DVT 14 (courbes 6 , 7 et 8)
- b. WBS 28 :
- Mesure du bruit (15)
 - Mesure faisceau : fonctionnement correct (16a)
 - Positionnement : comparaison avec la moyenne des UMA 27 – 29 , les différences sont de + 2,6mm. en H et + 0,3mm. en V (16b)
- c. WBS 82 :
- Mesure du bruit (17)
 - Mesure du faisceau sans dump (18)
 - Mesure du faisceau avec dump (19)
- d. WBS 14 :
- Mesure du bruit (20)
 - Mesure du faisceau amplificateur V changé (21)
 - Mesure du faisceau avec dump (22)

Christian Dutriat

Date: 26.6.89
Time: 11.01

LPI-TESTS JUIN 1989 - TABLEAU No 1

COURBE No	DHZ14	DVT14	WBS25H	UMA25H	WBS25V	UMA25V	HWBS-HUMA	VWBS-VUMA
5a+5b	8A	0A	+1,2mm	-1,6mm	+1,2mm	-2,1mm	+2,8mm	+3,3mm
6a+6b	8A	0A	+1mm	-1,2mm	+1mm	-1,5mm	+2,2mm	+2,5mm
7a+7b	4A	0A	+1,6mm	-0,4mm	+1mm	-1,4mm		
8a+8b	4A	7A	+1,6mm	-0,4mm	+2,2mm	-0,4mm		
9a+9b	8A	0A	+1mm	-0,6mm	+0,9mm	-0,2mm	+1,6mm	+1,1mm
10a+10b	8A	0A	+1mm	-0,6mm	+0,8mm	-0,3mm	+1,6mm	+1,1mm
11a+11b	8A	0A	+0,9mm	-1,2mm	+0,9mm	-0,5mm	+2,1mm	+1,4mm
12a+12b			+0,8mm	-0,7mm	+0,9mm	-0,3mm		
13	1A	9A	+2mm		+2,2mm			
14a+14b	10A	9A	+0,6mm	-0,7mm	+2mm	+0,1mm	+1,3mm	+2,1mm
							MOYENNE:	MOYENNE:
							+1,93mm	+1,91mm

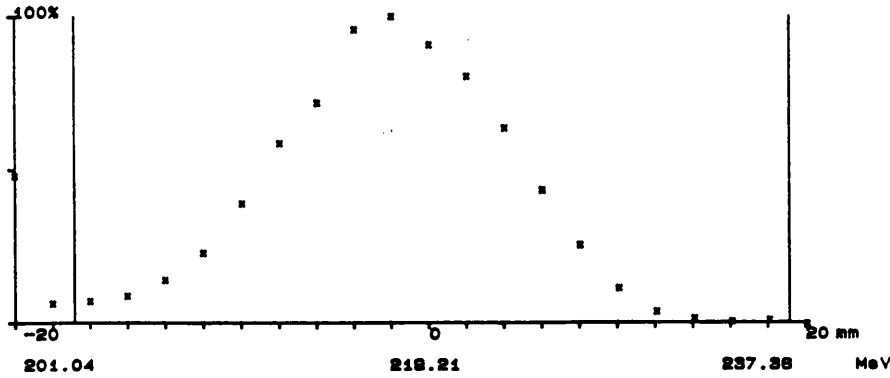
Date: 28.6.89
Time: 9.16

LPI-TESTS JUIN 1989 - TABLEAU No 3

COURBE No	INTENSITE	U pol.	Parasite H	Parasite V
9a+9b	2,4*10E11	-300V	5%	20%
10a+10b	2,8*10E11	-300V	15%	80%
11a+11b	2,8*10E11	-450V	20%	5%
12a+12b	2,4*10E11	-450V	10%	5%
13	2,2*10E11	-450V	5%	5%
14a+14b	2,7*10E11	-450V	35%	20%

1a

BEAM PROFILE MEASUREMENT - VL.MSH15

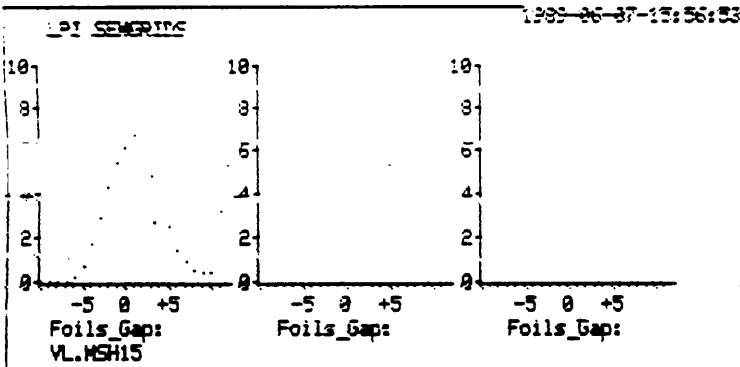


Central Energy 218.21 MeV
 Digital Value at 100% 1381 (est. 2047)
 INTENSITY (UMA meas.) -933.1 1EB part.
 Number of measurements 100
 Gain is .01
 Scraper VL.BLV11 (Top) : 18.0 (-18.5) mm
 (Bottom) : -18.0 (18.5) mm

0

1000

1c

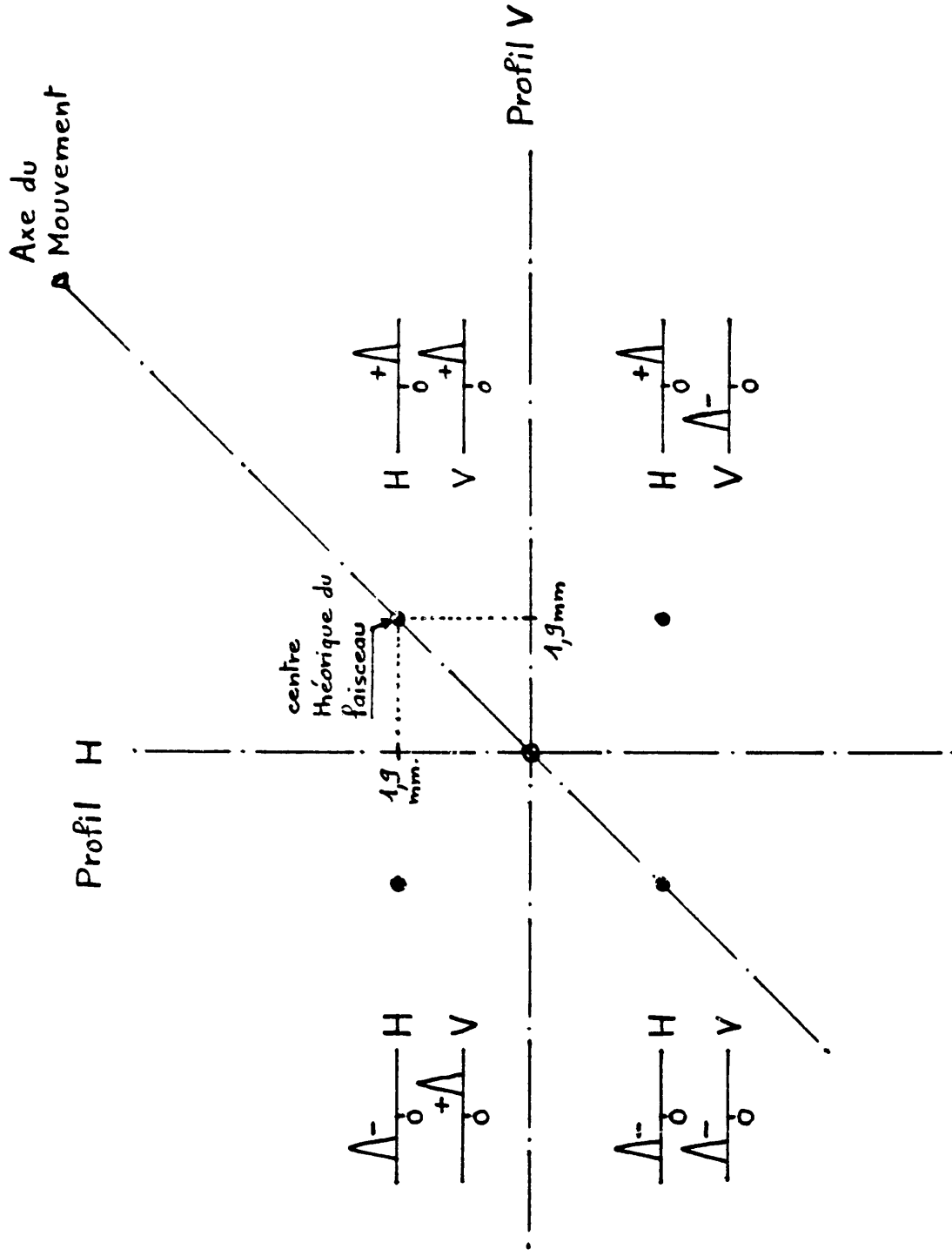


Seagrid	VL.MSH15	Plane:
Gain EM	.010	Ring:
Gain SW		User: electron
In/Out	in	Average: 100(100)
Mean		Start/Stop:
2 Sigma		
Exit 95		
Noise		Errors:
Average:	()	Gain -W:

LIL UMA 1b

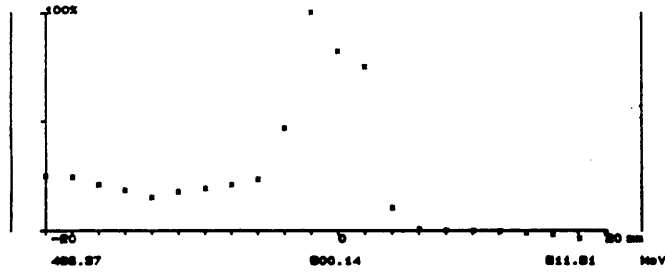
TRAJ. ELECTRONS

	Intensity(EB)	Horizontal(mm)	Vertical(mm)	
UMA 13	-927.8	.7	.1	
UMA 15	-933.1	1.5	.1	
UMA 22	0.0	111.1	111.1	
UMA 25	0.0	111.1	111.1	
UMA 27	-.3	111.1	111.1	
UMA 29	0.0	111.1	111.1	
UMA 30	0.0	111.1	111.1	
UMA 31	0.0	111.1	111.1	
UMA 32	0.0	111.1	111.1	
UMA 33	0.0	111.1	111.1	
UMA 34	0.0	111.1	111.1	
UMA 35	0.0	111.1	111.1	
UMA 36	-.3	111.1	111.1	
UMA 37	0.0	111.1	111.1	
HIZ 00	.7	111.1	111.1	
HIE 22	0.0	111.1	111.1	
HIP 22	0.0	111.1	111.1	
				MCM Intens.(EB)
				EDM01 -3939.6
				MDM11 -4232.4
				MDM12 -941.2
				MDM14 -976.1
				MDM37 0.0
				HIP00 .6
				NMEAS 100



2a

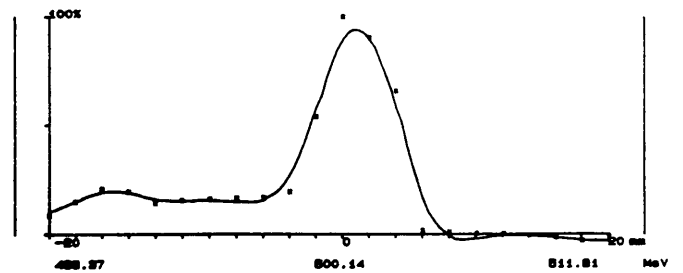
BEAM PROFILE MEASUREMENT - HIE.MSH20



Central Energy 800.14 MeV
 Digital Value at 100% 1200 (sat. 2047)
 INTENSITY (UMA meas.) -64.788 1EB part.
 Number of measurements 100
 Gain is .1
 Scraper HIE.BLH20 (Aperture) : 50 (48.8) mm
 (Position) : 0 (0) mm

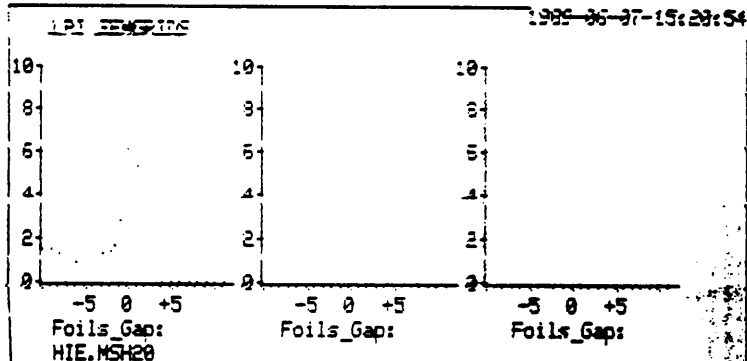
2d

BEAM PROFILE MEASUREMENT - HIE.MSH20



Central Energy 800.14 MeV
 Digital Value at 100% 1229 (sat. 2047)
 INTENSITY (UMA meas.) -68.118 1EB part.
 Number of measurements 18
 Sigma 19.85mm
 Gain is .001
 Scraper HIE.BLH20 (Aperture) : 50 (48.8) mm
 (Position) : 0 (0) mm

2c



S	id	HIE.MSH20	Plane:
Gain HW	.100		Rings:
Gain SW			User: electron
In/Out	in		Average:100(100)
Mean			Start/Stop:
2 Sigma			
Exit 95			
Noise			Errors:
Over age:		Gain HW:	

LIL UMA 2b

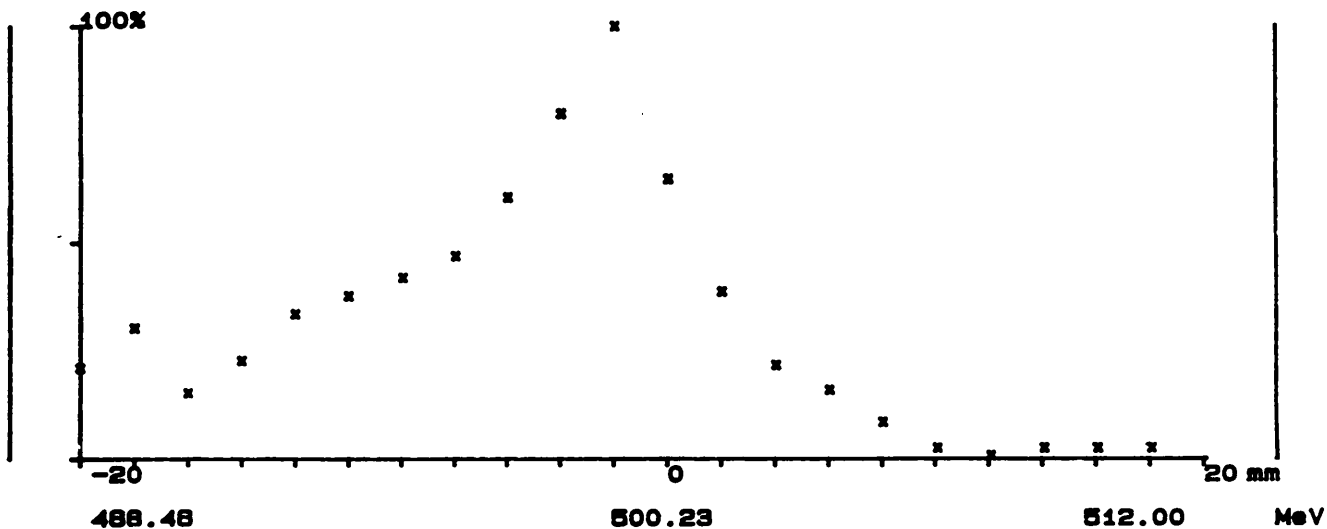
TRAJ. ELECTRONS

1988-06-07-15:29:

	Intensity(EB)	Horizontal(mm)	Vertical(mm)	
UMA 13	-64.0	2.3	.1	
UMA 15	-69.2	.9	-3.0	
UMA 22	-70.2	1.1	3.0	
UMA 25	-71.4	-1.9	-1.8	
UMA 27	-64.9	-1.7	2.1	
UMA 29	-63.2	.3	1.0	
UMA 30	-62.0	-1.2	1.1	WCM Intens.(EB)
UMA 31	-61.7	-1.5	-1.6	
UMA 32	-63.0	.2	.2	ECM01 -312.3
UMA 33	-64.1	-1.2	1.4	WCM11 -104.6
UMA 34	-64.5	.2	.7	WCM12 -97.1
UMA 35	-62.0	-1.4	3.1	WCM14 -69.7
UMA 36	-62.8	-1.1	2.9	WCM37 -104.9
UMA 37	-64.8	.6	-1.1	HIP00 .6
HIM 00	.7	111.1	111.1	
HIE 22	-53.7	-5.0	-2.3	
HIP 22	0.0	111.1	111.1	NMEAS 100

3

BEAM PROFILE MEASUREMENT - HIP.MSH20



Central Energy 500.23 MeV

Digital Value at 100% 118 (est. 2047)

INTENSITY (UMA meas.) 1.344 1E8 part.

Number of measurements 100

Gain is .1

Scraper HIP.SLH20 (Aperture) : 48.9 (48) mm

(Position) : 0 (0) mm

ELECT

④

WL.WBS25

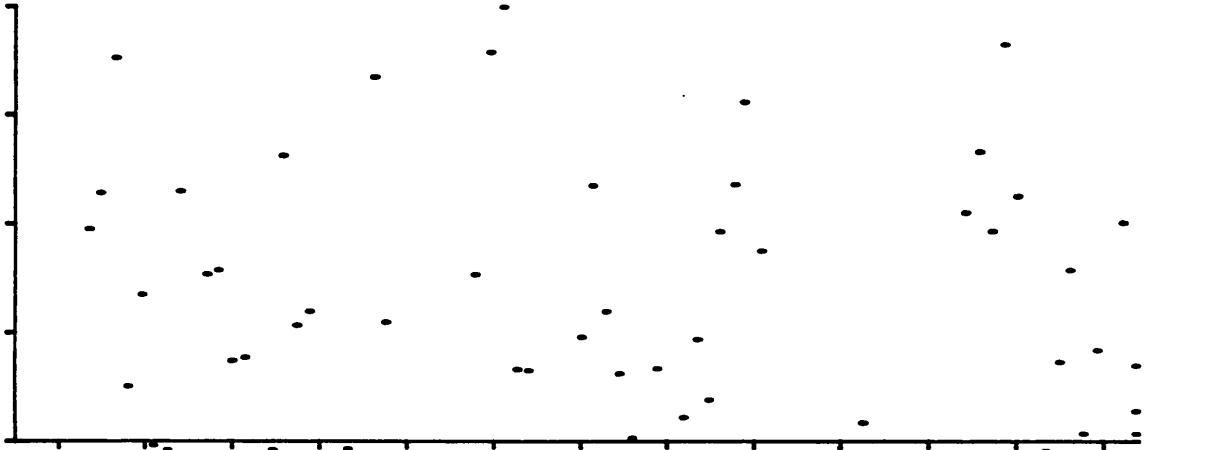
1989-08-28-14:25:13

POS. NEEDED 8.98 POS. EFFECTIVE 8.98

GAIN= 1 FREQUENCY= 100HZ PARTICLE= E-

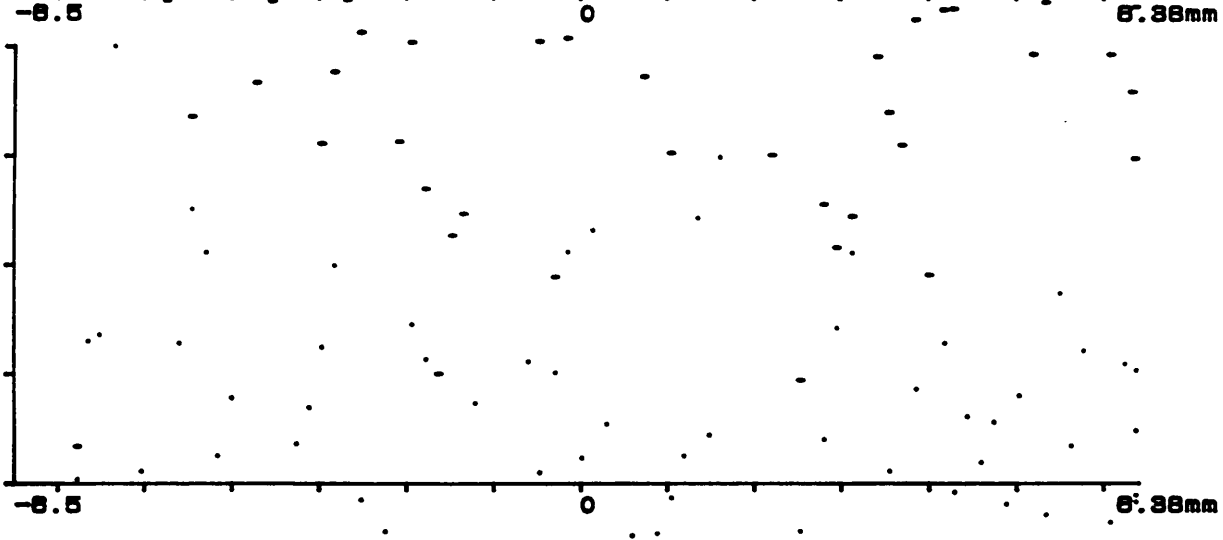
303

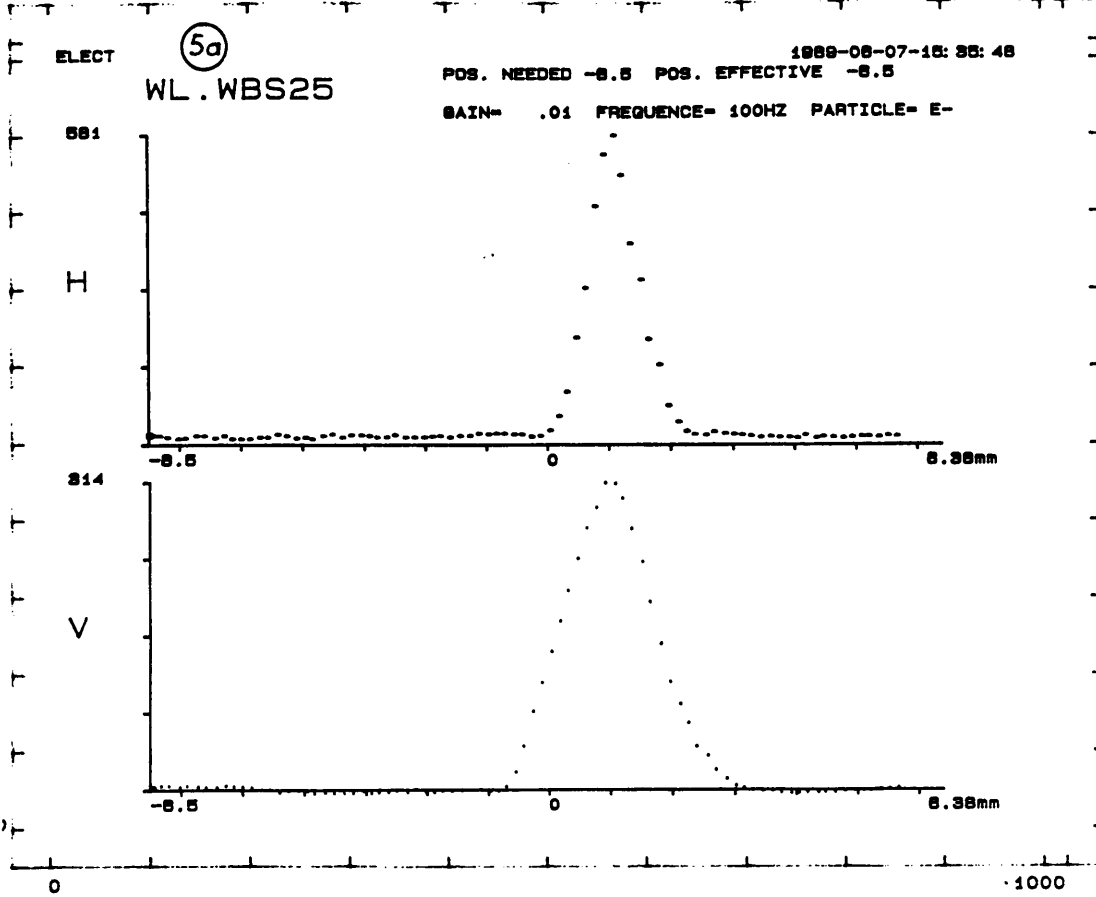
H



209

V



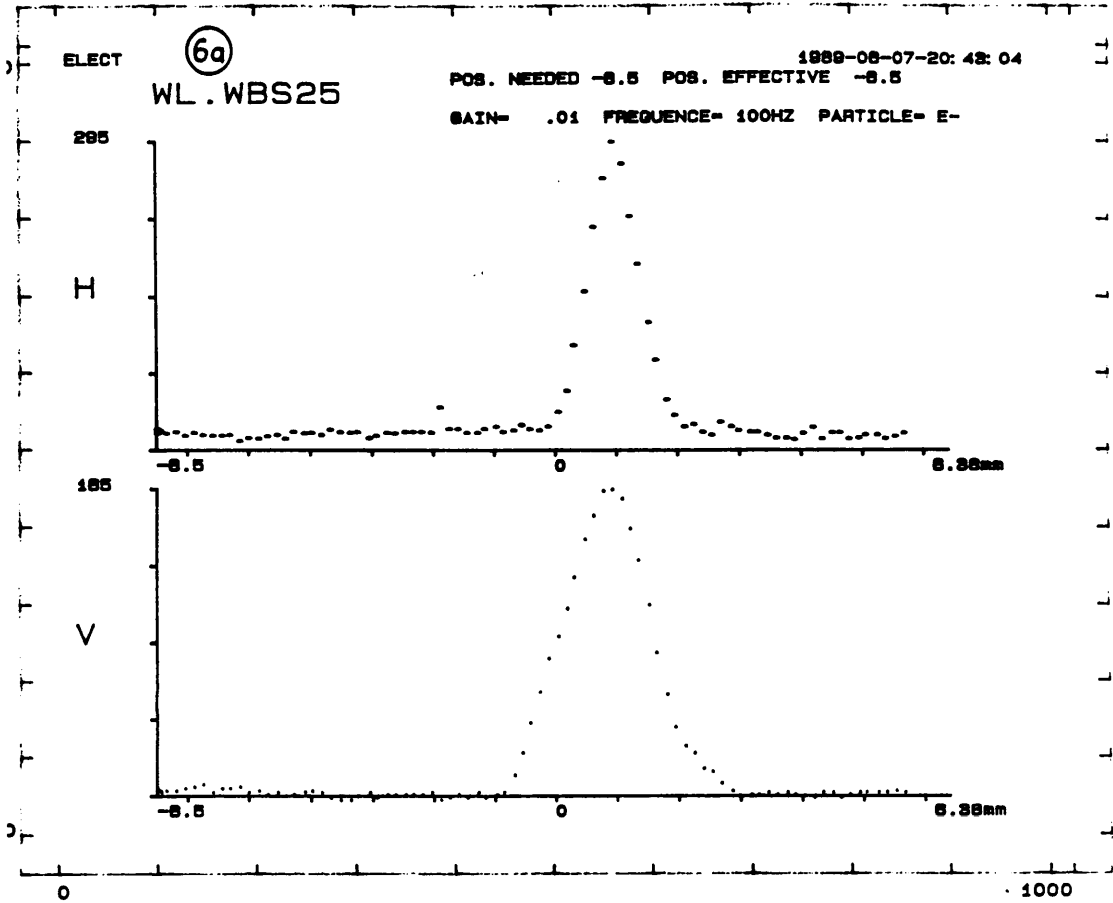


LIL UMA (5b)

1988-06-07-12:37:53

TRAJ. ELECTRONS

	Intensite(E8)	Horizontal(mm)	Vertical(mm)	
UMA 13	-213.3	1.3	.1	
UMA 15	-431.9	1.3	-.1	
UMA 22	-197.6	.9	.2	
UMA 25	-195.5	-1.6	-2.1	
UMA 27	-1.4	111.1	111.1	
UMA 29	0.0	111.1	111.1	
UMA 30	0.0	111.1	111.1	ACM Intens. (E8)
UMA 31	0.0	111.1	111.1	
UMA 32	0.0	111.1	111.1	ACM01 -384.4
UMA 33	0.0	111.1	111.1	ACM11 -313.7
UMA 34	0.0	111.1	111.1	ACM12 -225.6
UMA 35	3.3	111.1	111.1	ACM14 -225.6
UMA 36	-.3	111.1	111.1	ACMGT -2.4
UMA 37	0.0	111.1	111.1	-IPRS .3
HIM 00	.7	111.1	111.1	
HIE 22	0.0	111.1	111.1	
HIP 22	3.0	111.1	111.1	NEWS 100

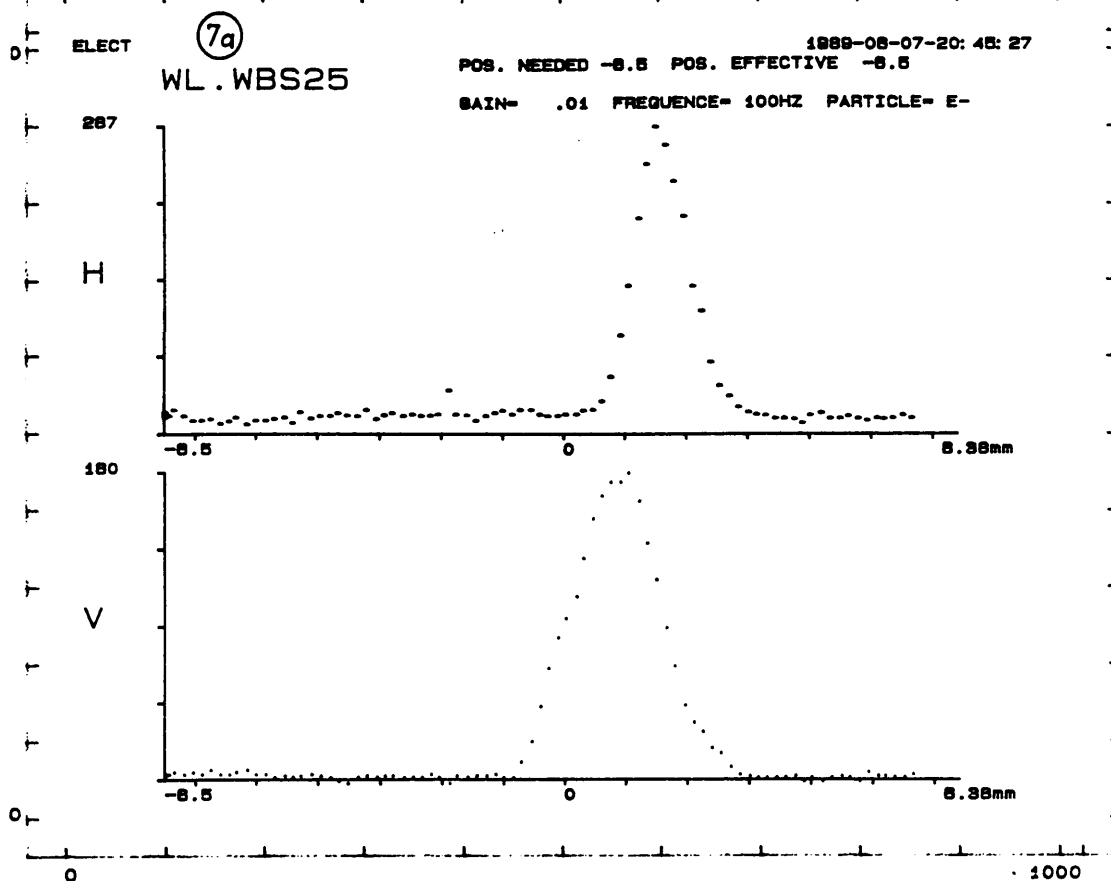


LIL UMA (6b)

1989-05-07-20:44:14

TRAJ. ELECTRONS

	Intensite(E8)	Horizontal(mm)	Vertical(mm)		WCH Intens.(E8)
UMA 13	-106.6	.8	.1		
UMA 15	-106.6	.8	-2.0		
UMA 22	-109.2	.9	.1		
UMA 25	-110.8	-1.2	-1.5		
UMA 27	-37.7	-2.2	2.3		
UMA 29	-36.6	.3	1.1		
UMA 30	-35.3	-1.6	1.3		
UMA 31	-35.0	-.7	-.9		
UMA 32	-36.7	.2	.1	EDM01	-209.9
UMA 33	-36.6	-.2	1.3	WCH11	-133.3
UMA 34	-36.4	.3	.7	WCH12	-114.2
UMA 35	-36.3	-.7	3.4	WCH14	-107.5
UMA 36	-35.4	-.1	3.5	WCH37	-98.6
UMA 37	-36.4	.9	-.9	HIP00	.3
HIM 00	.3	111.1	111.1		
HIE 22	-30.1	1.2	-2.8		
HIP 22	0.0	111.1	111.1	NMEAS	100



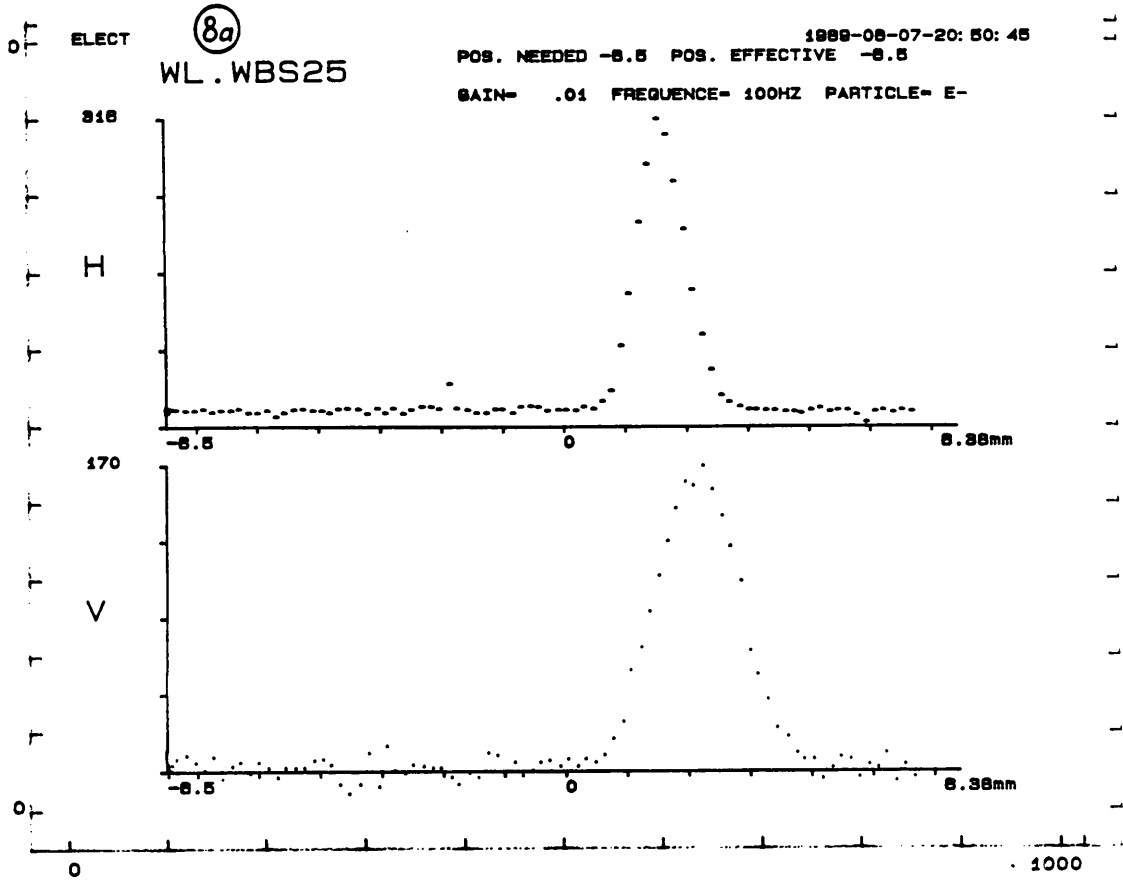
LIL UMA (7b)

1989-08-07-20:46:17

TRAJ. ELECTRONS

	Intensite(E8)	Horizontal(mm)	Vertical(mm)		
UMA 13	-101.3	.8	.1		
UMA 15	-106.6	2.7	-2.0		
UMA 22	-107.8	1.7	.1		
UMA 25	-109.5	-.4	-1.4		
UMA 27	-98.6	-2.0	2.7		
UMA 29	-96.4	.2	1.0		
UMA 30	-94.6	-1.6	.7		MON Intens.(E8)
UMA 31	-93.3	-.6	-.5		
UMA 32	-97.2	.3	.5	ECH01	-209.9
UMA 33	-97.0	-.2	.9	MON11	-129.0
UMA 34	-97.2	.3	.6	MON12	-114.2
UMA 35	-95.8	-.6	3.5	MON14	-107.5
UMA 36	-95.2	-.1	4.0	MON37	-35.0
UMA 37	-97.5	.9	-.7	HIP99	.3
HIM 00	.3	111.1	111.1		
HIE 22	-80.7	2.6	-3.0		
HIP 22	0.0	111.1	111.1		

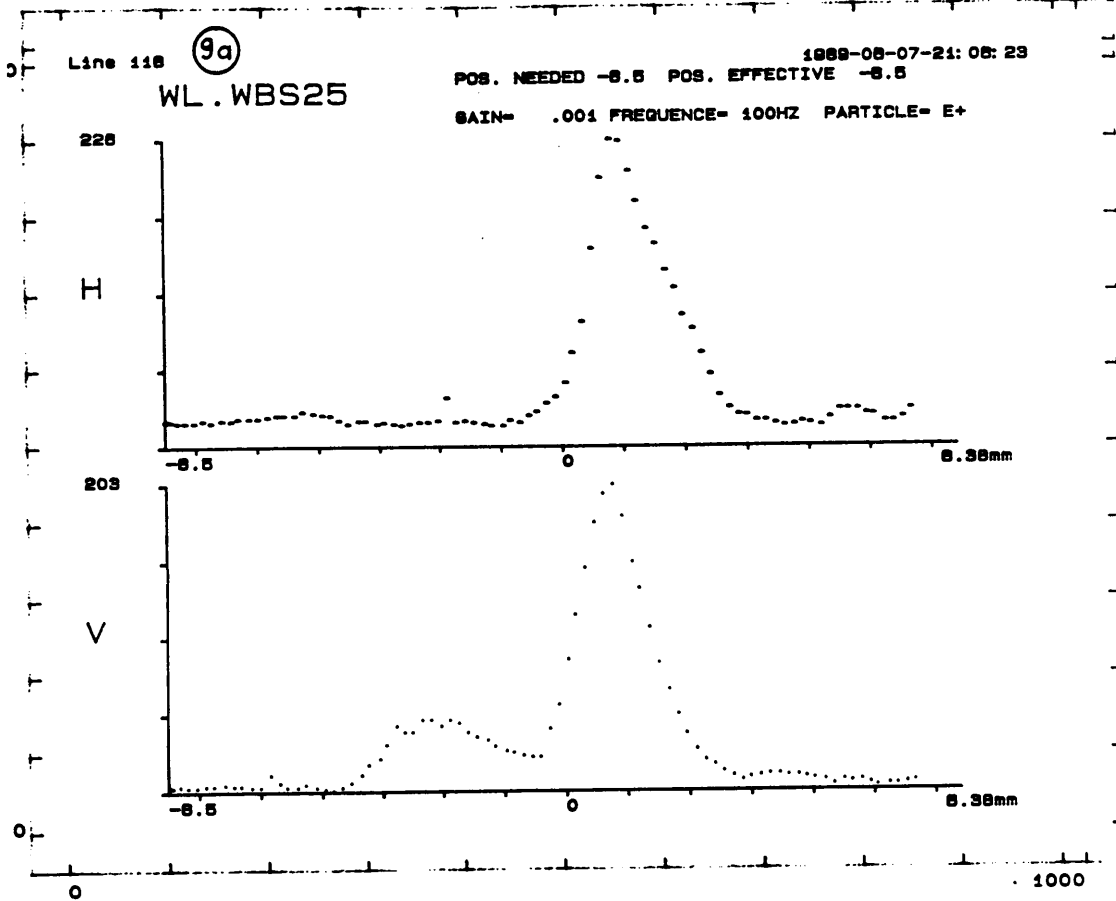
NEWS 100



LIL UMA (8b)

TRAJ. ELECTRONS

	Intensite(E8)	Horizontal(mm)	Vertical(mm)
UMA 13	-106.6	.8	.1
UMA 15	-106.6	2.7	-2.0
UMA 22	-108.9	1.7	1.4
UMA 25	-110.8	-.4	-.4
UMA 27	-97.6	-2.2	2.7
UMA 29	-95.4	.3	1.0
UMA 30	-93.3	-1.2	.6
UMA 31	-92.4	-.7	-.5
UMA 32	-95.9	-.1	.7
UMA 33	-95.6	-.1	1.0
UMA 34	-95.9	.6	.3
UMA 35	-94.4	-.6	3.4
UMA 36	-93.9	-.5	4.2
UMA 37	-96.5	.6	-.6
HIM 00	.3	111.1	111.1
HIE 22	-80.1	1.2	-2.0
HIP 22	0.0	111.1	111.1



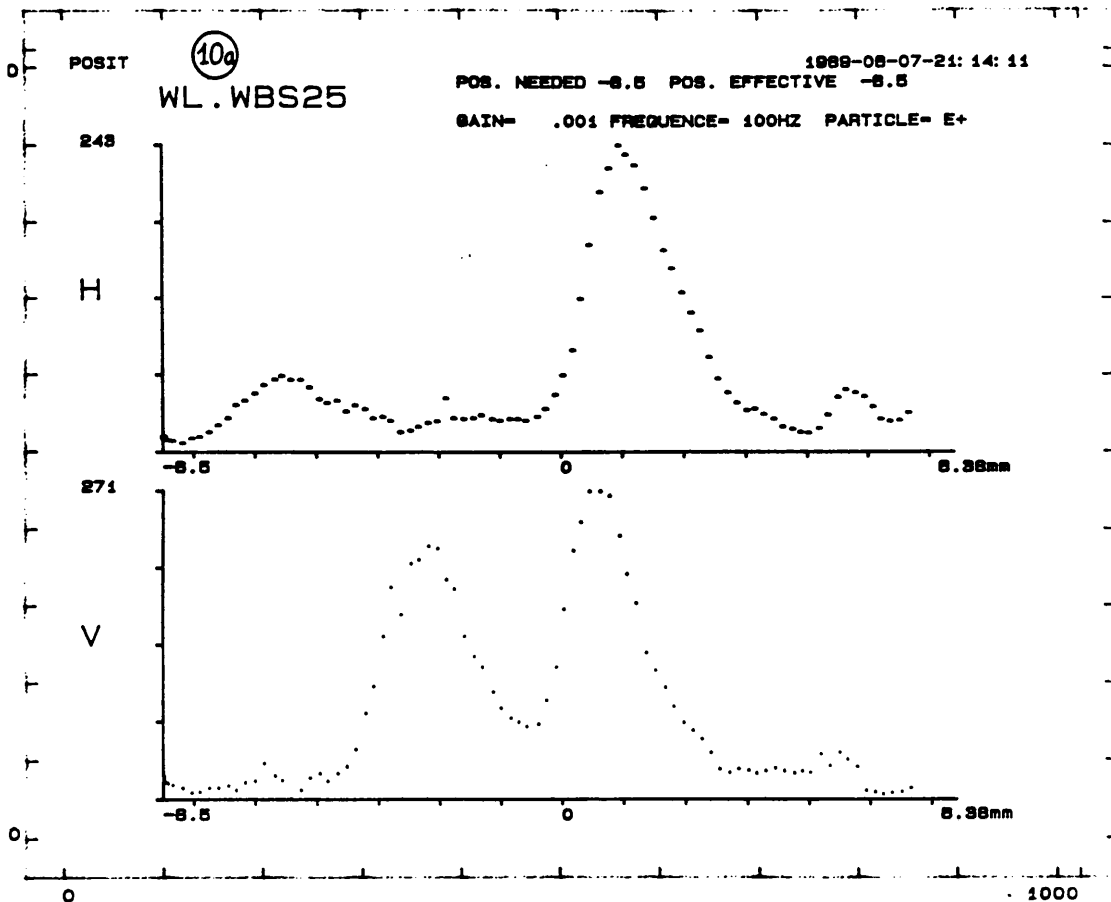
LIL UMA

(9b)

TRAJ. POSITRONS

1989-06-07-21:12:48

	Intensite(EB)	Horizontal(mm)	Vertical(mm)	
WCM 13	-2436.7	.5	-.2	
WCM 15	-2383.4	1.1	-.3	
WCM 16	-2363.4	1.3	.5	
WCM 18	-2788.8	-.6	-.2	
WCM 17	-11.5	-1.9	2.7	
WCM 23	-1.7	.1	.8	
WCM 25	-.5	111.1	111.1	WCM Intens.(EB)
WCM 31	-.3	111.1	111.1	
WCM 32	-.3	111.1	111.1	ECM01 -4419.2
WCM 33	2.8	111.1	111.1	WCM11 -2627.3
WCM 34	.3	111.1	111.1	WCM12 -2350.8
WCM 36	-.2	111.1	111.1	WCM14 -2257.5
WCM 38	2.8	111.1	111.1	WCM37 2.8
WCM 37	.3	111.1	111.1	HIP00 .3
HIP 28	-.3	111.1	111.1	
HIP 15	2.8	111.1	111.1	
HIP 10	2.8	111.1	111.1	NMEAS 97

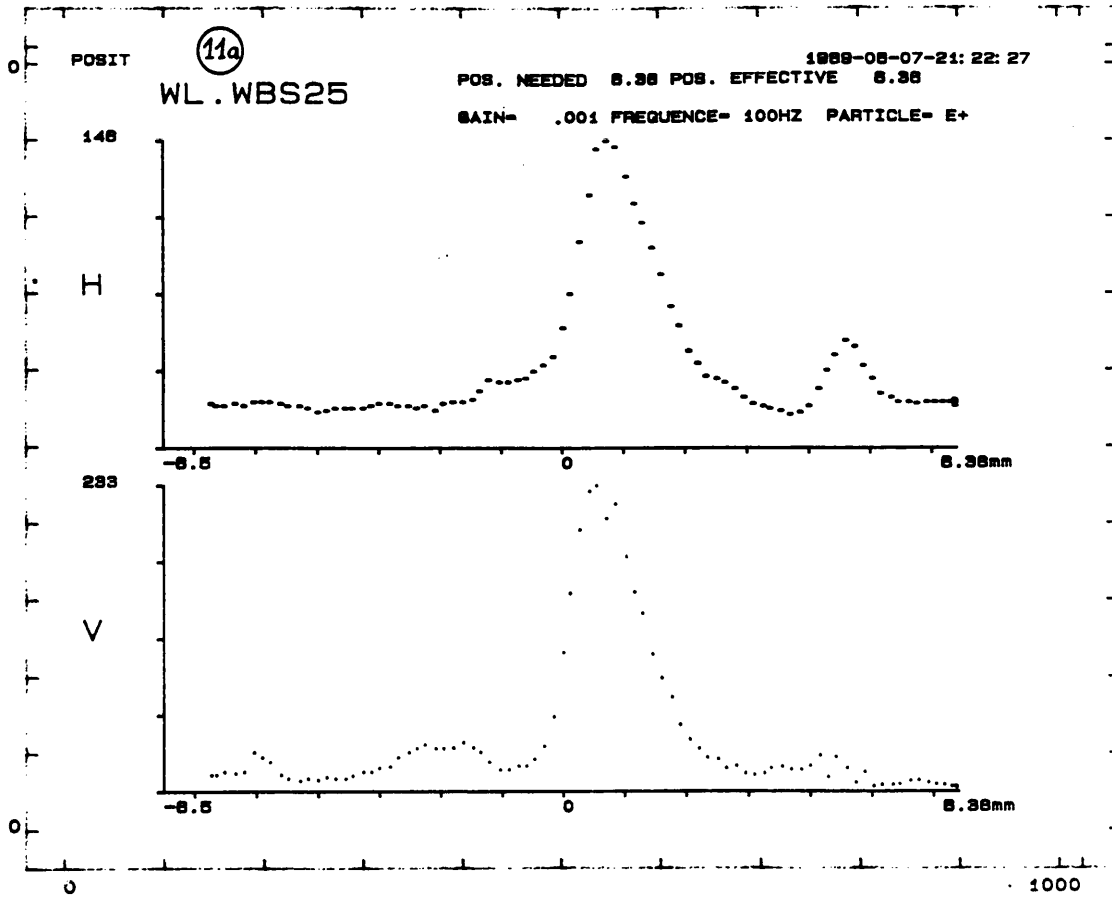


LIL UMA (10b)

1989-06-07-21:23:32

TRAJ. POSITRONS

	Intensite(EB)	Horizontal(mm)	Vertical(mm)	
UMA 13	-2988.6	.5	0.0	
UMA 15	-2799.3	1.4	-.4	
UMA 22	-3353.2	1.1	.2	
UMA 25	-3264.0	-.6	-.3	
UMA 27	-27.2	-.3	2.9	
UMA 29	-6.0	11.7	.8	
UMA 30	-1.9	-1.0	-5.9	WCH Intens.(EB)
UMA 31	-1.2	111.1	111.1	
UMA 32	-.7	111.1	111.1	ECH01 -5292.0
UMA 33	-.4	111.1	111.1	WCH11 -3113.2
UMA 34	.3	111.1	111.1	WCH12 -2794.6
UMA 35	0.0	111.1	111.1	WCH14 -2648.8
UMA 36	.7	111.1	111.1	WCH37 0.0
UMA 37	.3	111.1	111.1	HIP00 .5
HIM 00	.3	111.1	111.1	
HIE 22	0.0	111.1	111.1	
HIP 22	0.0	111.1	111.1	NHEAS 97



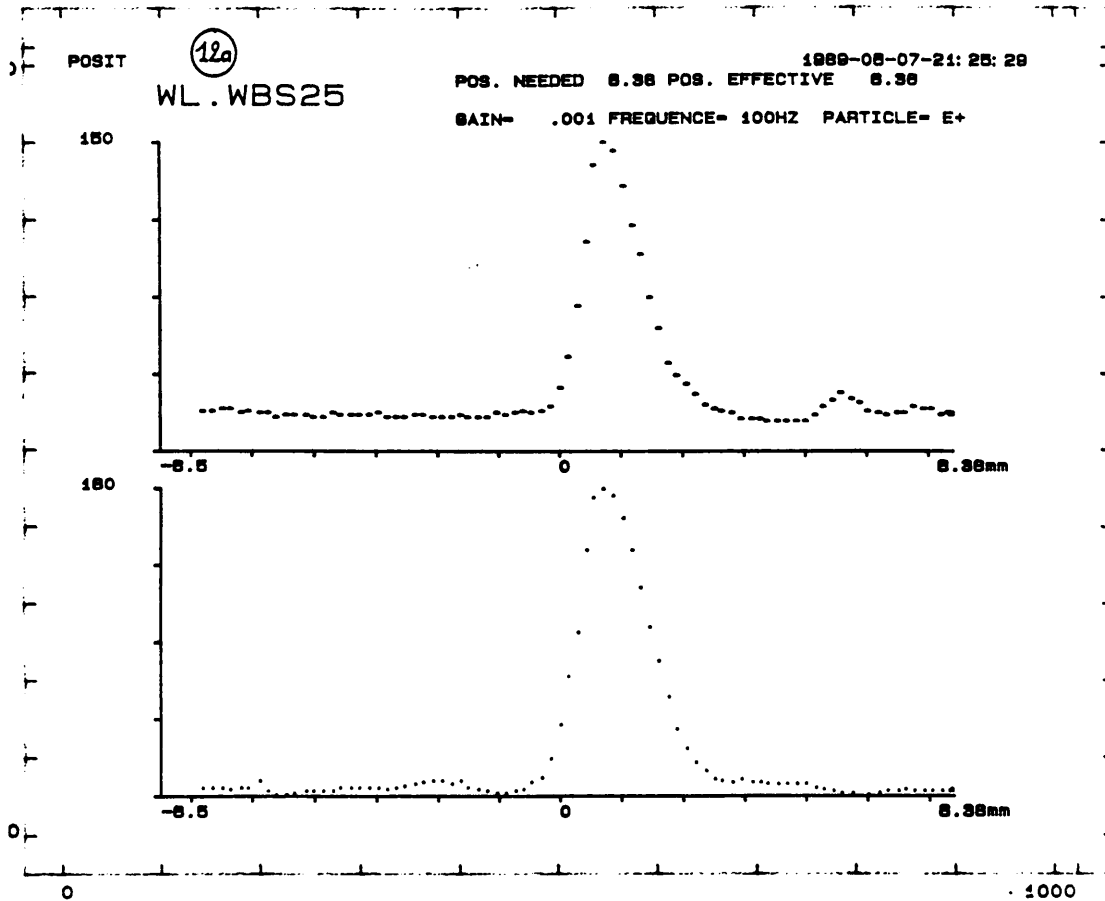
LIL UMA

11b

TRAJ. POSITRONS

1989-06-07-21:15:34

	Intensite(EB)	Horizontal(mm)	Vertical(mm)	
UMA 13	-2948.6	.5	0.1	
UMA 15	-2836.6	1.6	-.5	
UMA 22	-3427.2	1.6	.5	
UMA 25	-3202.8	-1.2	-.5	
UMA 27	-29.6	1.3	3.9	
UMA 29	-5.4	15.3	-1.4	
UMA 30	-1.2	111.1	111.1	WCH Intens.(EB)
UMA 31	-1.2	111.1	111.1	
UMA 32	-.3	111.1	111.1	EDM01 -5481.4
UMA 33	0.0	111.1	111.1	WCH11 -3156.2
UMA 34	.7	111.1	111.1	WCH12 -2834.1
UMA 35	-.3	111.1	111.1	WCH14 -2678.9
UMA 36	1.0	111.1	111.1	WCH37 0.0
UMA 37	.3	111.1	111.1	HIP00 .5
HIM 00	.3	111.1	111.1	
HIE 22	0.0	111.1	111.1	
HIP 22	0.0	111.1	111.1	NHEAS 97



LIL UMA (12b)

1988-06-07-21:26:23

TRAJ. POSITRONS

	Intensite(E8)	Horizontal(mm)	Vertical(mm)		
UMA 13	-2418.1	.5	.1		
UMA 15	-2383.4	1.5	-.2		
UMA 22	-2869.4	1.1	.3		
UMA 25	-2901.6	-.7	-.3		
UMA 27	-23.8	.1	3.2		
UMA 29	-5.4	13.2	.8		
UMA 30	-1.6	-1.0	-7.2		
UMA 31	-1.2	111.1	111.1		
UMA 32	-.7	111.1	111.1	EDM01	-4386.1
UMA 33	-1.1	111.1	111.1	WCH11	-2584.3
UMA 34	-.3	111.1	111.1	WCH12	-2328.0
UMA 35	-1.3	111.1	111.1	WCH14	-2223.1
UMA 36	0.0	111.1	111.1	WCH37	-.8
UMA 37	-.3	111.1	111.1	HIP00	.5
HIN 00	0.0	111.1	111.1		
HIE 22	0.0	111.1	111.1		
HIP 22	0.0	111.1	111.1	NMEAS	97

CONSOLE - GRAPHIC SYSTEM HARD-COPY

07/JUN/1989-21: 32: 49
YVETTE (LPI)

POSIT

13

WL.WBS25

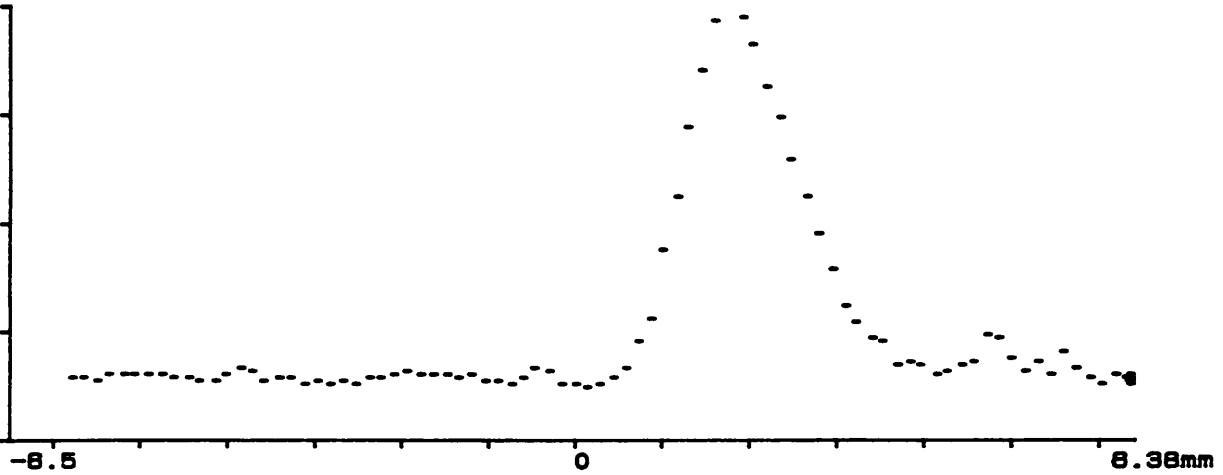
1989-08-07-21: 32: 38

POS. NEEDED 8.38 POS. EFFECTIVE 8.38

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

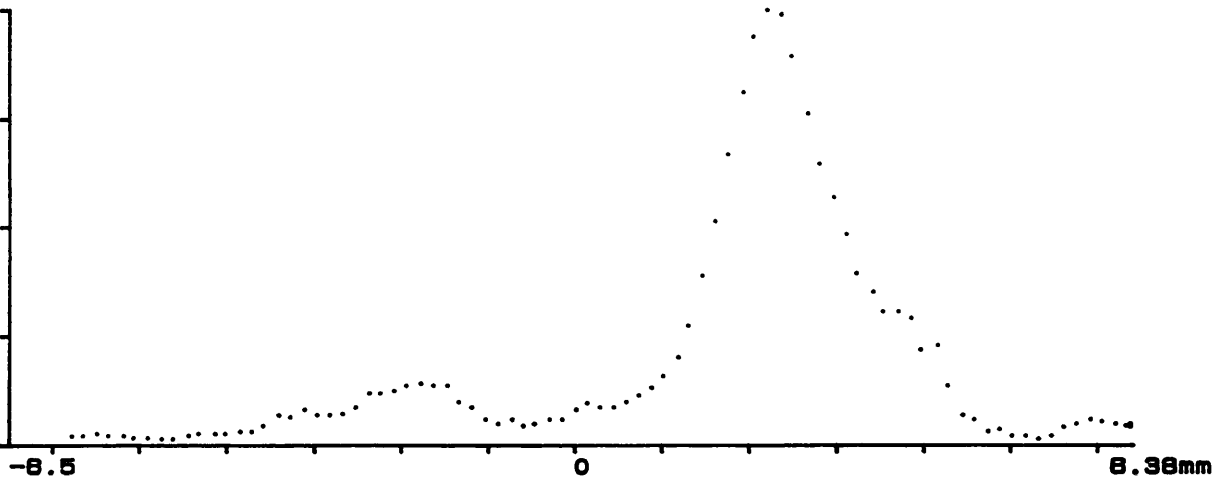
131

H



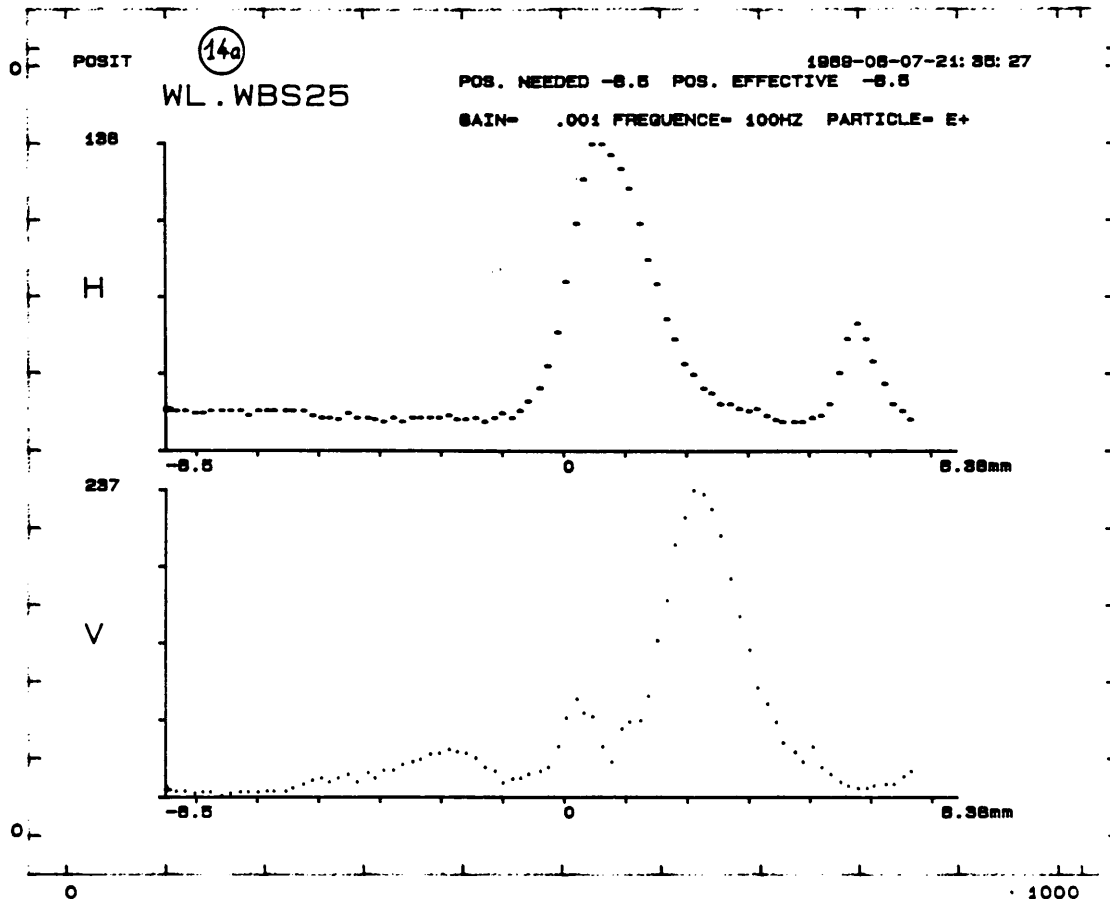
218

V



0

1000



LIL UMA (14b)

1988-06-07-21:33:24

TRAJ. POSITRONS

	Intensite(EB)	Horizontal(mm)	Vertical(mm)		WCH Intens.(EB)
UMA 13	-2815.3	.5	.1		
UMA 15	-2730.0	1.2	-.1		
UMA 22	-3272.6	.8	1.3		
UMA 25	-3196.0	-.7	.1		
UMA 27	-22.1	-.9	3.5		
UMA 29	-5.0	13.2	.8		
UMA 30	-1.2	-9.2	-7.2		
UMA 31	-1.2	111.1	111.1		
UMA 32	-.7	111.1	111.1	EDM01	-5181.5
UMA 33	-1.1	111.1	111.1	WCH11	-3835.8
UMA 34	0.0	111.1	111.1	WCH12	-2719.9
UMA 35	-1.8	111.1	111.1	WCH14	-2588.6
UMA 36	0.0	111.1	111.1	WCH37	-.9
UMA 37	-.3	111.1	111.1	HIP00	.5
HIM 00	.3	111.1	111.1		
HIE 22	0.0	111.1	111.1		
HIP 22	0.0	111.1	111.1	NMEAS	97

CONSOLE - GRAPHIC SYSTEM HARD-COPY

29/JUN/1989-14:28:25
YVETTE (LP1)

ELECT

(15)

WL.WBS28

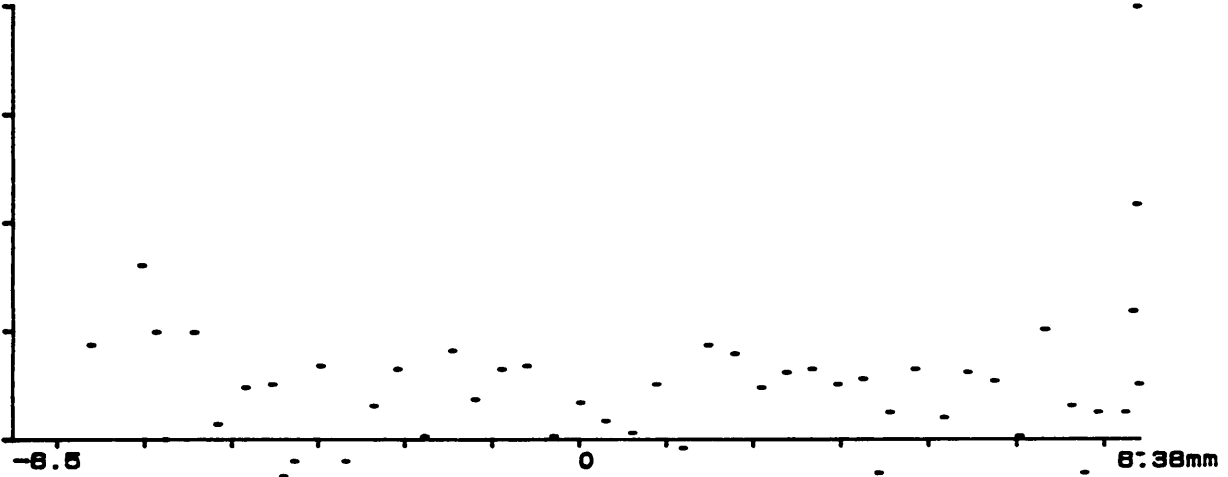
POS. NEEDED 8.38 POS. EFFECTIVE 8.4

1989-06-28-14:28:22

GAIN= 1 FREQUENCY= 100HZ PARTICLE= E-

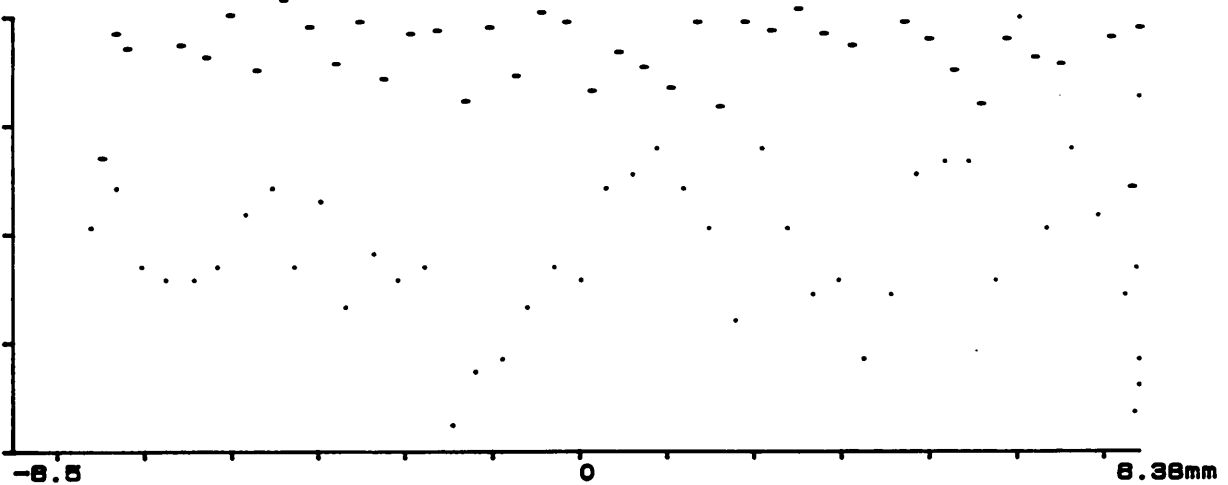
142

H



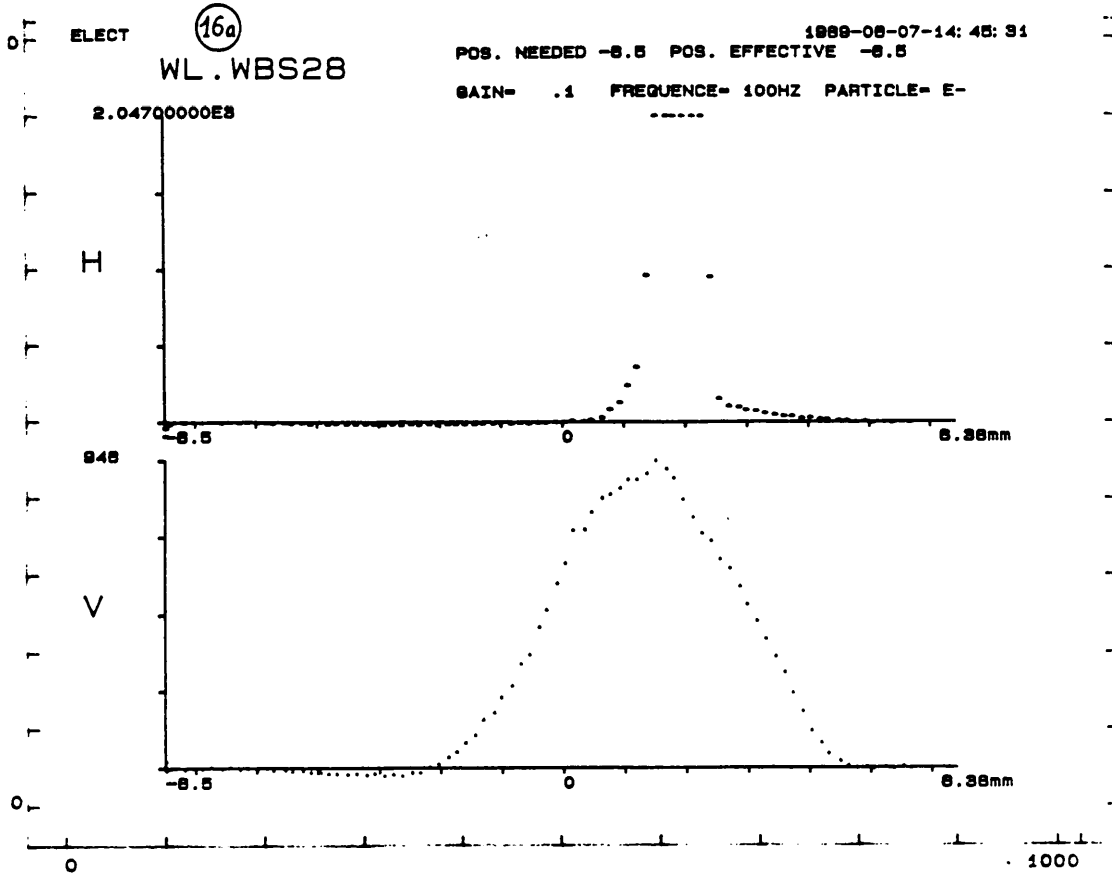
88

V



0

1000



LIL UMA 16b

RAJ. ELECTRONS

1988-08-07-14:48:35

	Intensity(E8)	Horizontal(mm)	Vertical(mm)		uCM Intens.(E8)
UMA 13	-54.0	2.3	.1		
UMA 15	-54.0	.6	-3.2		
UMA 22	-59.6	1.1	.1		
UMA 25	-71.1	-7.7	-7.9		
UMA 27	-64.6	-1.7	2.1		
UMA 29	-46.8	.1	1.2		
UMA 30	-41.8	-1.3	1.1		
UMA 31	-41.3	-7.7	-7.8		
UMA 32	-42.4	-1.1	.2	ECM01	-120.1
UMA 33	-42.7	-2.2	1.4	WCM11	-104.6
UMA 34	-42.8	.3	.7	WCM12	-69.7
UMA 35	-41.0	-1.3	2.9	WCM14	-69.7
UMA 36	-38.4	.1	3.6	WCM37	-104.6
UMA 37	-39.4	.6	-1.1	HIP00	.6
UMA 00	.7	111.1	111.1		
UMA 22	-32.3	-4.6	-2.1		
UMA 23	8.0	111.1	111.1		
					NME45 100

(17)

ELECT

HR.WBS82

POS. NEEDED 20

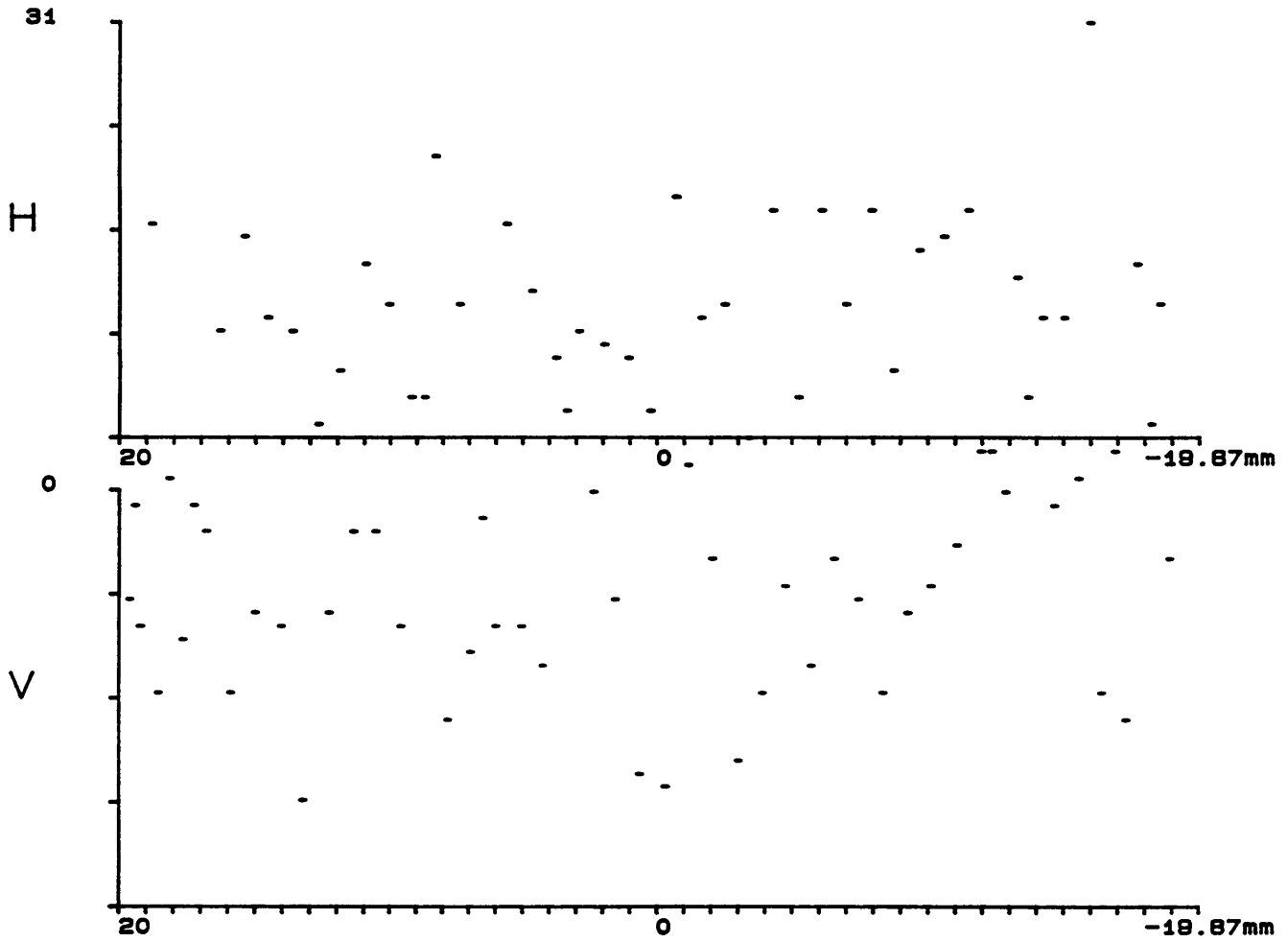
POS. EFFECTIVE 20

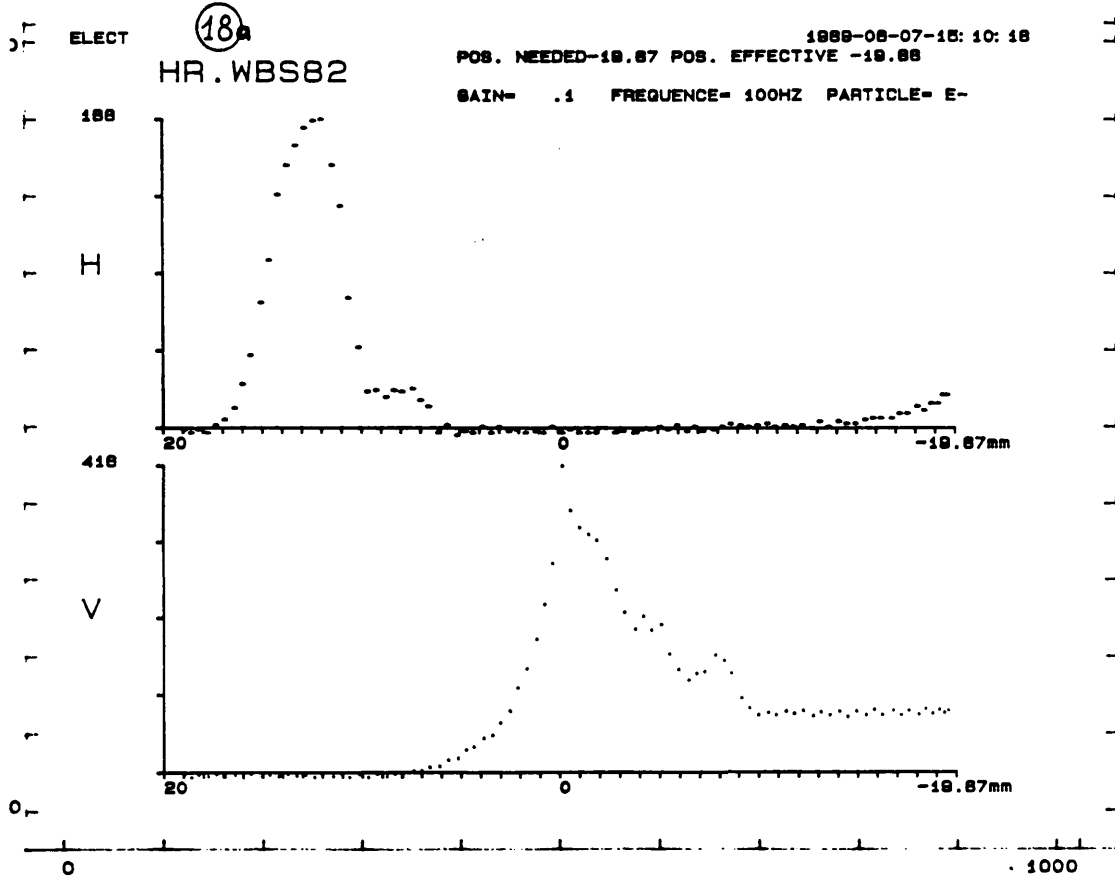
1989-06-29-14:38:32

GAIN= 1

FREQUENCY= 100HZ

PARTICLE= E-





LIL UMA (18b)

TRAJ. ELECTRONS

1889-08-07-15:07:27

	Intensite(E8)	Horizontal(mm)	Vertical(mm)	
UMA 13	-64.0	2.3	.1	
UMA 15	-64.0	.8	-.1	
UMA 22	-70.2	1.1	0.0	
UMA 25	-71.4	-.9	-.8	
UMA 27	-54.9	-1.7	2.0	
UMA 29	-63.2	.3	1.0	
UMA 30	-61.7	-1.2	1.1	WCM Intens. (E8)
UMA 31	-61.4	-.5	-.8	
UMA 32	-62.8	.2	.2	ECM01 -238.3
UMA 33	-64.1	-.2	1.4	WCM11 -104.5
UMA 34	-64.1	.2	.7	WCM12 -59.7
UMA 35	-63.2	-.4	2.0	WCM14 -59.7
UMA 36	-62.8	-.1	3.6	WCM37 -105.2
UMA 37	-64.8	.3	-1.1	HIP05 .3
-IM 00	.7	111.1	111.1	
-IE 22	-53.7	-5.0	-2.3	
-IP 22	0.0	111.1	111.1	NMEAS 100

CONSOLE - GRAPHIC SYSTEM HARD-COPY

07/JUN/1988-18:51:00
YVETTE (LPI)

19

ELECT

HR.WBS82

POS. NEEDED 20

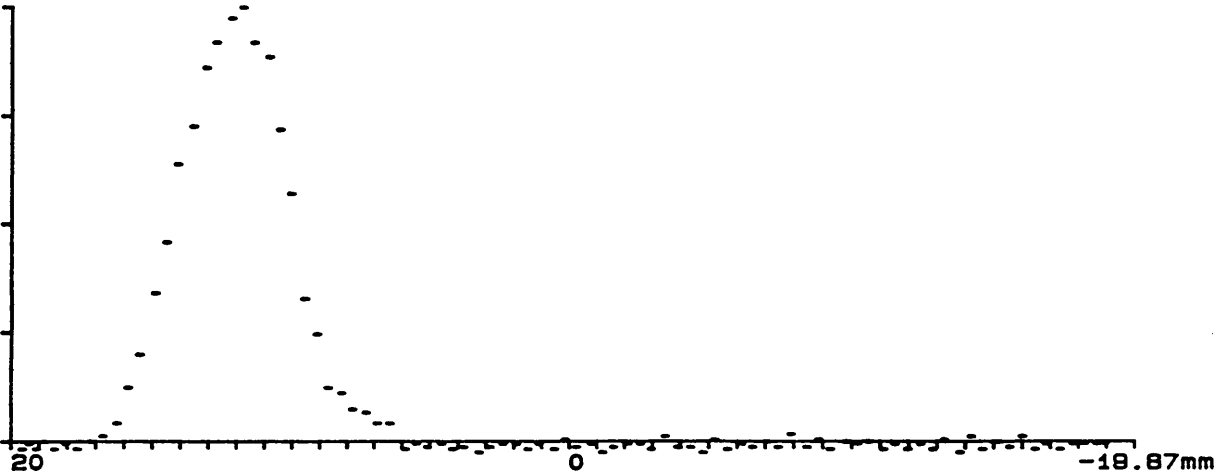
POS. EFFECTIVE 20

1988-06-07-18:50:48

GAIN= .1 FREQUENCY= 100HZ PARTICLE= E-

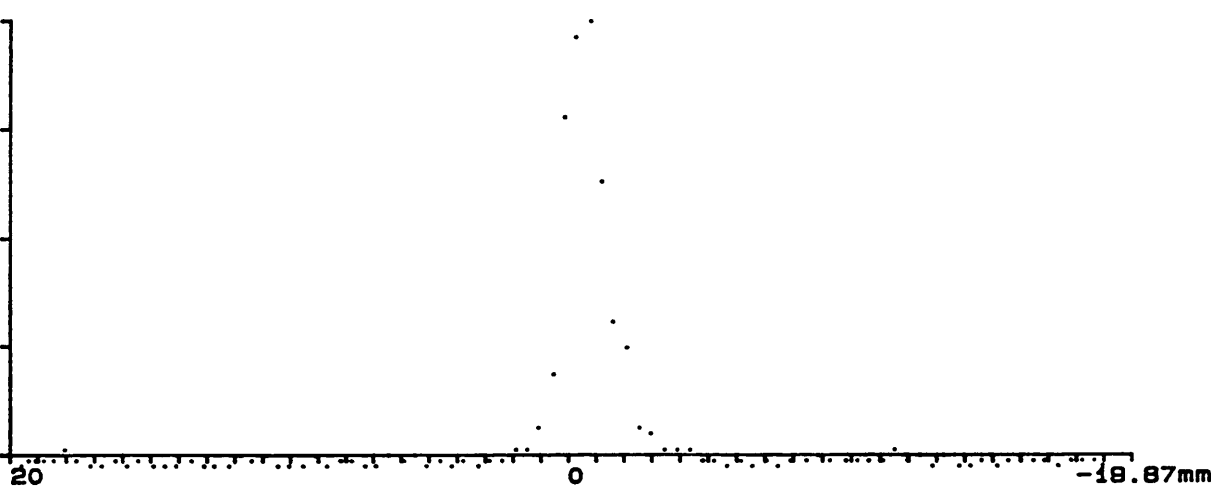
181

H



81

V



20

0

-18.87mm

0

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CONSOLE - GRAPHIC SYSTEM HARD-COPY

29/JUN/1989-14:38:30
YETTE (LPI)

ELECT

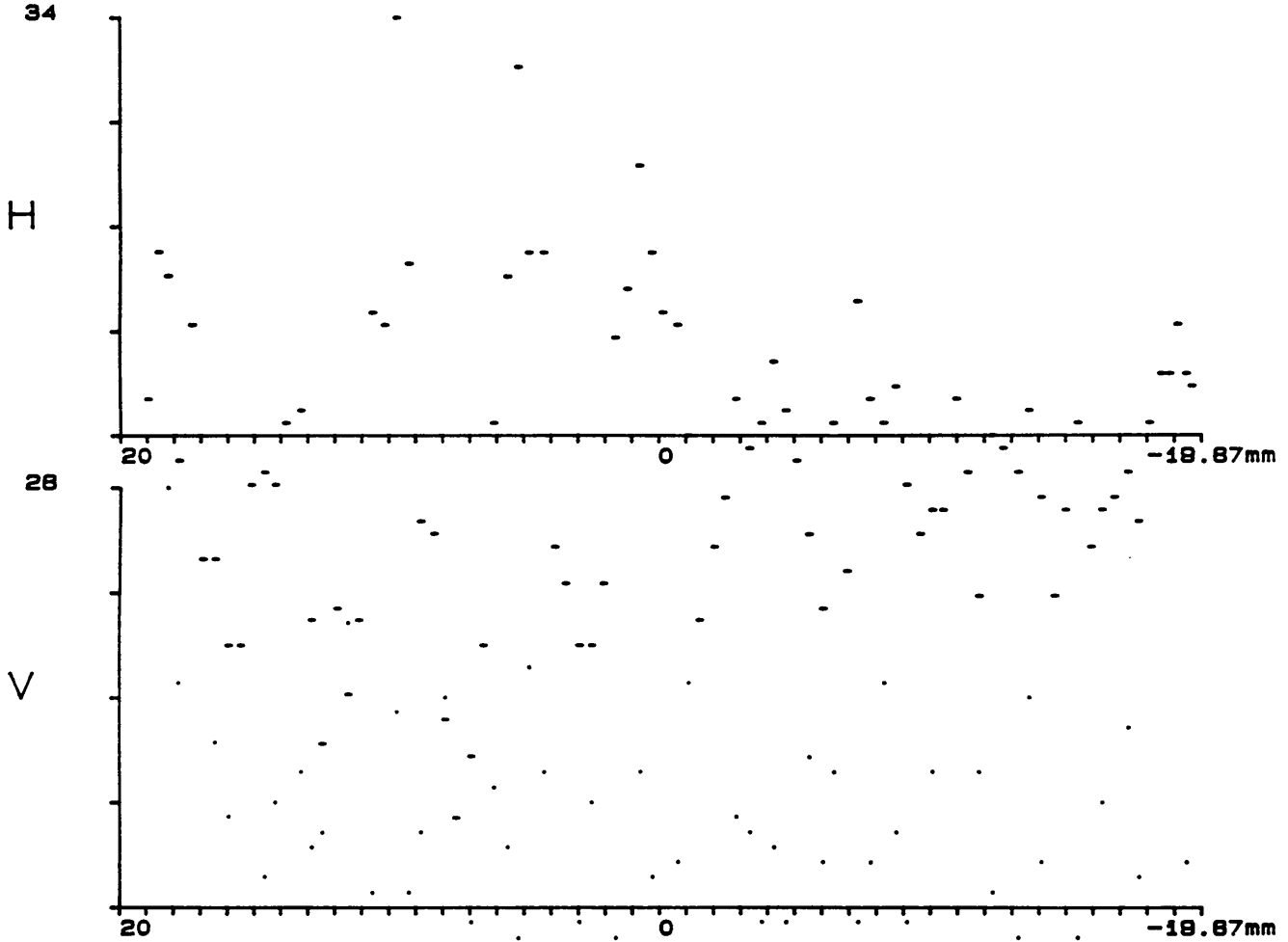
20

HR.WBS14

1989-08-29-14:38:30

POS. NEEDED-19.87 POS. EFFECTIVE -19.9

GAIN= 1 FREQUENCE= 100HZ PARTICLE= E-



0

.1000

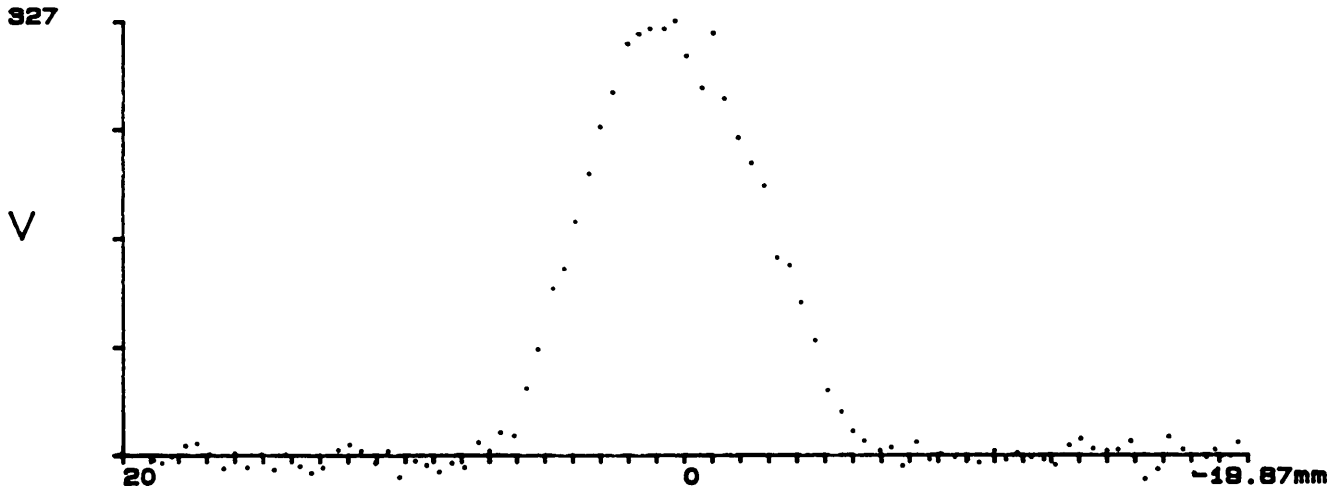
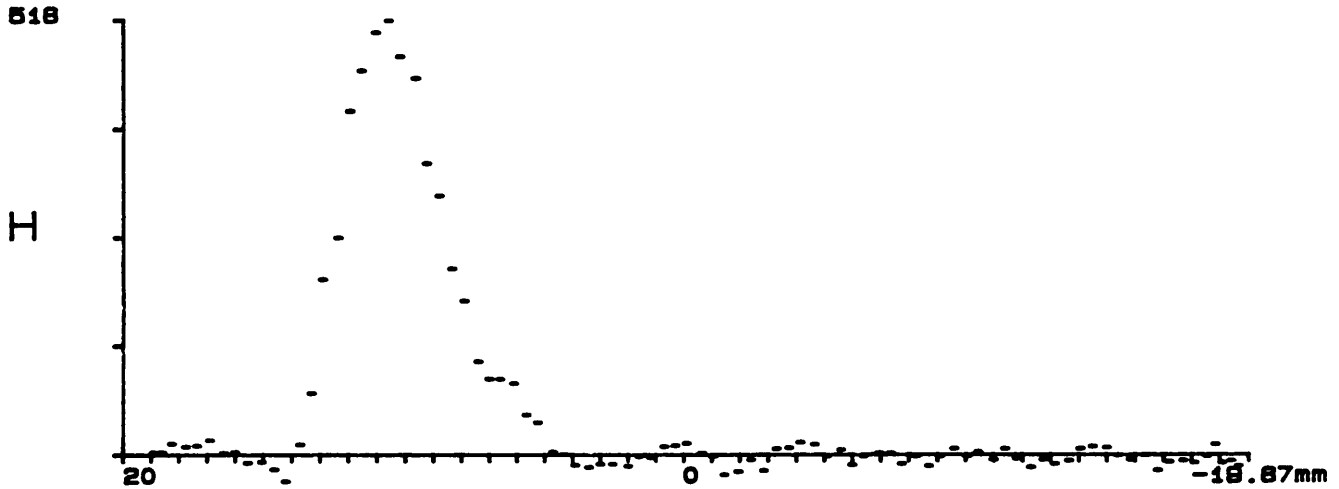
CONSOLE - GRAPHIC SYSTEM HARD-COPY

15/JUN/1988-20: 48: 48
YVETTE (LPI)

POSIT (21)
HR.WBS14

1988-06-15-20: 48: 34
POS. NEEDED-19.87 POS. EFFECTIVE -19.88

GAIN= 1 FREQUENCE= 100HZ PARTICLE= E+



CONSOLE - GRAPHIC SYSTEM HARD-COPY

15/JUN/1988-20:58:19
YVETTE (LPI)

POSIT

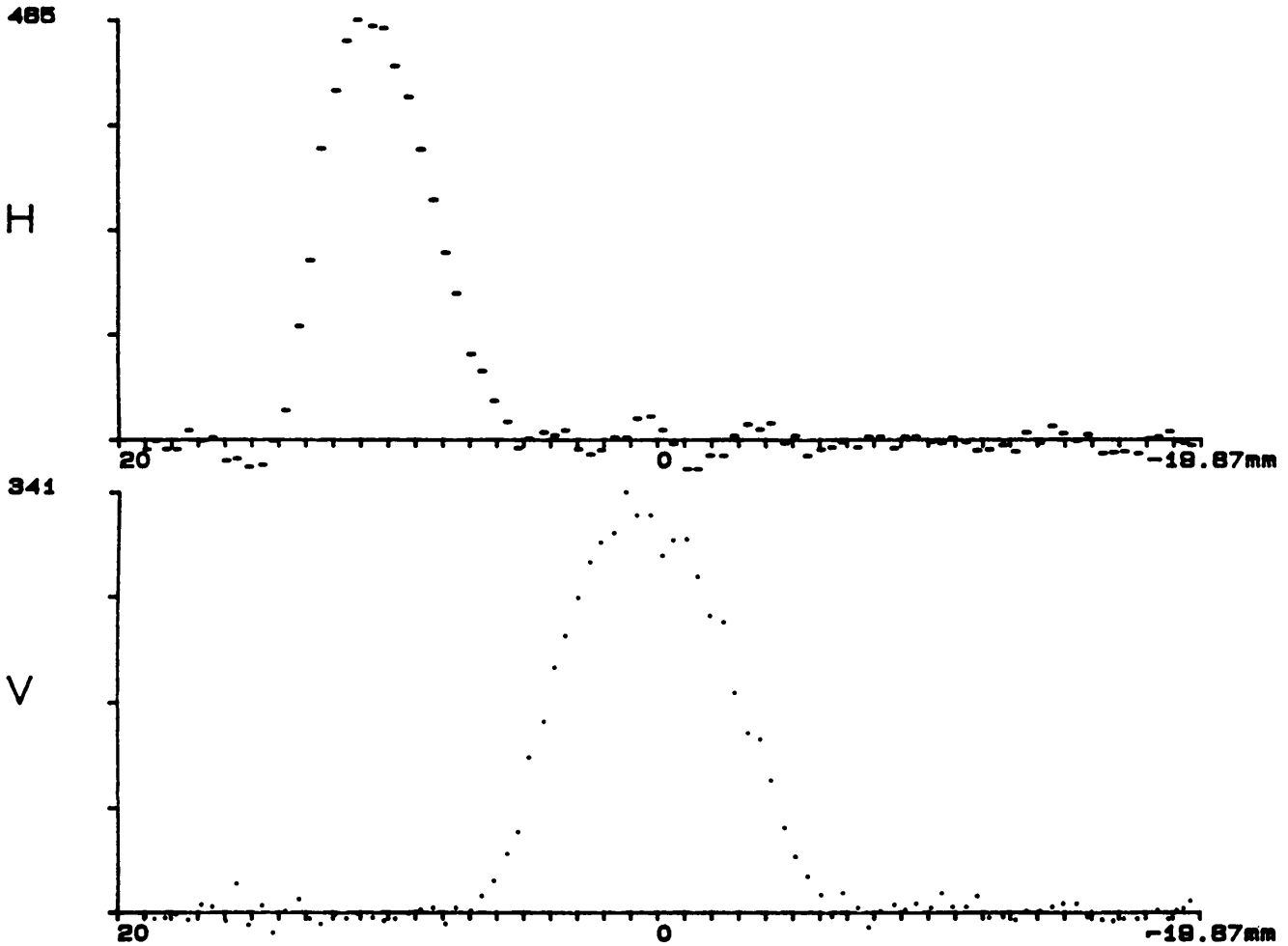
22

1988-08-15-20:50:03

HR.WBS14

POS. NEEDED-19.87 POS. EFFECTIVE -19.8

GAIN- 1 FREQUENCE- 100HZ PARTICLE- E+



0

1000

COMPTE-RENDU DE LA REUNION DU GROUPE HI DU 20 FEVRIER 1989

1. Séminaire HI :

PSB à 1 GeV : pourquoi et comment ?

N. Rasmussen présente le "projet 1 GeV" dans son aspect définitif, les avantages que le PS a tiré et tirera de l'augmentation de l'énergie du PSB à l'éjection (voir annexes 1 à 12).

2. Les travaux de l'arrêt machine 1989 :

B. Dumas signale que les travaux d'entretien et d'amélioration, selon planning, se sont déroulés normalement.

Il rappelle en particulier que le nouvel accès contrôlé en bas de l'ascenseur, au niveau du tunnel, sera opérationnel dès lundi 20 février 1989.

3. Démarrage des machines : (P. Tétu, H. Schönauer, G. Daems)

Les plans de démarrage des Linac I, II et du PSB seront respectés.

Le Booster fournira le faisceau de production avec les anneaux II et III tandis que les anneaux IV et I feront l'objet de 2 études séparées pour trouver l'instabilité à 600 MeV et la mise au point de la contre-réaction rapide sur la cavité.

Enfin, G. Daems rend attentif l'opération sur le fait que le PLS, les AFG et les ST ont été modifiés (sans oublier le remplacement du computer console PSB) ce qui peut engendrer de petites surprises ...

L'ordinateur TEMPX, actuellement un NORD 10S, est échangé contre un NORD 100 CX.

4. Divers

a. Dans quelques années, il se pourrait que les éléments constitutants du complexe AAC soient destinés au centre de recherche soviétique de SerpuKHOV pour vivre un deuxième ... printemps et permettre des collisions ppb à 3 TeV dans l'UNK. Ceci dans le cadre des échanges, d'une collaboration scientifique renouvelée entre le CERN et l'URSS.

b. Le Directeur Général s'intéresse et encourage particulièrement le programme d'accélération des IONS S^{16+} (dont on tachera de doubler l'intensité par rapport à 1987) et plus tard le projet d'accélération de Pb^{82+} .

Les machines sur lesquelles il faudra travailler en particulier sont le LINAC I, le Booster et le SPS.

c. L'expérience ISOLDE, raison d'être de la machine SC, pourrait à l'avenir être servie par la ligne ML du Booster avec les cycles parasites. Les études en cours diront si l'énergie et l'intensité du Booster seront satisfaisants à ces fins.

d. Pour terminer, il faut constater que malgré toutes ces perspectives, on ne trouve pas de candidats pour le poste ouvert (recrutement interne) de Booster Supervisor.

L. Magnani

PSB à 1 GeV
Pourquoi et comment ?

1

(T₋₁) Diminuer
Perles à l'injection au PS liés aux

- (T₀)
- Point de fonctionnement (PS)
 - 'stopbands'

Remède

Energie plus élevée \Rightarrow
 ΔQ moins important
(cas de 'une shift')

Éviter les stopbands (PS)
 $2Q_v + Q_H = 19$ et $Q_v = 6, Q_H = 6$

RF Dipole

Mettre deux paquets
dans un perigon

Distribuer l'intensité des
paquets longitudinalement quand elles
arrivent au PS.

Point de fonctionnement et stopbandes, explications T. 12

- Les particules exécutent des oscillations transversales (betatroniques) déterminées par l'optique de la machine
- Chaque particule a sa fréquence d'oscillation; verticalement et horizontalement.
- On peut alors caractériser chaque particule par le nombre d'oscillations qu'elle exécute dans le deux plans.

- 1 - Diagramme de Q
- Chaque particule \Rightarrow un point dans le plan, à un moment donné
- Point de fonctionnement = point correspondant au particule au centre du faisceau. = oscillations infiniment petites.
 - Les points des autres particules sont distribués dans zone en forme de losange ('corante')

Stopbandes Si le nombre d'oscillations par tour est entier, il y a danger: Accumulation d'erreur \Rightarrow instabilité

THE TUNE DIAGRAM (Fig. 1)

The tune diagram of Fig. 1 confirms that the PS works at injection with tune shifts crossing the two integer stop bands. *6 & 6*

In this diagram the fourth-order stop bands have not been indicated, with the exception of the 'Montague' space-charge stop band, at $2Q_H - 2Q_V = 0$.

We will successively consider the dipolar, quadrupolar, sextupolar, and 'Montague' resonances.

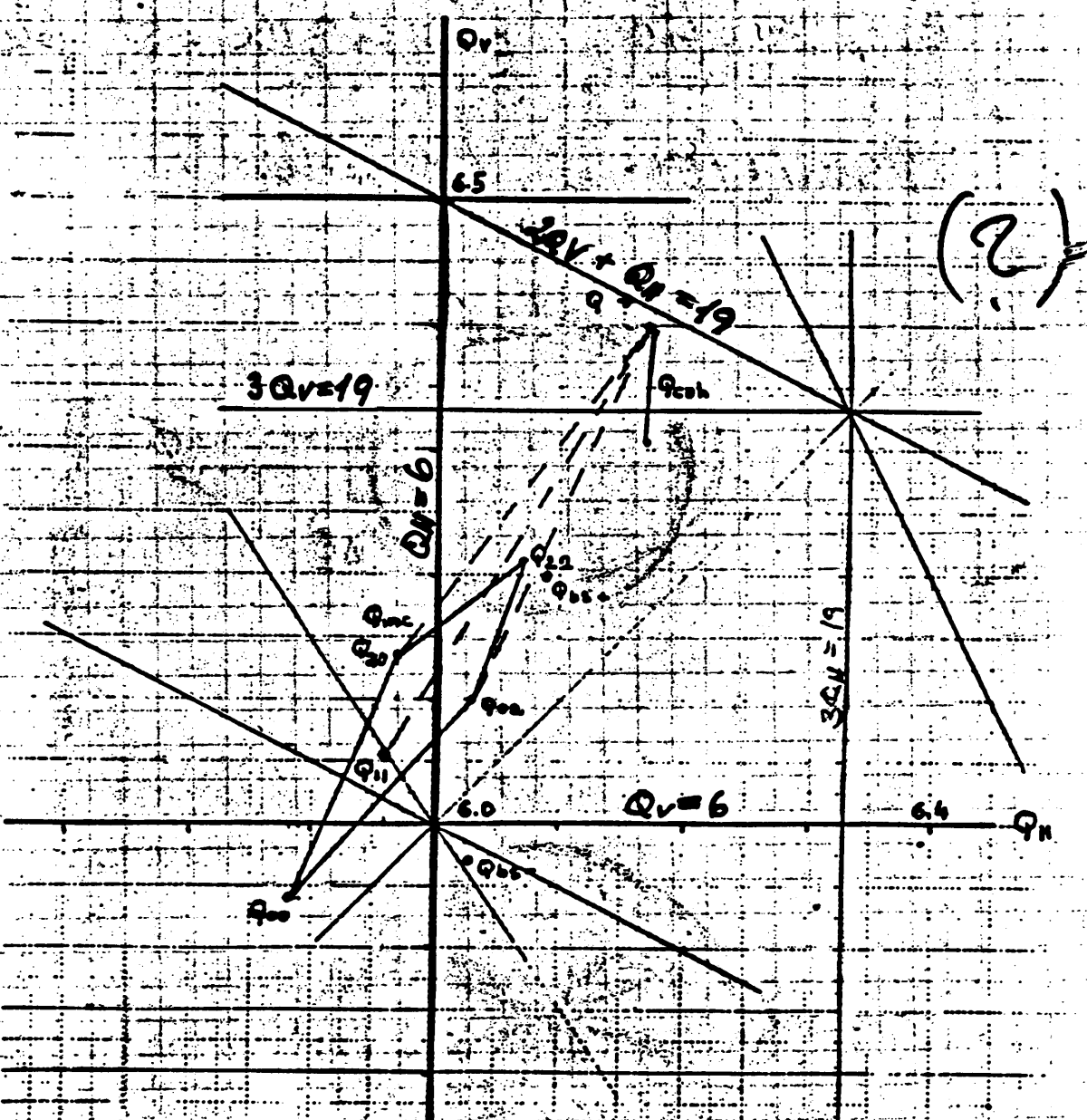


Fig. 1 The tune diagram

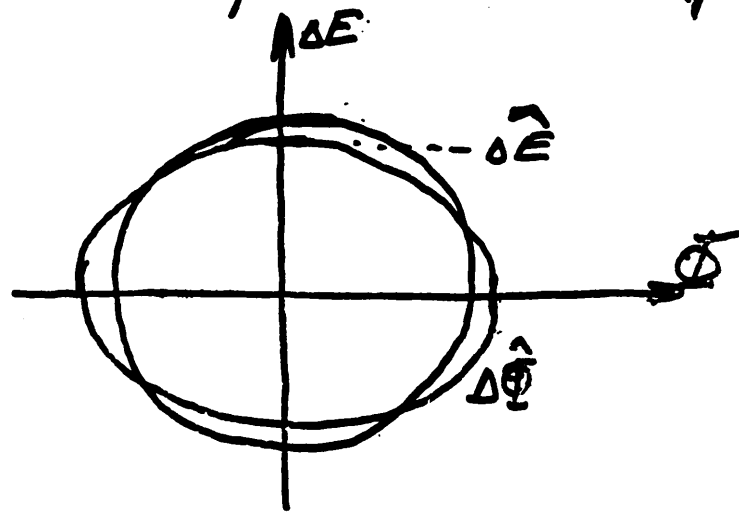
- Energie plus élevée \Rightarrow paquets plus courts.

(synchrotroniques)
- Oscillations longitudinales dans le paquet. Diminuent quand l'énergie augmente.

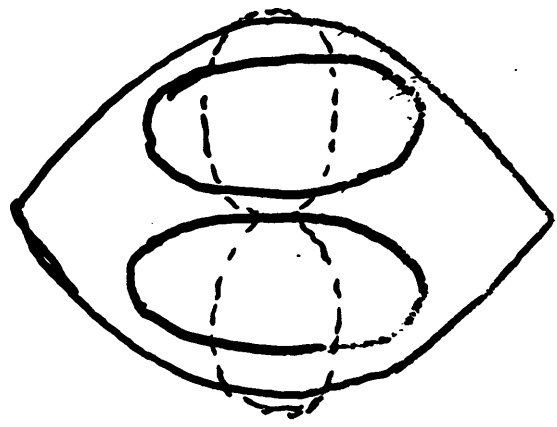
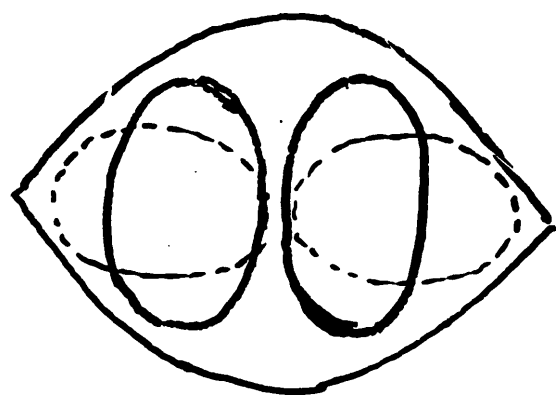
Explication physique simple?

2 Hamilton, Liouville (pas simple)

Plan de phase



~~3~~



Après 1/4 oscillation synchrotronique au P.E. ($\approx 0.3 \text{ ms}$)

$$I = \frac{h \eta_0 \Omega_0}{p_0 R_0} \overline{W^2} 2\pi \left[\frac{-2\pi p_0 R_0}{e \hat{V} h \eta_0 \Omega_0 \cos \phi_0} \right]^{\frac{1}{2}}$$

$$= \overline{W^2} \left[\frac{-(2\pi)^3 h \eta_0 \Omega_0}{p_0 R_0 e \hat{V} \cos \phi_0} \right]^{\frac{1}{2}} = \text{invariant.} \quad (36)$$

T2 6

ce, for sinusoidal oscillations, $\overline{W^2} = 2W^2$, the peak value \hat{W} varies under adiabatic changes of parameters as

$$\frac{\Delta E}{\Omega_0} = \hat{W} \propto \left[\frac{-p_0 R_0 \hat{V} \cos \phi_0}{\eta_0 \Omega_0} \right]^{\frac{1}{2}} \quad (37)$$

adiabatic variation of phase amplitude is obtained similarly, starting

$$I = \oint \Delta\phi dW = \oint \Delta\phi \frac{dW}{dt} dt = \overline{\left(\Delta\phi \frac{dW}{dt} \right)} \frac{2\pi}{\Omega_s} \quad (38)$$

proximating (25) for small amplitudes $\Delta\phi$, with $\phi = \phi_0 + \Delta\phi$, one has

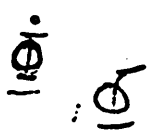
$$\frac{dW}{dt} = \frac{e \hat{V}}{2\pi} [\sin \phi - \sin \phi_0] \approx \frac{e \hat{V}}{2\pi} \cos \phi_0 \Delta\phi$$

adding to

$$\Delta\phi \propto \left[\frac{-\eta_0 \Omega_0}{p_0 R_0 \hat{V} \cos \phi_0} \right]^{\frac{1}{2}} \quad (39)$$

om (39) one sees that, during acceleration, p_0 increasing and the other parameters constant, the phase excursion $\Delta\phi$ is reduced as the one-fourth power of the momentum. This is loosely called "adiabatic damping" of phase oscillations, although in fact, with (37), it is evident that $\hat{W} \cdot \Delta\phi$ is invariant, Liouville's theorem holds and there is no damping of the area in the phase plane.¹⁾

ie in $\frac{\Delta E}{\Omega_0}, \Phi$ plane ($\Omega_0 = \Omega_s$) not in the $\Delta E, \phi$ plane.



(CAS Nov. 1976)

Can n be constant during acceleration?

Therefore, when $\gamma^2 = 3 \gamma_{tr}^2$, $\left| \frac{n}{\gamma} \right|$ reaches a maximum where

$$\left| \frac{n}{\gamma} \right|_{\max} = \frac{1}{\gamma} \left[\frac{1}{\gamma^2} - \alpha \right]_{\max} = - \frac{2}{(3 \gamma_{tr}^2)^{3/2}}$$

We notice that

$$\frac{n}{\gamma} = \frac{2}{(3 \gamma_{tr}^2)^{3/2}} \quad \text{when} \quad \gamma^2 = \frac{3}{4} \gamma_{tr}^2$$

The variation of $\left| \frac{n}{\gamma} \right|$ i.e. of ψ as a function of γ , is shown in



or ω_s

or $\left(\frac{\delta E}{h \omega_0} \right)^{-1}$

or $\left(\frac{\delta E}{h \omega_0} \right)^{-1}$ bucket

or $(A_s)^{-1/2}$ bucket

or $K_2^{-1/2}$

$$\left(\frac{2}{3 \sqrt{3} \gamma_{tr}^3} \right)^{1/2}$$

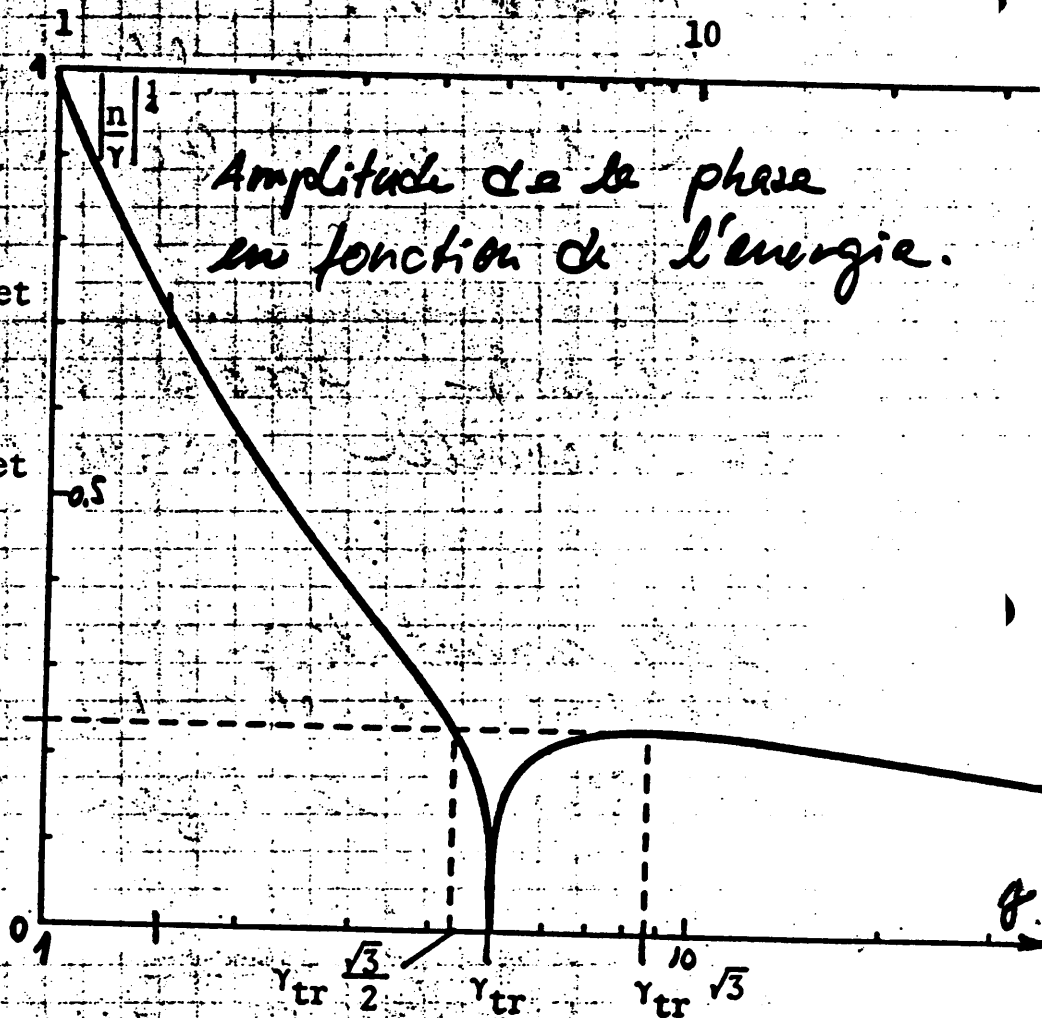


Fig. 10.1 Amplitude of phase oscillation as a function of energy. In the figure, $\gamma_{tr} = 5$.

CAS Sep. 1985

In case of a constant $|\varphi_s|$ during acceleration, the bucket width $|\phi_e|$. From (9-3) the bucket height is, for a sinusoidal voltage:

3
Deuxième partie.

Comment augmenter l'énergie
de la machine?

Les particules doivent être
amenées à une vitesse supérieure

⇒ Fréquence d'accélération ↑ ($f_r = \frac{\beta c}{2\pi R}$)

Combien?

$$T = \frac{1}{2} m_0 v^2 = \frac{1}{2} m \beta^2 c^2; \quad m = \frac{m_0}{\sqrt{1-\beta^2}}$$

Le petit livre jaune (youpié!)

(CERN MPS-S) / Int DL/70/4)

⇒ T et β à 815 MeV et 10 GeV

Augmentation de la fréquence :

$$\approx 3,5\%$$

(pour une augmentation de l'énergie
de $\approx 23\%$)

7
8
élément concerné: VCO

≈ ok.

A la vitesse accrue, il faut déployer plus de force pour défléchir les particules,

⇒ il faut augmenter la rigidité magnétique
Combien?

$$(Bev = m\frac{v^2}{e} \Rightarrow Be = \frac{mv}{e} = \frac{p}{e})$$

Du petit livre jaune ⇒ le momentané
p augmente de 14,5%

Be aussi:

La plupart des éléments magnétiques permettent cette charge supplémentaire certain demandaient des modifications.

Les modifications le plus importantes

Septa

Système d'eau de refroidissement :

- Faible contenu d'oxygène.
- Pression augmentée (+40%)

Kickers

Générateurs d'impulsions :

- Tension de sortie : ↑
Switch Thyristor^{ration}; temps de monte : ↓
- ligne de refroidissement ⇒ exit
- Spark gap : Adaptation à la tension plus élevée
- Nouvelles traversées HT céramiques pour les aimants (vide)

Aimant de déflexion (dipôles)

Aimant principal: Puissance OK, amélioration des niveaux

L'aimant de déflexion

(BTM. BH210):

- Réduction de l'entrefer de 140 mm à 110 mm (+ chambre à vide) (manœuvre délicate)

T4

RF dipole: Accord autour de la nouvelle fréquence d'éjection

Instrumentation:

Réfection du 'gate timing' et distribution pour les PUs de la ligne de transfert (BTU)

Note

'Transverse feedback'

Utilisation de toute la puissance disponible ← Impédance kicker était nécessaire

T5 Results

PARAMETRE

815 MeV

1 GeV

1 GeV

COMMENTAIRES

(20-BUNCH-MODE)

(2118) RFRACOMB

PLS LINES

CFAT/DMAX/OMAX/DOBS

CFE/INE/ONE/205NE

CFAC/ING/ONE/1/DO5NE



WARNING DELAY LINE (PPM)

859 us

914

GENERAL SYNCHRONIS

FORWARNING

1079

1134

PULSE TIMING

B_e
B_g

4.941 Tm

5.659

1.578

1.8096

1.481 GeV/c

1.696

P

0.848 → 2.44%

0.874

f_{RF}

8.06 (29 MHz)

8.248

8.346 (PPM)

B (PSS)

5997 G

6860 (6880)

I-TAIN MAJNET (PSS)

2789.5 A

3193 (3196)

U (BLR) "

8453 mV

9696 (9682)

230A ± 1V

BRGMSC22 (COMMAND)

2670.8

3093.5

B (PS)

702 G

804 G

TRANSFER ELEMENTS (VAL. COMMAND)

BE4KFA14L1	29.6 kV	33.9	
BE3KFA14L1	29.8 kV	33.5	
BE2KFA14L1	30.0 kV	34.4	
BE1KFA14L1	30.0 kV	34.4	
EBSW	303.8 A	248.0	
E3MH15L1	3620 A	4145	
BT4BVT10	218.3 A	249.9	
BT1BVT10	218.0 A	249.6	
BT3DVT10 (PPM)	19.6 A	22.4 (19.2)	
BT2DVT10 (PPM)	-19.5 A	-22.3	
BT DVT20	171.0 A	195.8	
BT4,1SMV10	1564 A	1791	
BT4KFA10	32.9 kV	37.7	
BT1KFA10	32.0 kV	36.6	
BT DVT30 (PPM)	-9.74 A	-11.15 (-10)	
BT3DVT10 (PPM)	82.0 (78.0) A	95.1 (92.0)	71.4 (63.9)
BT2DVT40 (PPM)	0 A	0	575 (8.8) (31.10.88)
BTBVT20	199.6 A	228.5	
BTSMV20	1515.8 A	1735.6	
BTBH210 (→ PE) (PPM)	251.2 A	287.6 (285.8)	
BTQNO10 (DEF)	135.0 A	156.5	
BTQNO20 (FOC)	125.6 A	145.6	
BTQNO30 (DFT)	60.0 A	69.5	
BTQNO40 (FOC)	170.0 A	159.1	
BTQNO50 (PPM) (DEF)	-100.0 A	-112.9	
BTKFA20	23.0 kV	26.3	0 (DISABLE)

MEASURING LINE

BTBH210 (→ ML) (PPM)	-265.2 A	-303.7
BTMH210	542.0 (N400) A	626.0
BTMQNO10 (FOC)	60.0 A	69.5
BTMQNO20 (DFT)	-20.0 A	-23.2

ENTREFER A → 11 cm

TIMINGS

BX.EFBL (PPM, USER)	410 us	500
BX.EFBT (PPM, INT.)	410 us	500
BX.EFBLQ (PPM, USER)	410 us	500
BLC (PROTECTEN BR)	364 us	434
BX.RFT (HWSPEC)		490

RECOMBINATION RF DIPOLE

BTSMV30	0	0	1350 A (1450) -4.33A (-7.5) ±7.63 (±6.31) [CONTRAT 3.6V] -4.6 (-7.5)
BT DVT50	0	0	
BT KRF (kV DEFE)	0	0	
BT DVT60	0	0	

FONCTIONS QUI CHANGENT ENTRE 815 MeV ET 1 GeV

BRAFGQDE, BRAFGQFO, BR1,4AFGBL, BRu AFGVRF, BRu AFG C16RATIO, BRGMSC

P PRODUCTION BEAMS FOR THE AAC COMPLEX

11/2/89
VJ

METHOD	LIMITED BY	NR. OF PS RINGS	PSB ENERGY	INTENSITY PS ENTRY	PS ACCEL.	BUNCH LENGTH ON P-TAG.	COMMENTS
ACCELERATION OF A SINGLE PS RING	PSB AT SOMEY	1	815 MeV 1 GeV	9 E12 9 E12	7.5 E12 8 E12	- 15	NOT USED, FOR COMPARISON ONLY; USED IN 1987.
2 RINGS (10 BUNCHES) RECOMBINED IN THE PSB-PS LINE BY AN RF DIPOLE (FUNNEL-LING) INTO 5 PS BUCKETS	LOSSES AT PS INJECTION (VERTICAL SEPARATION)	2	815 MeV 1 GeV	9 E12 1.25 E13	7.5 E12 1.05 E13	- 15	NOT USED USED NOV. 87 TO OCT. 88
2 RINGS (10 BUNCHES) FUSED INTO 5 BUCKETS BY QUASI-ADIABATIC RF MANIPULATIONS - AT 2.5 GeV/c (MERGING OF PAIRS OF BUNCHES) - AT 25 GeV/c (STABILIZING INCREASE OF HARMONIC NUMBER)	LOSSES AROUND PS INJECTION AND TRANSMISSION ENERGY	2	1 GeV	1.75 E13	1.55 E13	25-30	USED SINCE NOV. 88
(POSSIBLE FUTURE DEVELOPMENT) 4 RINGS (20 BUNCHES) INJECTED INTO 10 PS BUCKETS BY FUNNELING, FOLLOWED BY THE PROCESS GIVEN ABOVE	PRESUMABLY INJECTION AND LOW-ENERGY LOSSES IN PS	4	1 GeV	2.0 E13 (?)	1.8 E13 (?)	?	WOULD REQUIRE EXTENSIVE MACHINING STUDIES

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Dis-c.r.

Chefs de Groupe (12)

Billinge R. - DI
Allardyce B - SC
Bouthéon M. - OP
Coull L. - PO
Fiander D. - RF
Jones E. - DI
Madsen J.H.B. - LP
Pedersen F. - AR
Perriollat F. - CO
Riboni P. - ML
Schindl K. - HI
Simon D. - PA

Associates (6)

Blechs Schmidt D.
Dekkers D.
Haseroth H.
Koziol H.
Lefevre P.
Wilson E.

Opérateurs Booster (8)

M. Arruat
E. Chevallay
G. Cyvogt
G. Jubin
B. Mangeot
E. Ovalle
S. Pasinelli
M. Ruelle

Distribution

Groupe HI (31 + 3)

L. Bernard
R. Boudot
G. Bourgeois
C. Carter
H. Charmot
M. Damiani
B. Dumas
Ch. Dutriat
G. Gelato
B. Hadorn
G. Henchoz
C.E. Hill
J. Knott
M. Le Gras
L. Magnani
R. Nettleton
P. Odier
F. Prost
N. Rasmussen
J.P. Romero
G. Royer
K. Schindl
J.D. Schnell
H. Schönauer
U. Tallgren
E. Tanke
P. Tétu
S. Tirard
J.L. Vallet
D. Warner
M. Weiss

G. Amendola (étudiant)
A. Margot (apprenti)
M. Moret

Personnes éventuellement intéressées (32)

Baillod J.M.
Blas F.
Boillot J.
Brouet M.
Burlat A.
Chaintreuil R.
Daems G.
Danloy L.
Dehavay C.
Fiebiger H.
Gailloud R.
Gendre F.
Girardini M.
Godenzi B.
Henny L.
Krusche A.
Labeye J.F.
Laudet S.
Le Dallic G.

Malandain E.
Metais M.
Metzmacher K.D.
Nitsch F.
Raich U.
Renou A.
Royer J.P.
Schneider G.
Simitsch R.
Sullivan A.H.
Valbuena R.
Van Cauter W.
Völker F.
Vretenar M.