Characteristics of the beam T11

Maximum design momentum		3.6 GeV/c
Length at reference focus [1]		28 m
Beam height		2.5 m
Production angle from target	H	148.36 mrad
	V	16.06 mrad
	total	149.2 mrad
Horizontal angular acceptance (in QFO02)		6.2 mrad
Vertical angular acceptance (in QDE01)		19.7 mrad
Momentum slit displacement (half aperture)		10 mm for $\Delta p/p \sim 1.12\%$
Theoretical momentum resolution		± 0.3 %
Dispersion at nominal focus	H	0 mm/ 0 mrad (first order calculations)
	V	1.1mm/ 0.3 mrad

The total momentum spread at the nominal focus for horizontal collimator fully open is $\Delta p/p \sim 3\%$ with spot sizes (accuracy 0.8%, multiple scattering included) :

$\sigma x \sim 1.05$ cm $\quad \sigma y \sim 0.47$ cm
$\sigma x' \sim 3.8$ 9 mrad $\quad \sigma y' \sim 8.43$ mrad

---

1 Reference focus is located 2.5 m downstream of the last magnet .

O.Ferrando
CERN PS/CA/BL

Beam Intensity

Intensity of various particles species can be found in the graphics below.
Data are given for 2.10^{11} p/spill at 24 GeV/c on standard target and 10 mm half width of the momentum slit.

Line tuning

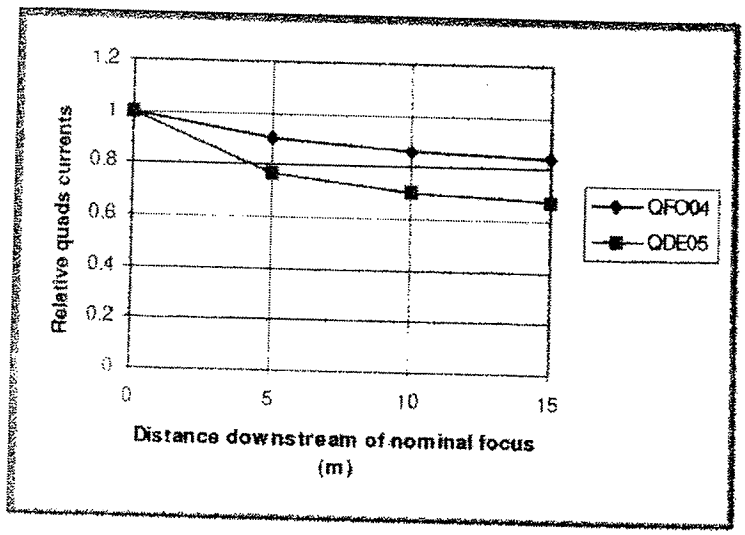
It can be done with the help of tables 1 and 2. By convention magnets are wired such that all polarities are the same as the selected particles species (i.e. all positive currents for protons). Final beam focusing and steering can be done with the last four magnets (QFO04, QDEO5 for focusing and BHZ02, BVT01 for steering).

H and V steering

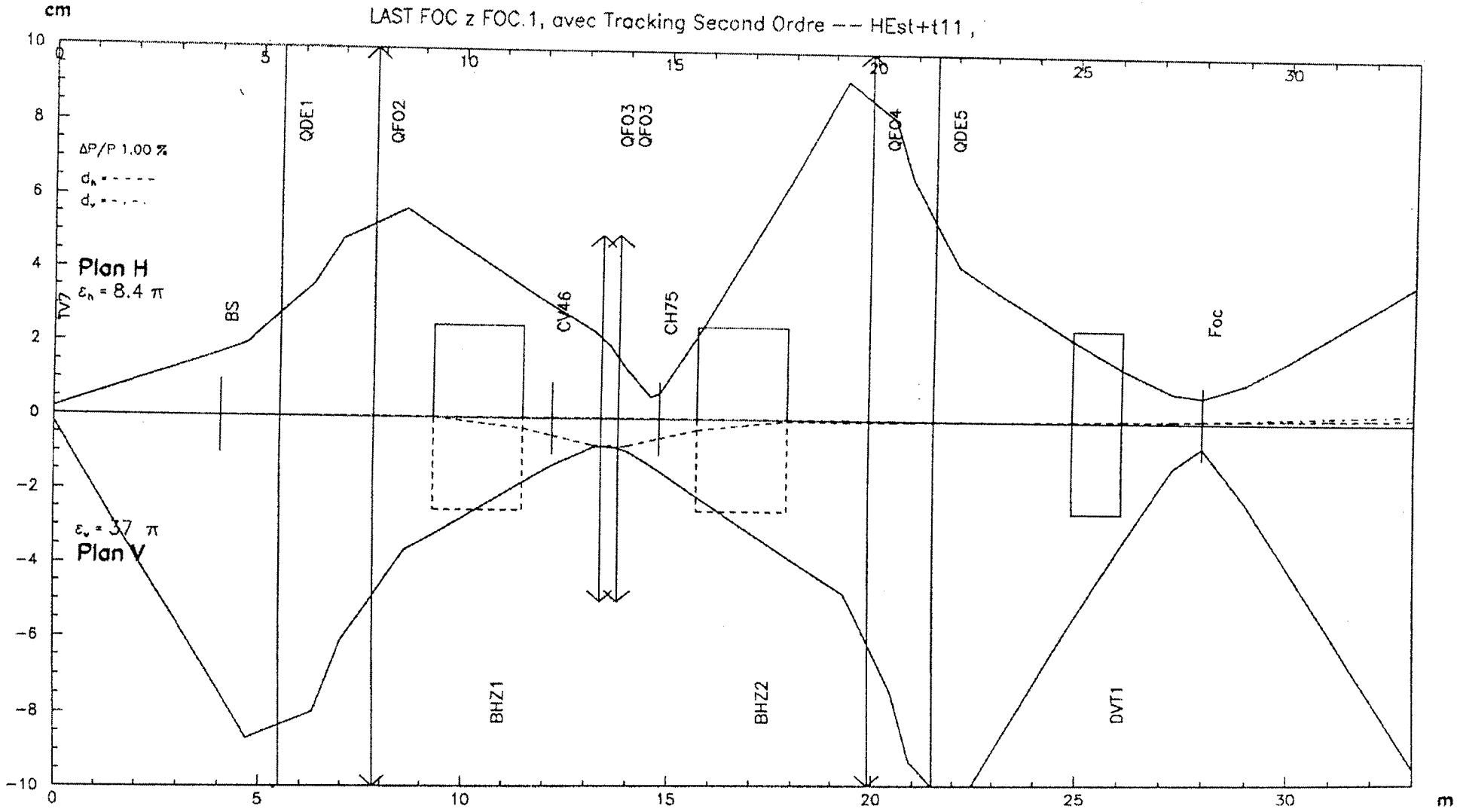
Uses BHZ03 for horizontal steering : A for 1 cm
Uses BVT01 for vertical steering: A for 1 cm

Focusing

Table 2 should be used to move the longitudinal location of the focus, both H and V are in the same plane. The quadrupoles tunning and the expected spot sizes at focus is graphically illustrated below.



O. Ferrando
CERN PS/CA/BL

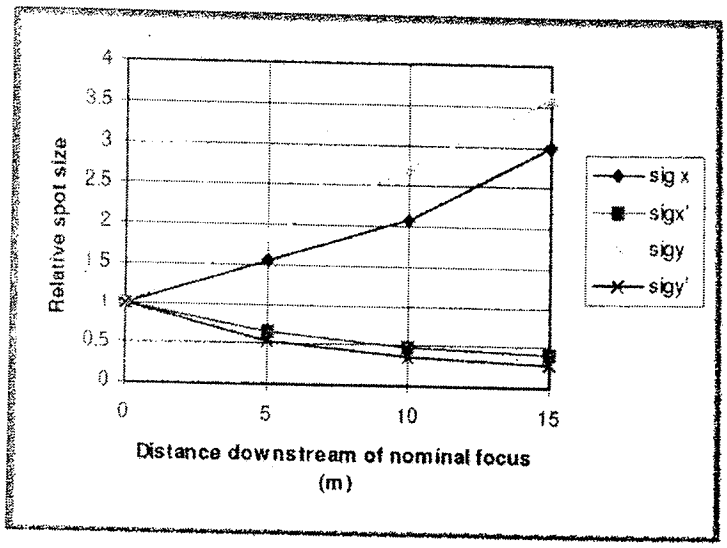

cm
LAST FOC z FOC.1, avec Tracking Second Ordre -- HEst+t11 ,
ΔP/P 1.00 %
Plan H
Plan V
TV7
BS
QDE1
QFO2
QFO3
QFO3
QFO4
QDE5
CV46
CH75
Foc
BHZ1
BHZ2
DVT1
m

Momentum		ZT11.QDE01	ZT11.QFO02	ZT11.BHZ01	ZT11.QFO03	ZT11.BHZ02	ZT11.QFO04	ZT11.QDE05	ZT11.BVT01
(GeV/c)									
1		97.2	86	218	66	165	88	82	37.5
1.2		117	103	261	79	198	105	98	45
1.4		136	120	304	92	231	123	115	52.5
1.6		156	137	348	105	264	140	131	60
1.8		175	154	392	118	297	158	148	67.5
2		195	172	435	131	330	176	164	75
2.2		214	189	479	145	363	193	181	82.5
2.4		233	206	522	158	396	211	197	90
2.6		253	223	566	171	429	228	214	97.5
2.8		272	240	609	184	462	246	231	105
3		292	257	653	197	495	263	248	113
3.2		311	275	696	210	528	281	265	120
3.4		331	292	739.5	223	561	298	283	128
3.5		340.3	300	761	229	578	307	292	131
3.6		350	309	783	236	594	316	300	135

Table 1. Computed currents (A) for the nominal focus, function of the momentum

Momentum		ZT11.QFO04	ZT11.QDE05	ZT11.QFO04	ZT11.QDE05	ZT11.QFO04	ZT11.QDE05	ZT11.QFO04	ZT11.QDE05
(GeV/c)									
Focus at		0m	0m	5m	5m	10m	10m	15m	15m
1		88	82	79	68	76	62	74	59
1.2		105	98	95	81	91	75	88	71
1.4		123	115	111	95	106	87	103	83
1.6		140	131	127	108	121	99.4	118	95
1.8		158	148	143	122	136	112	133	106
2		176	164	159	136	152	125	147	118
2.2		193	181	175	149	167	137	162	130
2.4		211	197	191	163	182	150	177	142
2.6		228	214	207	177	198	162	192	154
2.8		246	231	223	191	213	174	207	166
3		263	248	240	204	229	187	222	178
3.2		298	265	256	218	244	200	237	190
3.4		298	283	273	232	260	212	252	202
3.5		307	292	282	239	268	219	261	208
3.6		316	300	290	246	276	225	268	214

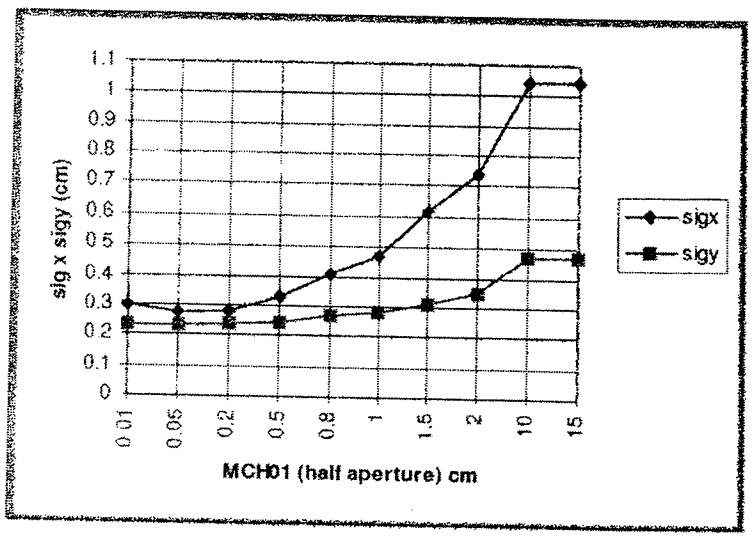
Table 2. Computed currents (A) int the last doublet, function of momentum and distance from the nominal focus



Collimators effects (intensity and momentum spread tuning)

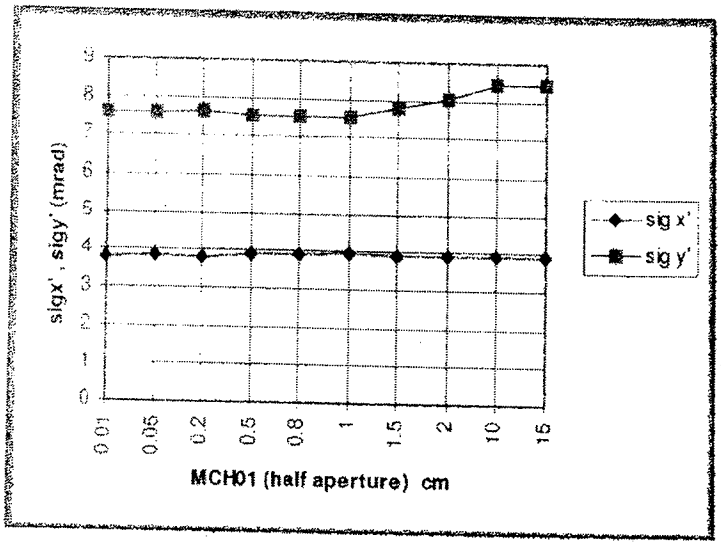
The following graphs show the effects of collimators MCH01 and MCV01. Values are obtained by TURTLE runs and each point has a statistic uncertainty of 2% to 4% due to finite sample size.
Collimators are supposed to be set symmetrical with respect the beam axis.

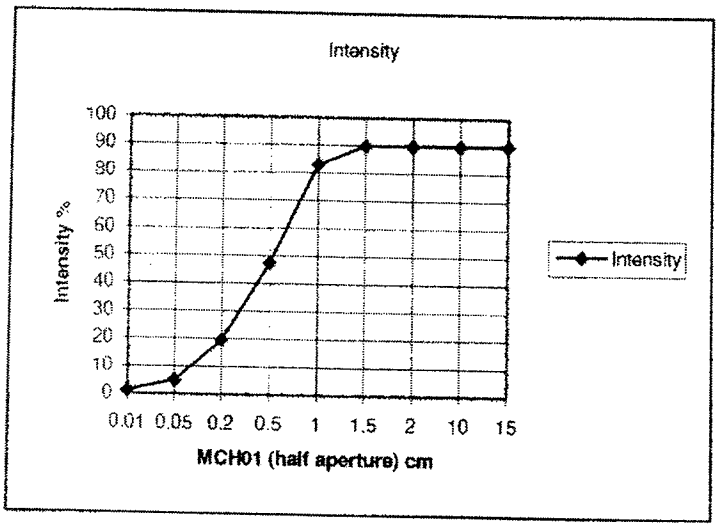
Momentum slit aperture effects (MCH01) on the beam at the nominal focus:



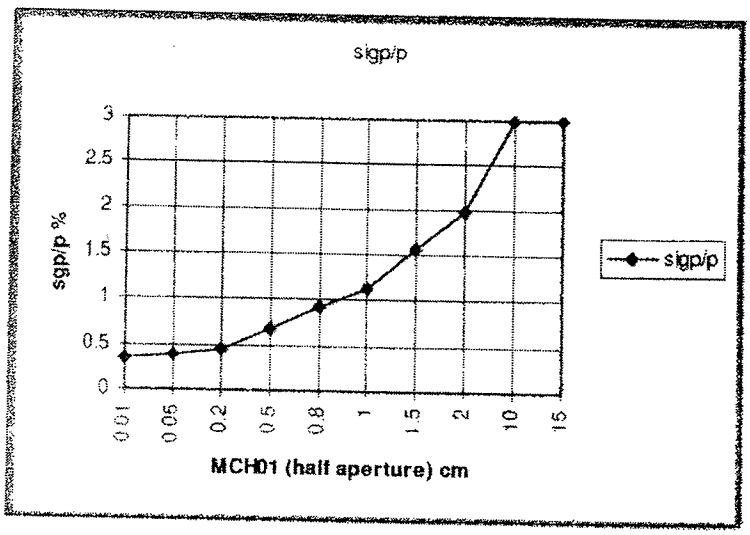
Observed changes in spot sizes are namely due to the optics chromatism.

O. Ferrando
CERN PS/CA/BL

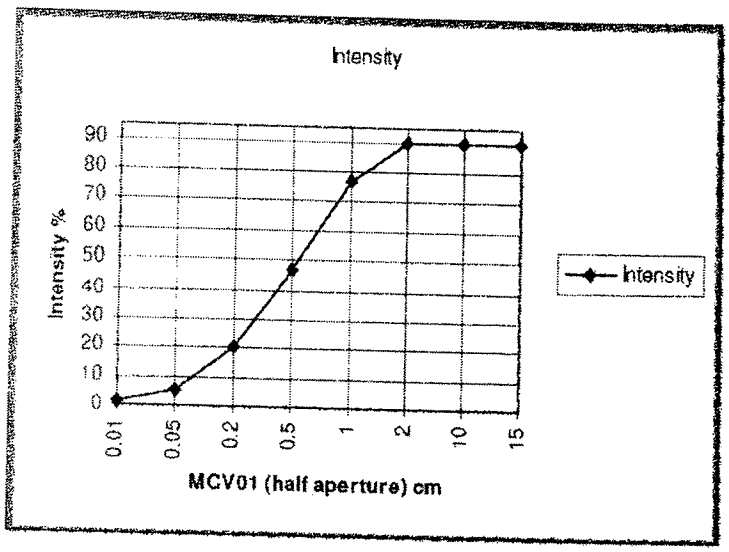


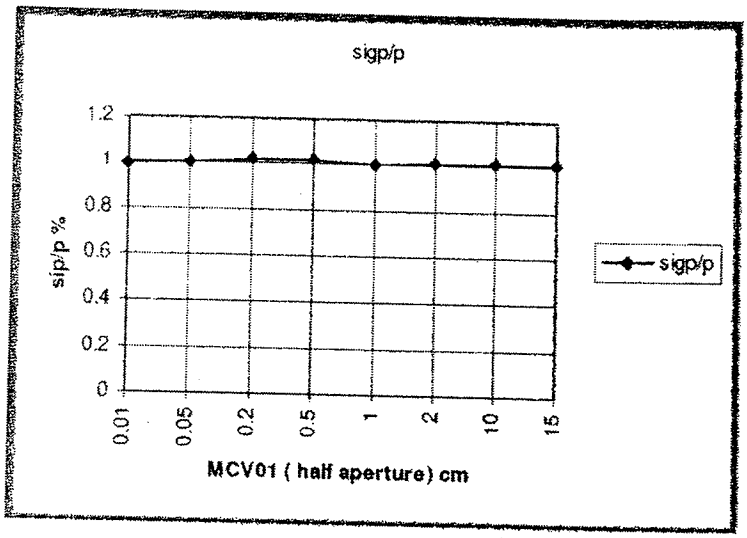


(Momentum slit aperture effects on the intensity for a beam with $\Delta p/p \sim 1\%$).



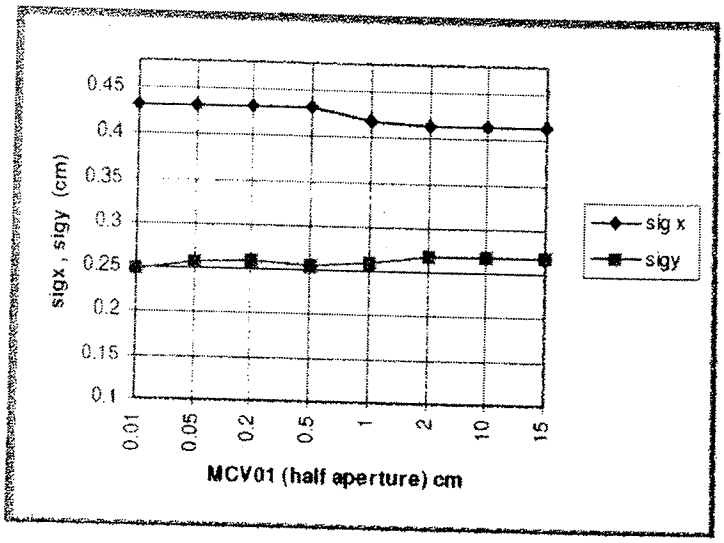
O. Ferrando
CERN PS/CA/BL



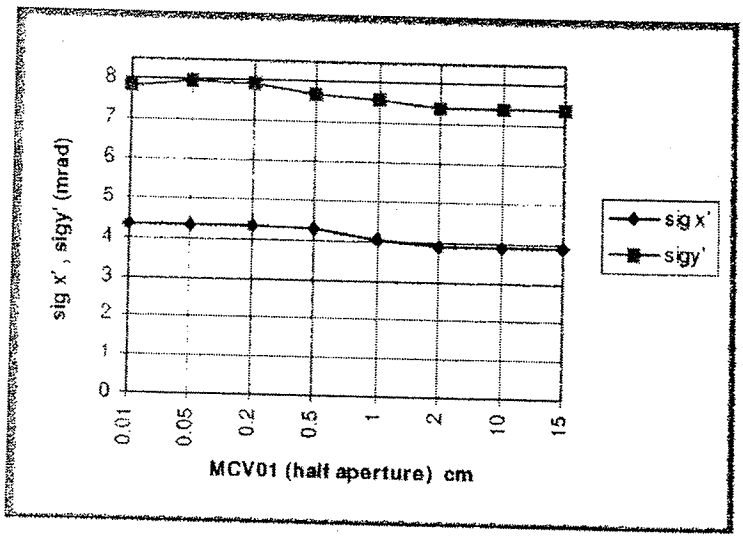


O. Ferrando
CERN PS/CA/BL

Effects of the vertical collimator MCV01 on the beam ($\Delta p/p \sim 1\%$).



Observed changes in spot sizes are namely due to the optics chromatism.



O. Ferrando
CERN PS/CA/BL

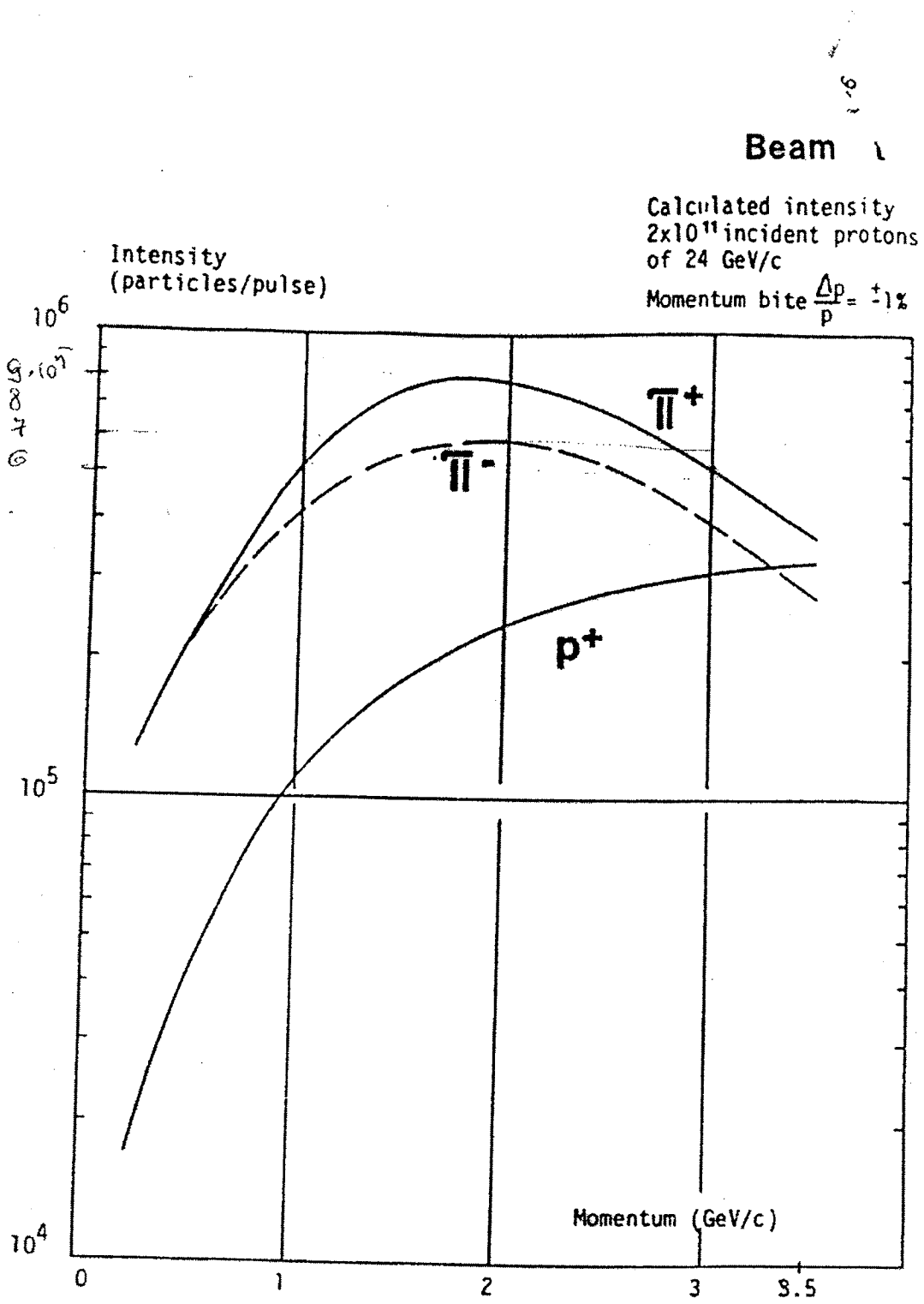


Fig. 27 : Calculated intensity at the reference focus of t11.