

PROJECT OF THE PS BEAM FOR ν OSCILLATIONS

EXPERIMENTS: LAYOUT AND OPTICS

D. Dumollard, P. Lazeyras, D.J. Simon

A number of variants have been considered in the past months; the present solution has been selected and will be used to provide neutrinos for the three experiments PS 169, PS 180 and PS 181.

1. Layout

Figure 1 gives a general layout of the three lines at the CERN scale: the first detectors of the experiments PS 169 and PS 181 are placed in the building 181 (I_1 from ISR) at a distance of about 130 m from the target, which is itself located at \approx 830 m from BEBC, 870 m and 900 m from CDHS and CHARM respectively. One has the freedom to direct the proton beam to any of the three detectors. The first detector located in building 181 is centered on the line which points towards the CHARM set-up.

Figures 2 and 3 show a schematic layout of the proton beam line, diverted out of TT1 by the magnet HB412 which bends horizontally the particles 15 mrad to the right. Then follows a large 220,5 mrad bend to the left in order to get the required direction towards I_1 and the West Area detectors.

In the vertical plane the beam is bent two times in opposite directions in order to pass over the TT6 line, to cross the close detector located \approx 6 m below the floor level in the building 181, and to point to the far detectors in WANF (level \approx 15 m higher than the proton beam in TT1).

The proton beam line is ≈ 82 m long between QF413 and the target. The last vertical bending magnet (B340.3) placed 6,40 m upstream the target must be tilted in order to provide the horizontal deflexion necessary to steer the beam to each of the three far detectors. The target (Beryllium, 1,20 m long) will be moved accordingly.

Table 1 gives the main coordinates of the proton and neutrino beam lines.

Figure 4 shows the gallery which houses the proton beam elements (3,5 m diameter, ≈ 59 m long) followed by the access pit (6,5 x 3,5 m²) and the target and horn area (10 x 6,5 m²). Then follows the decay tunnel, the cross-section of which is rectangular, 3,5 x 2,8 m² over 25 m, then 5 x 2,8 m² on the last 25 m.

The decay length between the target center and the tip of the tunnel is $\approx 52,6$ m.

The decay tunnel is aligned on the S₀ line (center line on the drawings 2 and 3) which points to the middle between the center of BEBC and the center of the CHARM detector.

The close detectors are placed in a hole 17 x 10 x 6 m³ dug in building 181 (see Fig. 5). They are aligned on the CHARM line (left neutrino line on Figs. 2 and 3).

2. Proton beam optics

Protons may be transported and focused on the target for momenta in the range 10-20 GeV/c.

The horizontal and vertical beam envelopes at 10 GeV/c are shown on Fig. 6 (emittances: $E_h = 6 \text{ } \mu\text{m} \cdot \text{mrad}$, $E_v = 4 \text{ } \mu\text{m} \cdot \text{mrad}$).

The optics in the TT1 line upstream Q143 is the same as for the transfer to ISR. At 10 GeV/c, the computed spot size at the target position is $\approx 5,4$ mm (H plane) x 3,8 mm (V plane) including the chromatic dispersions for $\Delta p/p = \pm 10^{-3}$. It changes with the momentum as $p^{-\frac{1}{2}}$.

We have assumed the use of the following beam transfer elements:

- 3 B340-type bending magnets
- 1 MBN-type bending magnet
- 5 QTS-type quadrupoles
- 3 MDX-type (or equivalent) steering dipoles.

Four TV boxes (with alumina screens) and at least one current transformer will be used to tune and control the beam,

We acknowledge the many people who helped us during the numerous studies concerning this layout and especially A. Böker, M. Chassard and E. Menant.

D. Dumollard - P. Lazeyras - D.J. Simon

Distribution:

PS: MU/EP and MU/BL sections
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EF: J.C. Catin, J.M. Maugain, S. Rangod, M. Schmitt
and Mrs. M. Baldo-Ceolin (Padova)

ISR: P.J. Bryant, K. Potter

SB: A. Böker, R. Degerine

SPS: E. Menant

FIGURE CAPTIONS

- Table 1 : Coordinates of the lines
- Figure 1 : General layout
- Figures 2, 3 : Schematic view of the lines
- Figure 4 : Layout of the proton beam
- Figure 5 : Detectors in building 181
- Figure 6 : Optics of the proton beam

1. NEUTRINO LINE FROM TT1 TO ISRU AND SO - AUGUST 1981

28/08/81

	X-COORDINATE	Y-COORDINATE	ALTITUDE	GISEMENT	HOR ANGLE	VERT ANGLE
INITIAL	1841.60485	2063.65700	2434.23497	315.90340	2.891783	0.000000
REQUIRED FINAL	894.99950	2118.12950	2449.72600	0.00000	7.853982	.013157

FH = 1.0000000 FV = 1.0000000

I	ELEMENT	L	ANGLE	X	Y	ALTITUDE	HOR LENGTH	HOR ANGLE	GISEMENT	BEAM LENGTH
1	UF 413	0.0000	0.0000000	1841.60485	2063.65700	2434.23497	0.000	2.891783	315.9034	0.000
2	HR412-EN	0.7000	0.0000000	1840.92658	2063.83005	2434.23497	0.700	2.891783	315.9034	0.700
3	HR412	1.2500	0.0000000	1839.71538	2064.13908	2434.23497	1.950	2.891783	315.9034	1.950
4	HR412-HO	0.0000	-0.0150000	1839.71538	2064.13908	2434.23497	1.950	2.891783	316.8583	1.950
5	B 34J.1	30.0000	0.0000000	1810.76111	2071.90086	2434.23497	31.950	2.891783	316.8583	31.950
6	B 34J.1V	0.0000	-0.0903439	1810.76111	2071.90086	2434.23497	31.950	2.891783	316.8583	31.950
7	B.VIRT.H	25.2144	0.0000000	1780.52491	2078.56320	2436.50981	57.062	3.097241	302.8235	57.164
8	B 34J.3	0.0000	-0.2204582	1780.52491	2078.56320	2436.50981	57.062	3.097241	302.8235	57.164
9	B 34J.3V	19.1216	0.0000000	1767.50001	2079.40754	2438.23497	76.105	3.097241	302.8235	76.286
10	B 34J.3V	0.0000	-0.0771865	1767.50001	2079.40754	2438.23497	76.105	3.097241	302.8235	76.286
11	ENTP.TAR	5.8005	0.0000000	1761.70571	2079.66170	2438.31128	81.905	3.097241	304.0609	82.687
12	CENT.TAR	0.6000	0.0000000	1761.10635	2079.66170	2438.31128	82.505	3.097241	304.0609	82.687
13	END.TUNN	52.6000	0.0000000	1703.56263	2082.44324	2439.01119	135.101	3.097241	304.0609	135.286
14	PT ISR=0	77.1451	0.0000000	1631.50001	2085.92324	2440.02612	212.239	3.097241	304.0609	212.574
15	PT S=0	737.2893	0.0000000	894.99952	2118.12992	2449.72598	949.464	3.097241	302.8235	949.721

2. NEUTRINO LINE FROM TT1 TO ISR1 AND WA18 - AUGUST 1981

28/08/81

	X-COORDINATE	Y-COORDINATE	ALTITUDE	GISEMENT	HOR ANGLE	VERT ANGLE
INITIAL	1841.60485	2063.65700	2434.23497	315.90340	2.891783	0.000000
REQUIRED FINAL	850.45800	2103.47300	2451.48100	0.00000	7.853982	.014533

FH = 1.9000000 FV = 1.0000000

I	ELEMENT	L	ANGLE	X	Y	ALTITUDE	HOR LENGTH	HOR ANGLE	GISEMENT	BEAM LENGTH
1	UF 413	0.0000	0.0000000	1841.60485	2063.65700	2434.23497	0.000	2.891783	315.9034	0.000
2	HR412-EN	0.7000	0.0000000	1840.92658	2063.83005	2434.23497	0.700	2.891783	315.9034	0.700
3	HR412	1.2500	0.0000000	1839.71538	2064.13908	2434.23497	1.950	2.891783	315.9034	1.950
4	HR412-HO	0.0000	-0.0150000	1839.71538	2064.13908	2434.23497	1.950	2.891783	316.8583	1.950
5	B 34J.1	30.0000	0.0000000	1810.76111	2071.90086	2434.23497	31.950	2.891783	316.8583	31.950
6	B 34J.1V	0.0000	-0.0903439	1810.76111	2071.90086	2434.23497	31.950	2.891783	316.8583	31.950
7	B.VIRT.H	25.2144	0.0000000	1780.52491	2078.56320	2436.50981	57.062	3.097241	302.8235	57.164
8	B 34J.3	0.0000	-0.2204582	1780.52491	2078.56320	2436.50981	57.062	3.097241	302.8235	57.164
9	B 34J.3V	19.1216	0.0000000	1767.50001	2079.40754	2438.23497	76.105	3.097241	302.8235	76.286
10	B 34J.3V	0.0000	-0.0771865	1767.50001	2079.40754	2438.23497	76.105	3.097241	302.8235	76.286
11	ENTP.T=1	5.8014	0.0000000	1761.70120	2079.56072	2438.31928	81.906	3.115183	301.6813	82.687
12	CENT.T=1	0.6000	0.0000000	1761.10147	2079.56072	2438.31928	82.506	3.115183	301.6813	82.687
13	PT ISR=0	120.8004	0.0000000	1631.50001	2083.00011	2440.21233	212.153	3.115183	301.6813	212.448
14	PT WA18	775.3942	0.0000000	850.45802	2103.47360	2451.48097	987.465	3.115183	301.6813	987.742

3. NEUTRINO LINE FROM TT1 TO ISRB AND BEBC - AUGUST 1981

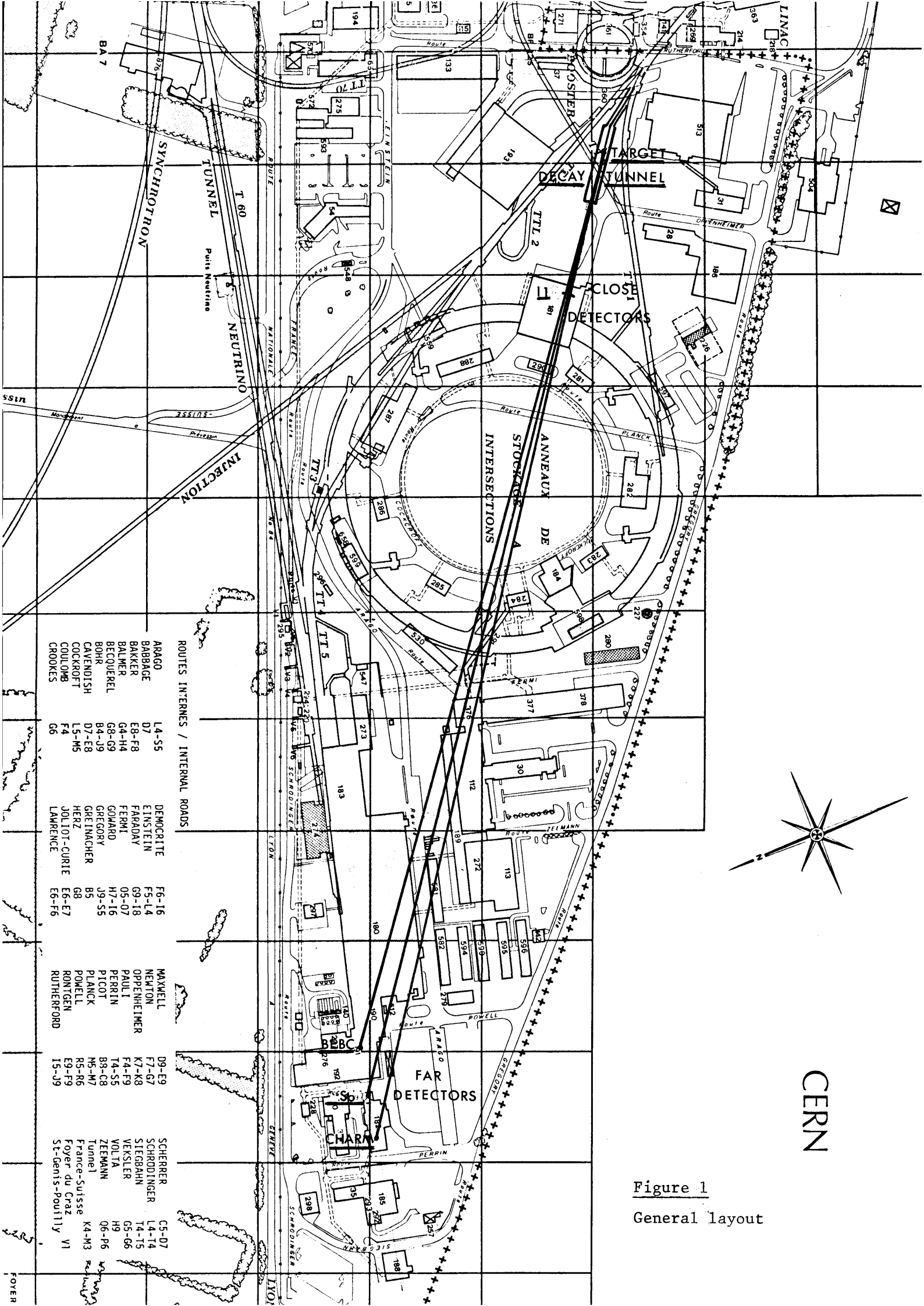
28/08/81

	X-COORDINATE	Y-COORDINATE	ALTITUDE	GISEMENT	HOR ANGLE	VERT ANGLE
INITIAL	1841.60485	2063.65700	2434.23497	315.90340	2.891783	0.000000
REQUIRED FINAL	933.54100	2132.78600	2447.97100	0.00000	7.853982	.011650

FH = 1.0000000 FV = 1.0000000

I	ELEMENT	L	ANGLE	X	Y	ALTITUDE	HOR LENGTH	HOR ANGLE	GISEMENT	BEAM LENGTH
1	UF 413	0.0000	0.0000000	1841.60485	2063.65700	2434.23497	0.000	2.891783	315.9034	0.000
2	HR412-EN	0.7000	0.0000000	1840.92658	2063.83005	2434.23497	0.700	2.891783	315.9034	0.700
3	HR412	1.2500	0.0000000	1839.71538	2064.13908	2434.23497	1.950	2.891783	315.9034	1.950
4	HR412-HO	0.0000	-0.0150000	1839.71538	2064.13908	2434.23497	1.950	2.891783	316.8583	1.950
5	B 34J.1	30.0000	0.0000000	1810.76111	2071.90086	2434.23497	31.950	2.891783	316.8583	31.950
6	B 34J.1V	0.0000	-0.0903439	1810.76111	2071.90086	2434.23497	31.950	2.891783	316.8583	31.950
7	B.VIRT.H	25.2144	0.0000000	1780.52491	2078.56320	2436.50981	57.062	3.097241	302.8235	57.164
8	B 34J.3	0.0000	-0.2204582	1780.52491	2078.56320	2436.50981	57.062	3.097241	302.8235	57.164
9	B 34J.3V	19.1216	0.0000000	1767.50001	2079.40754	2438.23497	76.105	3.097241	302.8235	76.286
10	B 34J.3V	0.0000	-0.0771865	1767.50001	2079.40754	2438.23497	76.105	3.097241	302.8235	76.286
11	ENTP.T=B	5.8010	0.0000000	1761.71303	2079.77819	2438.30266	81.906	3.077673	304.0609	82.687
12	CENT.T=B	0.6000	0.0000000	1761.11189	2079.77819	2438.30266	82.506	3.077673	304.0609	82.687
13	PT ISR=0	120.8359	0.0000000	1631.50001	2088.11243	2439.82270	212.383	3.077673	304.0609	212.574
14	PT BEBC	697.4547	0.0000000	933.54103	2132.78635	2447.97100	911.771	3.077673	304.0609	912.008

Table 1: Coordinates of the lines



CERN

Figure 1
General layout

ROUTES INTERNES / INTERNAL ROADS

- | | | | | | | | |
|-----------|-------|--------------|-------|-------------|-------|------------------|---------------|
| ARAGO | L4-S5 | DEMOCRITTE | F6-16 | MAXWELL | D9-E9 | SCHERRER | C5-D7 |
| BABBAGE | D7 | EINSTEIN | F5-L4 | NEXTON | F7-G7 | SCHRODINGER | L4-T4 |
| BAKKER | E8-F8 | FARADAY | G9-18 | OPPENHEIMER | K7-K8 | STIEGBAHN | T4-T5 |
| BALMER | G4-H4 | FERMI | 05-07 | PAULI | F4-F9 | VEKSLER | G5-G6 |
| BEQUEREL | G8-G9 | GOARD | H7-16 | PERLIN | T4-S5 | VOLTA | H9 |
| BOHR | B4-J9 | GREGORY | J9-S5 | PICOT | B9-C8 | ZEMANN | 06-P6 |
| CAVENDISH | D7-E8 | GREINACHER | B5 | PLANCK | M5-M7 | Tunnel | K4-M3 |
| COCKROFT | L5-M5 | HERZ | 68 | POMELL | R5-R6 | France-Suisse | Foyer du Craz |
| COULOMBS | F4 | JOLIOT-CURIE | E6-E7 | RONTGEN | E9-F9 | St-Genis-Pouilly | V1 |
| CROOKES | G6 | LAWRENCE | E6-F6 | RUTHERFORD | I5-J9 | | |

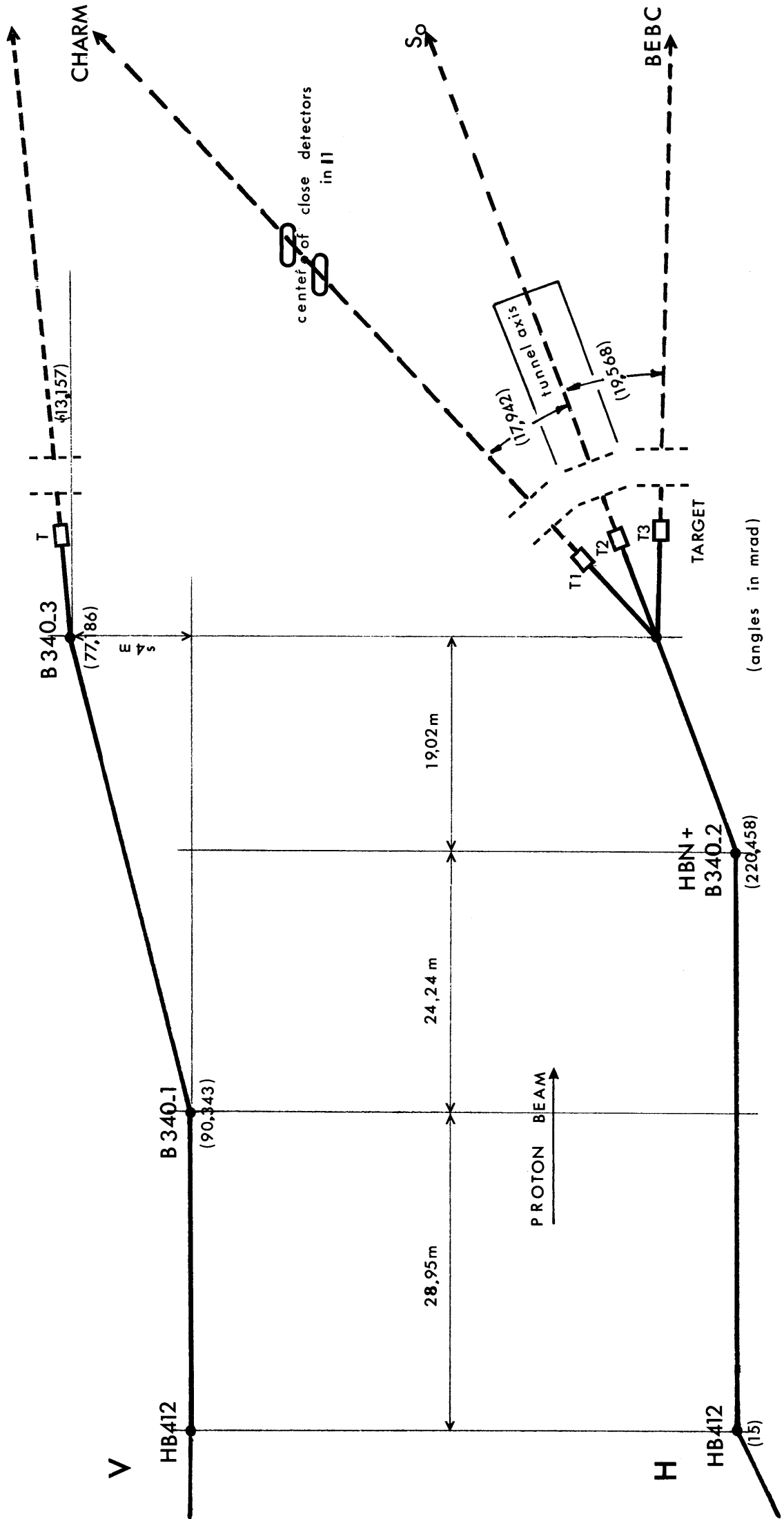


Figure 2
 Schematic view of the lines

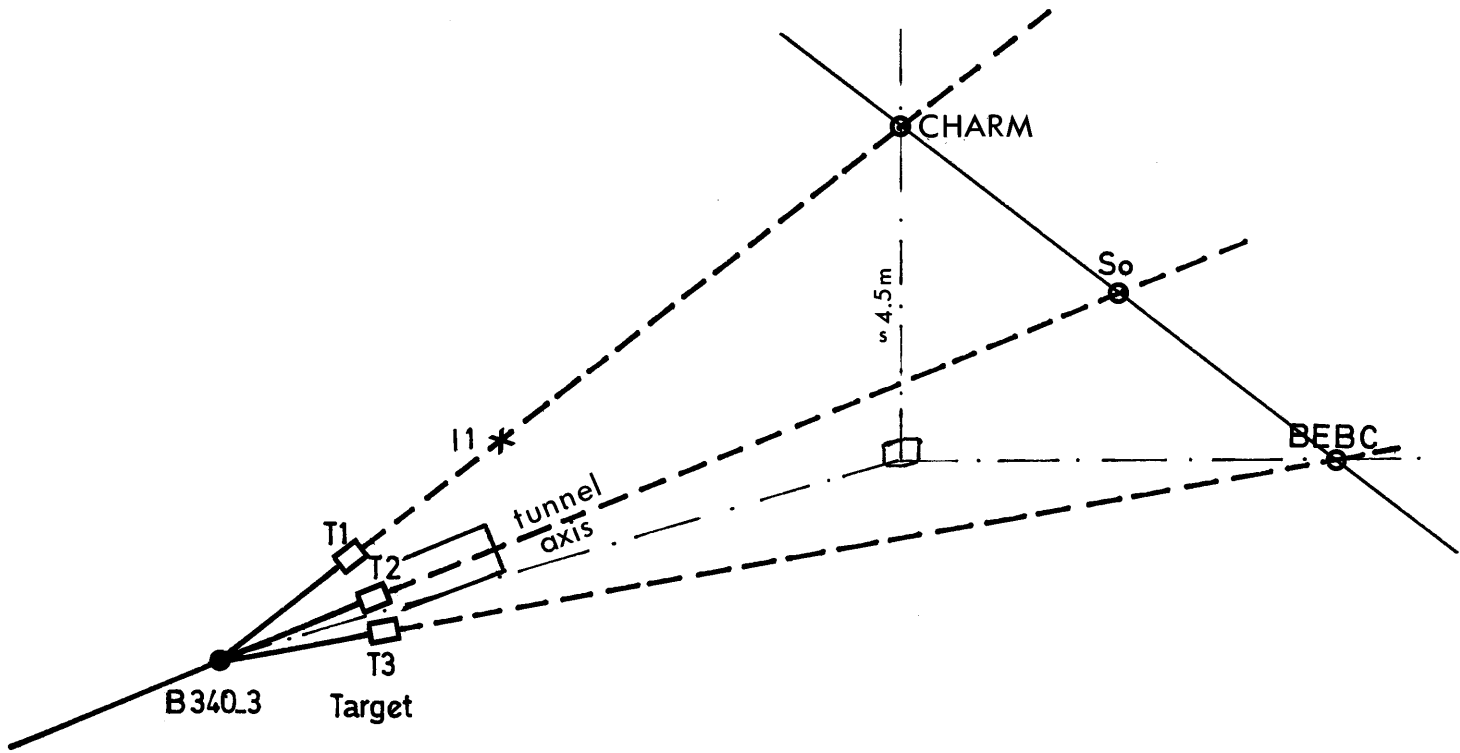


Figure 3
Schematic view of the lines

— NEUTRINO OSCILLATIONS —
 — nouvelle position du faisceau —

— ISR 1 —

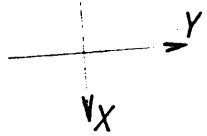
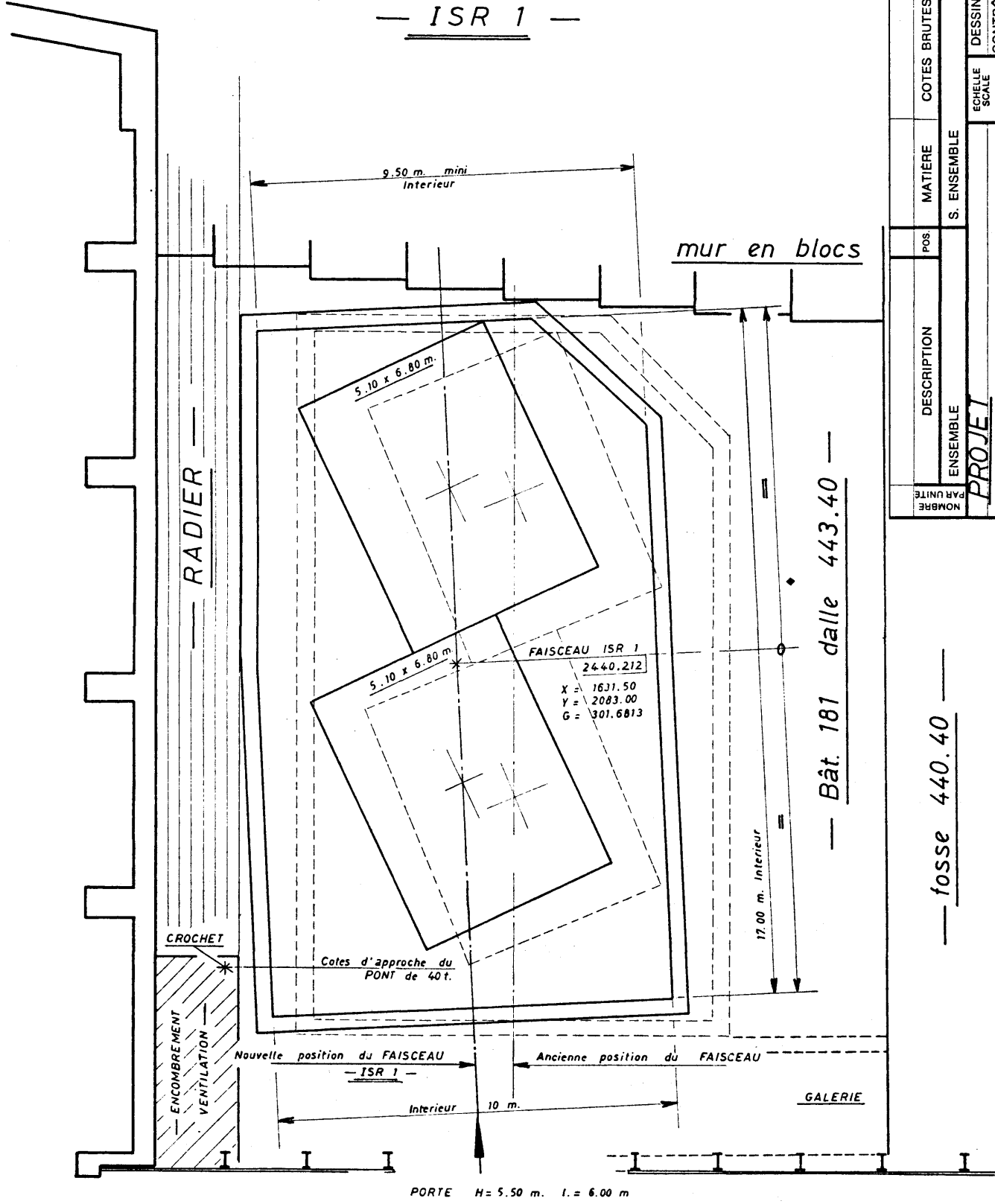


Figure 5
 Detectors in building 181

NOBRE PAR UNITÉ	ENSEMBLE	DESCRIPTION	POS	MATIÈRE	COTES BRUTES	FOURNISSEURS	NOM	DATE
						NO SCHEM	J.-J. Cortig	25-8-81
PROJET			S. ENSEMBLE		DESSINE	CONTRÔLE	REPLACÉ PAR	
PUITS pour WA 1 & WA 18					REPLACÉ PAR	RÉDUCTION		
(Implantation possible)					REPLACÉ PAR	RÉDUCTION		
ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH CERN					TEL: (022) 49 51 11 TELEX: GENEVE 23686		IND:	
					WANF 182 044			

fosse 440.40

Bât. 181 dalle 443.40

RADIÉ

mur en blocs

CROCHET

ENCOMBREMENT VENTILATION

Cotes d'approche du PONT de 40t.

FAISCEAU ISR 1
 2440.212
 X = 1631.50
 Y = 2083.00
 G = 301.6813

Nouvelle position du FAISCEAU - ISR 1

Ancienne position du FAISCEAU

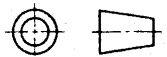
GALERIE

PORTE H = 5.50 m. l. = 6.00 m

DIMENSION	> 1	> 30	> 120	> 315	> 1000	> 2000
USINAGE	±0.2	±0.3	±0.5	±0.8	±1.2	±2
MECANO-SOUDURE	±0.5	±0.8	±1	±2	±3	±4
TOLERANCES GENERALES						

DESSIN, RUGOSITE, TOLERANCES SELON NORMES ISO

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Projection européenne
 First angle projection

INDIC	DATE	NOM	ZONE	MODIFICATION

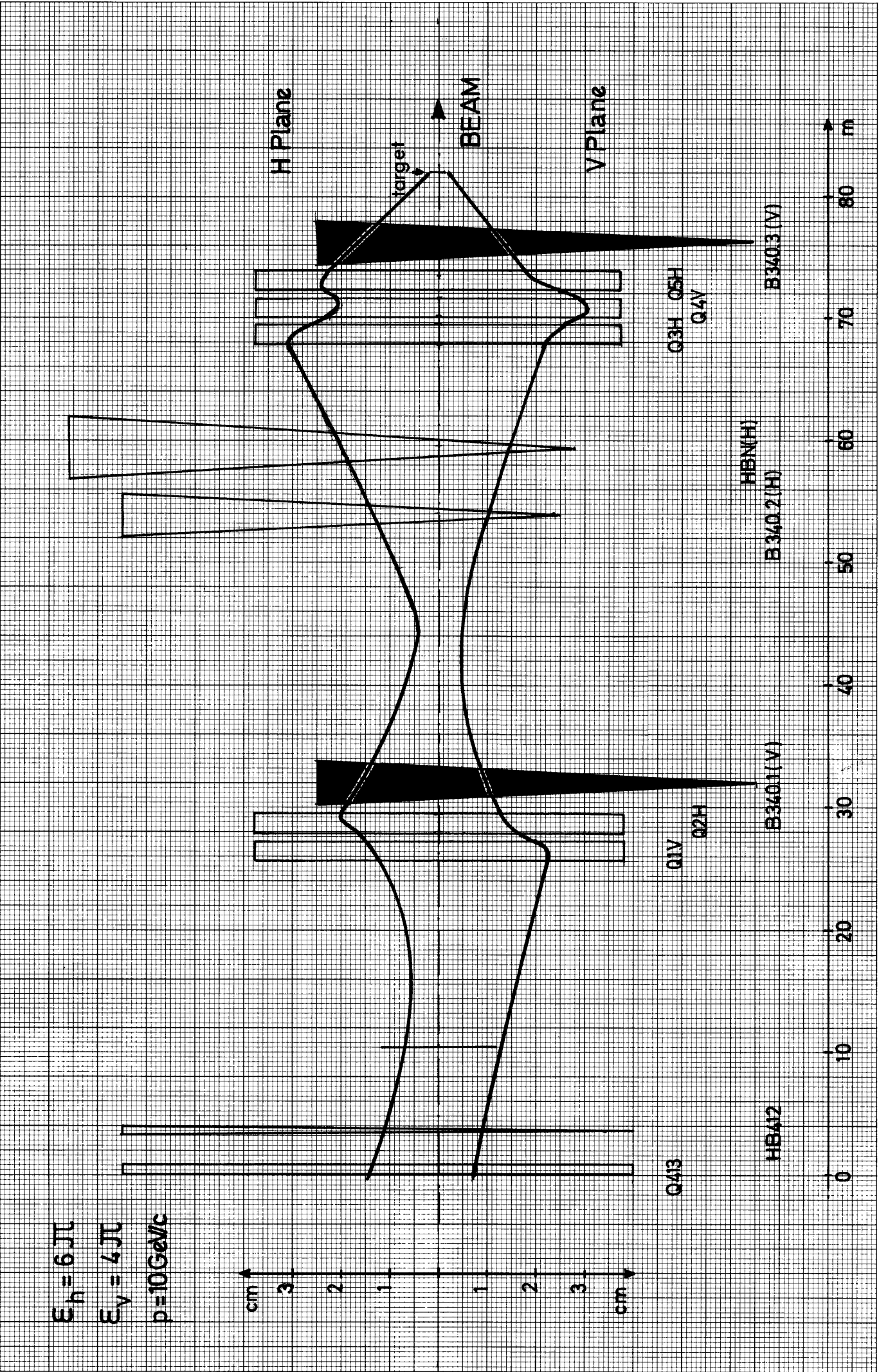


Figure 6 - Optics of the proton beam

ADDENDUM A LA NOTE PS/MU/EP/NOTE 81-6

du 7.9.1981

En raison de la limitation du nombre et de la puissance des alimentations disponibles pour le faisceau de protons pour l'expérience 'v oscillations', la position de l'aimant MBNH a été modifiée selon la copie du programme ci-jointe (aimant déplacé vers l'amont de 0.225 m). Le point virtuel de déflexion horizontale de la ligne proton (amont B340.2(H) - aval MBNH) reste inchangé, ainsi que la position de l'aimant B340.2(H).

En outre a été rajoutée la position de TV 2.

La position des beam-stoppers n'est pas encore déterminée; l'étude en cours permettra également de fixer dans l'anneau TT1 la position de TV 1 (le plus proche possible de HB412) et des 2 MDX (H et V); (étude de Ph. Bryant).

Les positions du second MDX(V) (en aval de MBNH, le plus proche possible), TV 3 (le plus près possible en amont de QTS3H) et TV 4 (en amont de la cible) seront fixées lors de l'étude du vide.

Remarque importante: la position de tous les éléments de la ligne de protons sera confirmée après l'étude du vide du faisceau.

22.12.1981

DD/gm

D. Dumollard - D.J. Simon

Distribution: comme note PS/MU/EP/NOTE 81-6

EF: R. Gerst, P. Lazeyras

ISR: G. Chapman, W. Coosemans

et sur demande

LIGNE NEUTRINO DE TT1 VERS ISR-0(FOSSE DEPL.2M)PUIS S-0, NEW POS.MBN-22.12.81

22/12/81

INITIAL X-COORDINATE Y-COORDINATE ALTITUDE GISEMENT OR ANGLE VERT ANGLE
 REQUIRED FINAL 1841.60485 2063.65700 2434.23497 315.90340 2.891783 0.000000
 894.99950 2118.12950 2449.72600 0.000000 7.853982 0.000000

FH = 1.0000000 FV = 1.0000000

I	ELEMENT	L	M	ANGLE	X	Y	ALTITUDE	GISEMENT	HOR LENGTH	HOR ANGLE	GISEMENT	GRADES	BEAM LENGTH
				RAD	M	M	M	M	M	RAD	M		M
1	OF 413	0.0000		0.0000000	1841.60485	2063.65700	2434.23497	315.90340	0.000	2.891783	315.90340	315.90340	0.000
2	HR412-EN	1.2500		0.0000000	1839.71538	2064.13908	2064.13908	2434.23497	1.950	2.891783	315.90340	315.90340	1.950
3	HR412-HO	0.0000		0.0000000	1839.71538	2064.13908	2064.13908	2434.23497	1.950	2.891783	315.90340	315.90340	1.950
4	QTS.1 V	2.5000		0.0000000	1819.94608	2070.55136	2070.55136	2434.23497	2.891783	2.891783	315.90340	315.90340	2.891783
5	QTS.2 V	3.0000		0.0000000	1811.76111	2071.99086	2071.99086	2434.23497	3.11183	2.891783	315.90340	315.90340	3.11183
6	QB 340.1 V	0.0000		0.0000000	1810.76111	2071.99086	2071.99086	2434.23497	3.11183	2.891783	315.90340	315.90340	3.11183
7	QB 340.1 V	0.0000		0.0000000	1810.76111	2071.99086	2071.99086	2434.23497	3.11183	2.891783	315.90340	315.90340	3.11183
8	TV 340.2 H	10.0000		0.0000000	1799.51507	2075.04054	2075.04054	2435.29131	3.11183	2.891783	315.90340	315.90340	3.11183
9	TV 340.2 H	10.0000		0.0000000	1789.68274	2077.70686	2077.70686	2435.29131	3.11183	2.891783	315.90340	315.90340	3.11183
10	MBN H	5.0000		0.0000000	1784.49342	2078.65336	2078.65336	2436.60307	3.11183	2.891783	315.90340	315.90340	3.11183
11	MBN H	5.0000		0.0000000	1784.49342	2078.65336	2078.65336	2436.60307	3.11183	2.891783	315.90340	315.90340	3.11183
12	QTS.3 H	0.0000		0.0000000	1775.16298	2079.06754	2079.06754	2437.53858	3.11183	2.891783	315.90340	315.90340	3.11183
13	QTS.4 H	2.0000		0.0000000	1772.78266	2079.26183	2079.26183	2437.53858	3.11183	2.891783	315.90340	315.90340	3.11183
14	QTS.5 H	3.0000		0.0000000	1767.49967	2079.40754	2079.40754	2437.53858	3.11183	2.891783	315.90340	315.90340	3.11183
15	QB 340.3 V	0.0000		0.0000000	1767.49967	2079.40754	2079.40754	2437.53858	3.11183	2.891783	315.90340	315.90340	3.11183
16	ENTR.TAR	5.0000		0.0000000	1761.70568	2079.64770	2079.64770	2438.31147	3.11183	2.891783	315.90340	315.90340	3.11183
17	ENTR.TAR	5.0000		0.0000000	1761.70568	2079.64770	2079.64770	2438.31147	3.11183	2.891783	315.90340	315.90340	3.11183
18	PT ISR-0	129.74551		0.0000000	1631.50003	2085.44338	2085.44338	2440.72600	3.11183	2.891783	315.90340	315.90340	3.11183
19	PT S-0	737.2873		0.0000000	1894.99954	2118.13010	2118.13010	2449.72600	3.11183	2.891783	315.90340	315.90340	3.11183

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 ALLED FROM GEOM AT LINE 12
 ALLED FROM BEATCH AT LINE 39

12.2.1982
DJS/gm

NOTE PS/MU/EP/NOTE 81-6
du 7.9.1981

ADDENDUM No. 2

Pour faciliter l'installation de la corne magnétique, la cible du faisceau pour les expériences "ν oscillations" doit être déplacée. En conséquence, la position de plusieurs éléments de la ligne de protons doit être adaptée. Veuillez trouver ci-joint la nouvelle géométrie des lignes de faisceaux.

En résumé, le dernier triplet de quadrupôles et l'aimant vertical B340.3 sont déplacés en aval de 3 mètres. La cible elle-même est descendue d'environ 2.60 m, son altitude est augmentée d'environ 27 cm.

Le boîtier de télévision TV 2 est plus en aval d'environ 1.50 m.

Les caractéristiques de l'optique restent pratiquement inchangées.

Remarque: La position précise et définitive de tous les éléments sera confirmée quand l'étude du vide du faisceau sera terminée.

D. Dumollard et D.J. Simon

Distribution: comme note PS/MU/EP/NOTE 81-6

EF: J.C. Dusseux, R. Gerst, P. Lazeyras

ISR: G. Chapman, W. Coosemans

LIGHE NLUPTING: TTI-ISRI(DEPI.2H)-CHARM, HFV POS.MBN +(B340.3V + TAR)-10.02.82

LIGHE
11/02/82

INITIAL 1641.60485 X-COORDINATE Y-COORDINATE ALTITUDE 2434.23497 GISEMENT 315.90340 HQR ANGLE 2.891783 VERT ANGLE 0.000000
 REQUIRED FINAL 850.45800 2063.65700 2103.47300 2451.48100 0.000000 7.853982 0.000000

FH = 1.000000 FV = 1.000000

I	ELFHEHT	L	H	ANGLF	X	H	Y	H	ALTITUDE	GISEMENT	HQR	LENGTH	H	ANGLE	RAO	GISEMENT	GRADLS	BEAM	LENGTH	H
1	GF 413	0.0000	0.0000	0.0000000	1841.60485	2063.65700	2434.23497	2451.48100	2434.23497	315.90340	2.891783	0.000000	2434.23497	2.891783	315.90340	315.90340	0.000	0.000		
2	HR412-EN	1.2500	0.0000	0.0000000	1840.62658	2063.83005	2434.23497	2451.48100	2434.23497	315.90340	2.891783	1.9500	2434.23497	2.891783	315.90340	315.90340	1.700	1.700		
3	HR412-1H	0.0000	0.0000	0.0000000	1839.71538	2064.13908	2434.23497	2451.48100	2434.23497	315.90340	2.891783	1.9500	2434.23497	2.891783	315.90340	315.90340	1.950	1.950		
4	HR412-1H	0.0000	0.0000	0.0000000	1839.71538	2064.13908	2434.23497	2451.48100	2434.23497	315.90340	2.891783	1.9500	2434.23497	2.891783	315.90340	315.90340	1.950	1.950		
5	Q15.1 V	24.5000	0.0000	0.0000000	1819.66939	2070.55136	2434.23497	2451.48100	2434.23497	315.90340	2.891783	20.4500	2434.23497	2.891783	315.90340	315.90340	20.450	20.450		
6	Q15.2 H	3.3000	0.0000	0.0000000	1813.94608	2071.19086	2434.23497	2451.48100	2434.23497	315.90340	2.891783	31.9500	2434.23497	2.891783	315.90340	315.90340	28.8500	28.8500		
7	B 340.1	0.0000	0.0000	0.0000000	1810.76111	2071.99086	2434.23497	2451.48100	2434.23497	315.90340	2.891783	31.9500	2434.23497	2.891783	315.90340	315.90340	31.9500	31.9500		
8	B 340.1V	0.0000	0.0000	0.0000000	1810.76111	2071.99086	2434.23497	2451.48100	2434.23497	315.90340	2.891783	31.9500	2434.23497	2.891783	315.90340	315.90340	31.9500	31.9500		
9	TV 340.2	13.2000	0.0000	0.0000000	1708.07327	2075.43153	2434.23497	2451.48100	2434.23497	315.90340	2.891783	45.0900	2434.23497	2.891783	315.90340	315.90340	45.1500	45.1500		
10	B 340.2	18.7292	0.0000	0.0000000	1789.68274	2077.70080	2434.23497	2451.48100	2434.23497	315.90340	2.891783	53.7900	2434.23497	2.891783	315.90340	315.90340	53.8790	53.8790		
11	B 340.2H	0.0000	0.0000	0.0000000	1789.68274	2077.70080	2434.23497	2451.48100	2434.23497	315.90340	2.891783	53.7900	2434.23497	2.891783	315.90340	315.90340	53.8790	53.8790		
12	HRH H	5.2966	0.0000	0.0000000	1784.49342	2078.65336	2434.23497	2451.48100	2434.23497	315.90340	2.891783	59.0650	2434.23497	2.891783	315.90340	315.90340	59.1760	59.1760		
13	HRH H	0.0000	0.0000	0.0000000	1784.49342	2078.65336	2434.23497	2451.48100	2434.23497	315.90340	2.891783	59.0650	2434.23497	2.891783	315.90340	315.90340	59.1760	59.1760		
14	Q15.1 V	12.3922	0.0000	0.0000000	1772.16393	2079.29770	2434.23497	2451.48100	2434.23497	315.90340	2.891783	71.5000	2434.23497	2.891783	315.90340	315.90340	71.5668	71.5668		
15	Q15.5 H	12.2000	0.0000	0.0000000	1769.97507	2079.29770	2434.23497	2451.48100	2434.23497	315.90340	2.891783	73.5900	2434.23497	2.891783	315.90340	315.90340	73.7668	73.7668		
16	B 340.3	3.3000	0.0000	0.0000000	1767.78620	2079.39484	2434.23497	2451.48100	2434.23497	315.90340	2.891783	79.0750	2434.23497	2.891783	315.90340	315.90340	79.2668	79.2668		
17	B 340.3V	0.0000	0.0000	0.0000000	1764.50291	2079.54050	2434.23497	2451.48100	2434.23497	315.90340	2.891783	79.0750	2434.23497	2.891783	315.90340	315.90340	79.2668	79.2668		
18	B 340.3H	0.0000	0.0000	0.0000000	1764.50291	2079.54050	2434.23497	2451.48100	2434.23497	315.90340	2.891783	79.0750	2434.23497	2.891783	315.90340	315.90340	79.2668	79.2668		
19	CNR.TAR	5.4000	0.0000	0.0000000	1759.10534	2079.68282	2434.23497	2451.48100	2434.23497	315.90340	2.891783	84.0740	2434.23497	2.891783	315.90340	315.90340	84.0668	84.0668		
20	C.TARGET	5.6000	0.0000	0.0000000	1759.10534	2079.68282	2434.23497	2451.48100	2434.23497	315.90340	2.891783	84.0740	2434.23497	2.891783	315.90340	315.90340	84.0668	84.0668		
21	PI TOR-1	127.0027	0.0000	0.0000000	1631.50000	2083.04605	2434.23497	2451.48100	2434.23497	315.90340	2.891783	212.1240	2434.23497	2.891783	315.90340	315.90340	212.3331	212.3331		
22	PI WA-1R	775.3302	0.0000	0.0000000	850.45800	2103.47347	2434.23497	2451.48100	2434.23497	315.90340	2.891783	987.4350	2434.23497	2.891783	315.90340	315.90340	987.7210	987.7210		

END-OF-FILE ENCOUNTERED. FILENAME - INPUT
 ERROR NUMBER 05 DETECTED BY INPC= AT ADDRESS 000145
 CALLED FROM GLEH AT LINE 12
 CALLED FROM REATCH AT LINE 39

LIGHE NEURIRIU: T11 - S0, NEW PUS. HRN + NEW POS.(R340.JV + TARJ)-10.02.82
 LIGHL

11/02/82

INITIAL 1641.60485 X-COORDINATE Y-COORDINATF ALTITUDE GISEMENT HUR ANGLE VERT ANGLE
 REQUIRED FINAL 894.99950 2063.65700 2434.23497 315.90340 2.891783 0.000000
 0.000000 7.853982 0.000000

FH = 1.0000000 FV = 1.0000000

I	ELEMENT	L	H	ANGLE	X	Y	ALTITUDE	H	HUR LENGTH	HUR ANGLE	GRADES	BEAM LENGTH
				KAD	M	M	M	M	M	RAD		M
1	GF 413	0.0000	0.00000000	0.00000000	1841.60485	2063.65700	2434.23497	2434.23497	0.000	2.891783	315.9034	0.000
2	HR412-EN	1.2000	0.00000000	0.00000000	1840.92658	2063.83005	2434.23497	2434.23497	.700	2.891783	315.9034	.700
3	HR412-110	0.0000	0.00000000	0.00000000	1839.71538	2064.13908	2434.23497	2434.23497	1.950	2.876783	316.8583	1.950
4	UTS-1 V	24.5000	0.00000000	0.00000000	1815.06939	2070.55136	2434.23497	2434.23497	20.450	2.876783	316.8583	20.450
5	UTS-2 H	3.3000	0.00000000	0.00000000	1813.94000	2071.12710	2434.23497	2434.23497	28.650	2.876783	316.8583	28.650
6	B 340-1V	13.0000	0.00000000	0.00000000	1810.76111	2071.99086	2434.23497	2434.23497	31.950	2.876783	316.8583	31.950
7	B 340-2	18.7292	0.00000000	0.00000000	1798.07327	2075.43153	2435.12674	2435.12674	45.096	2.876783	316.8583	45.150
8	B 340-2H	0.0000	0.00000000	0.00000000	1789.08274	2077.70080	2430.21487	2430.21487	53.790	2.876783	316.8583	53.879
9	HRN H	5.2966	0.00000000	0.00000000	1789.08274	2077.70080	2430.21487	2430.21487	53.790	2.961183	311.4853	53.879
10	HRN H	0.0000	0.00000000	0.00000000	1784.49342	2078.65330	2436.69307	2436.69307	59.065	2.961183	311.4853	59.176
11	UTS-3 H	12.0000	0.00000000	0.00000000	1784.49342	2078.65330	2436.69307	2436.69307	71.406	3.097241	302.8235	71.568
12	UTS-4 V	2.2000	0.00000000	0.00000000	1772.16303	2079.20955	2437.81192	2437.81192	73.597	3.097241	302.8235	73.768
13	B 340-3	3.3000	0.00000000	0.00000000	1769.97507	2079.20955	2430.91055	2430.91055	75.788	3.097241	302.8235	75.968
14	UTS-5 H	5.4000	0.00000000	0.00000000	1764.50291	2079.54056	2438.50712	2438.50712	79.075	3.097241	302.8235	79.268
15	ENTR.TAR	5.4000	0.00000000	0.00000000	1759.10867	2079.77990	2438.50712	2438.50712	84.474	3.097241	302.8235	84.668
16	C TARGET	864.4310	0.00000000	0.00000000	1758.30050	2079.30050	2438.58445	2438.58445	949.434	3.097241	302.8235	949.700
17	Pf S=0				804.99953	2118.13010	2449.72580	2449.72580				

END-OF-FILE ENCOUNTERED, FILENAME = INPUT
 ERROR NUMBER 05 DETECTED BY INPC= AT ADDRESS 000145
 CALLED FROM GLOB AT LINE 12
 CALLED FROM REATCH AT LINE 39

LIGNE NEURIPRO: T11 - RERC, NEW POS.M6N, NEW POS.(B340.3V + TAR)-10.02.82
LIGUL

11/02/82

X-COORDINATE Y-COORDINATE ALTITUDE GISEMENT HOR ANGLE VERT ANGLE
INITIAL 1841.50485 2063.95700 2434.23497 315.90340 2.891783 0.000000
REQUIRED FINAL 933.54100 2132.78000 2447.97100 0.00000 7.353982 0.000000

FH = 1.000000 FV = 1.000000

I	FLEIGHT	L	ANGLE	X	Y	ALTITUDE	ALTIITUDE	HOR LENGTH	HOR ANGLE	GISEMENT	GRADES	REAM LENGTH
		M	RAD	M	M	M	M	M	RAD	M	GRADES	M
1	UF 413	0.0000	0.0000000	1841.50485	2063.95700	2434.23497	2434.23497	0.000	2.891783	315.9034	315.9034	0.000
2	HR412-EN	1.2500	0.0000000	1840.92058	2063.83005	2434.23497	2434.23497	1.700	2.891783	315.9034	315.9034	0.700
3	HR412-HO	0.0000	0.0000000	1839.71538	2064.13908	2434.23497	2434.23497	1.950	2.891783	315.9034	315.9034	1.950
4	UTS-1 V	24.5000	0.0150000	1839.71538	2064.13908	2434.23497	2434.23497	26.450	2.876783	316.8583	316.8583	26.450
5	UTS-2 H	2.2000	0.0000000	1810.94608	2071.00086	2434.23497	2434.23497	28.950	2.876783	316.8583	316.8583	28.950
6	B 340-1V	3.3000	0.0000000	1810.76111	2071.99080	2434.23497	2434.23497	31.950	2.876783	316.8583	316.8583	31.950
7	B 340-1V	0.0000	0.0000000	1798.97327	2077.43153	2434.23497	2434.23497	45.000	2.876783	316.8583	316.8583	45.000
8	B 340-2	13.2000	0.0000000	1789.68274	2077.70086	2436.21487	2436.21487	53.700	2.876783	316.8583	316.8583	53.700
9	B 340-2H	0.0000	0.0000000	1789.68274	2077.70086	2436.21487	2436.21487	53.700	2.961183	311.4853	311.4853	53.879
10	HRH II	5.2500	0.0000000	1784.40342	2078.65330	2436.21487	2436.21487	59.065	2.961183	311.4853	311.4853	59.176
11	HRH II	0.0000	0.0000000	1784.40342	2078.65330	2436.21487	2436.21487	59.065	3.097241	302.8235	302.8235	59.176
12	UTS-1 V	12.3922	0.1360580	1772.16393	2079.29770	2437.61192	2437.61192	71.406	3.097241	302.8235	302.8235	71.568
13	UTS-1 V	0.0000	0.0000000	1769.07507	2079.29770	2437.61192	2437.61192	73.597	3.097241	302.8235	302.8235	73.768
14	UTS-1 V	2.2000	0.0000000	1767.78020	2079.59484	2438.01055	2438.01055	75.788	3.097241	302.8235	302.8235	75.968
15	UTS-1 V	2.2000	0.0000000	1764.50291	2079.54050	2438.20918	2438.20918	79.075	3.097241	302.8235	302.8235	79.268
16	B 340-3V	0.0000	0.0000000	1764.50291	2079.54050	2438.50712	2438.50712	79.075	3.097241	302.8235	302.8235	79.268
17	B 340-3V	0.0000	0.0000000	1764.50291	2079.54050	2438.50712	2438.50712	79.075	3.077603	304.0737	304.0737	79.268
18	B 340-3V	0.0000	0.0000000	1759.11431	2079.88585	2438.50712	2438.50712	84.474	3.077603	304.0737	304.0737	84.668
19	B 340-3V	5.4000	0.0000000	1758.11431	2079.88585	2438.50712	2438.50712	85.074	3.077603	304.0737	304.0737	85.668
20	EMTR-GET	0.0000	0.0000000	1758.11431	2079.88585	2438.50712	2438.50712	85.074	3.077603	304.0737	304.0737	85.668
21	C-TAN-GET	826.7198	0.0000000	933.54100	2132.78000	2447.97103	2447.97103	911.741	3.077603	304.0737	304.0737	911.288
22	PF RERC											

END-OF-FILE ENCOUNTERED, FILENAME = INPUT
ERROR NUMBER 95 DETECTED BY INPC= AT ADDRESS 000145
CALLED FROM GEOM AT LINE 12
CALLED FROM REATCH AT LINE 36