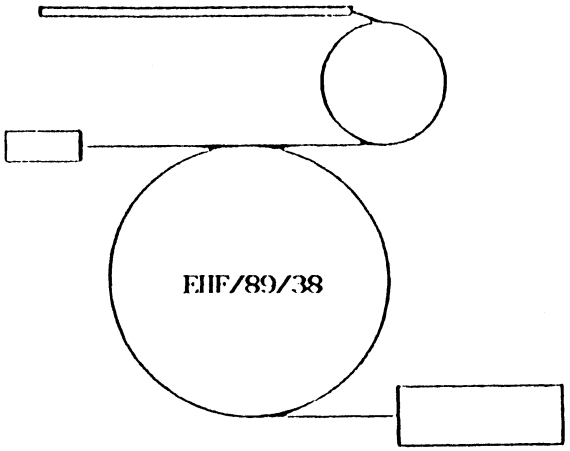
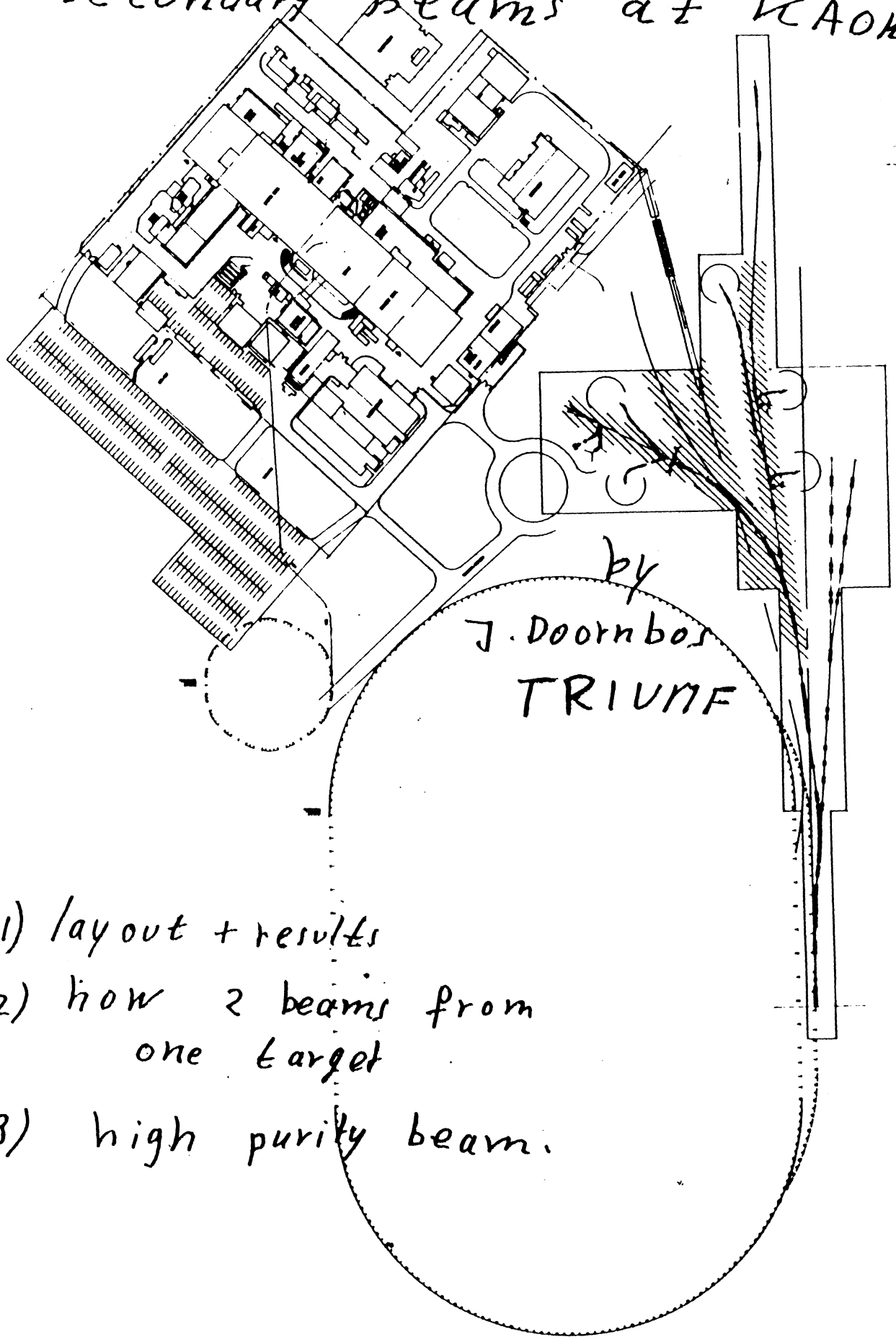


SECONDARY BEAMS AT KAON

J. Doornbos

secondary beams at KAON



1) layout + results
2) how 2 beams from one target
3) high purity beam.

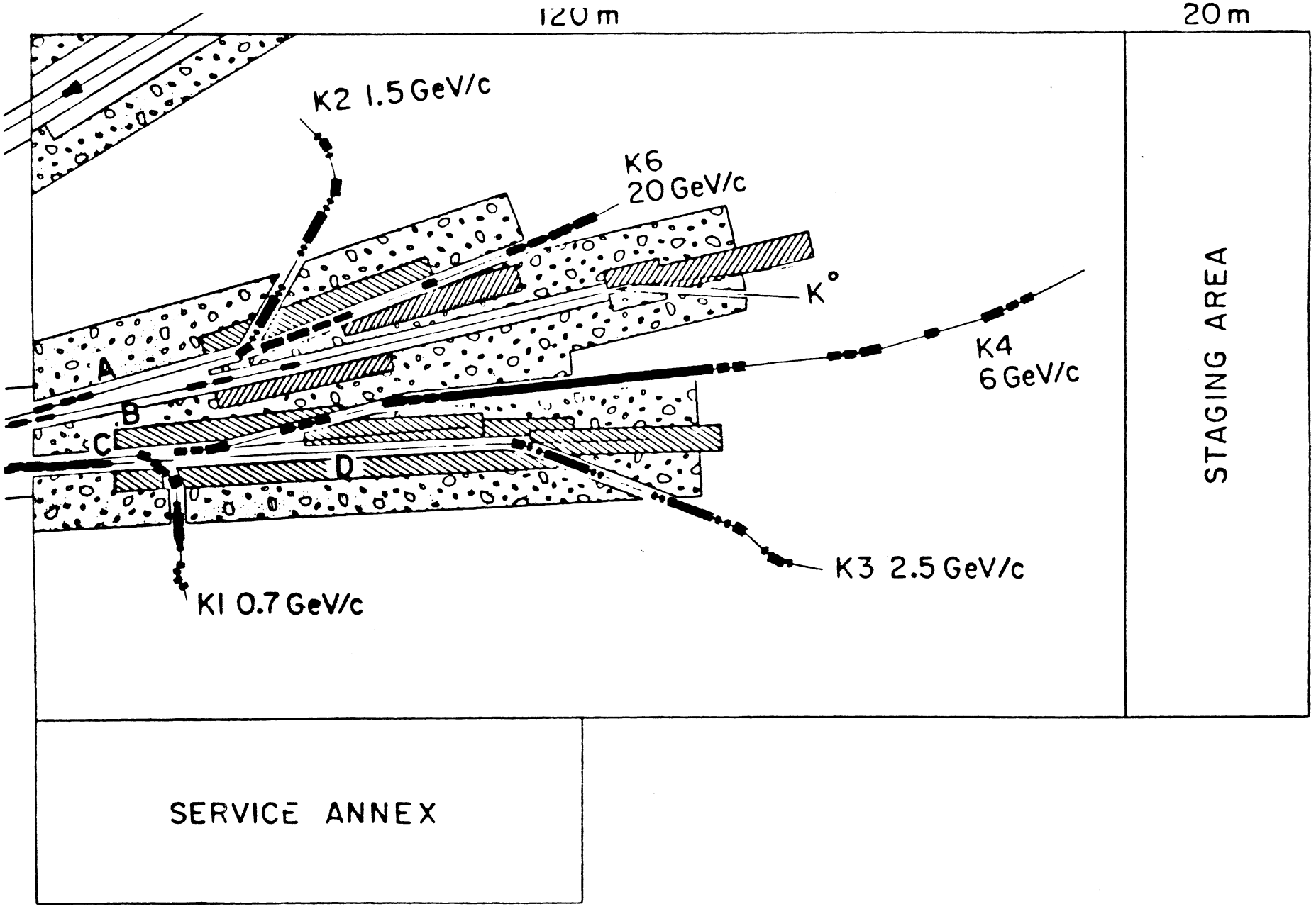


Figure 1b

1985 proposal

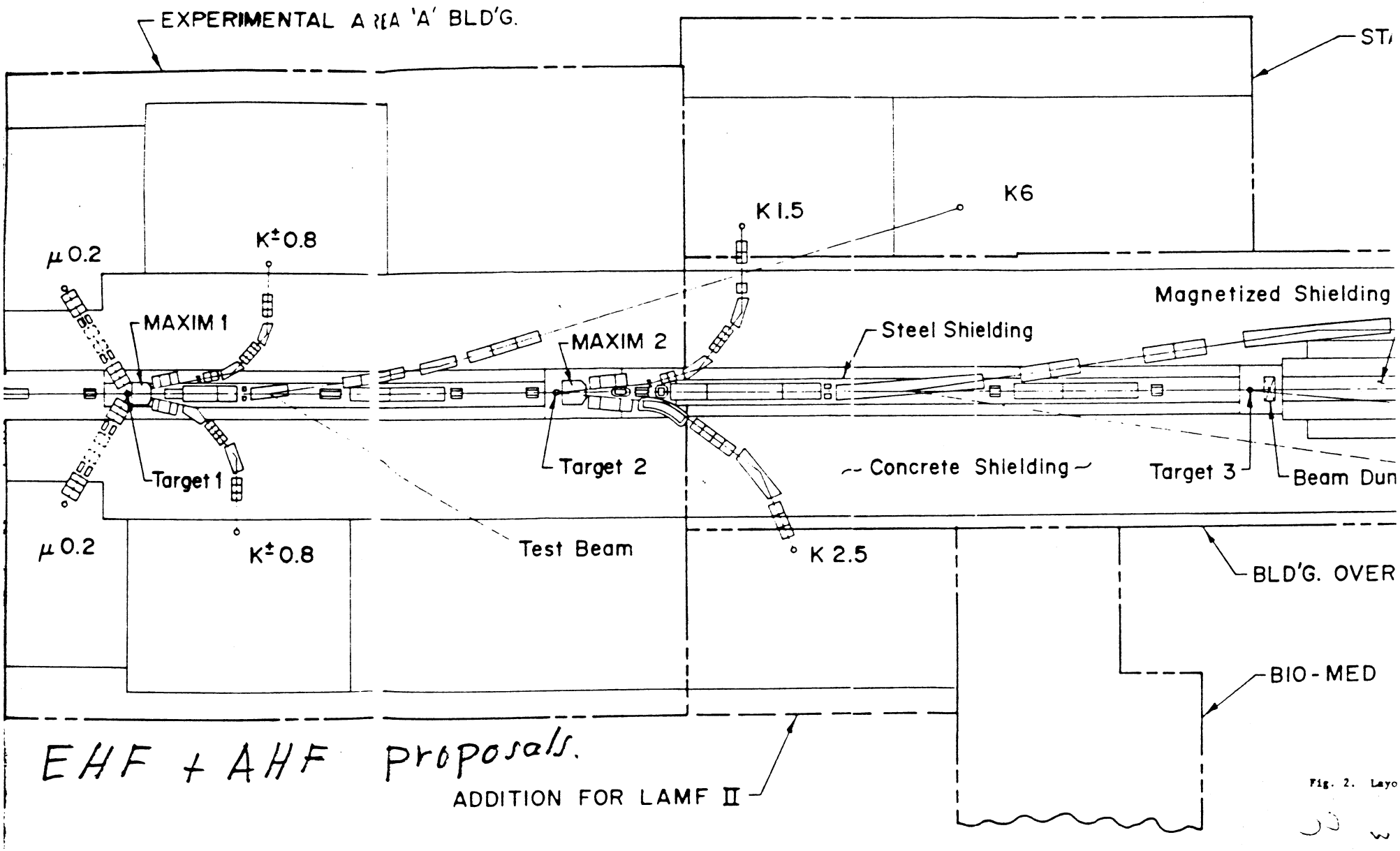
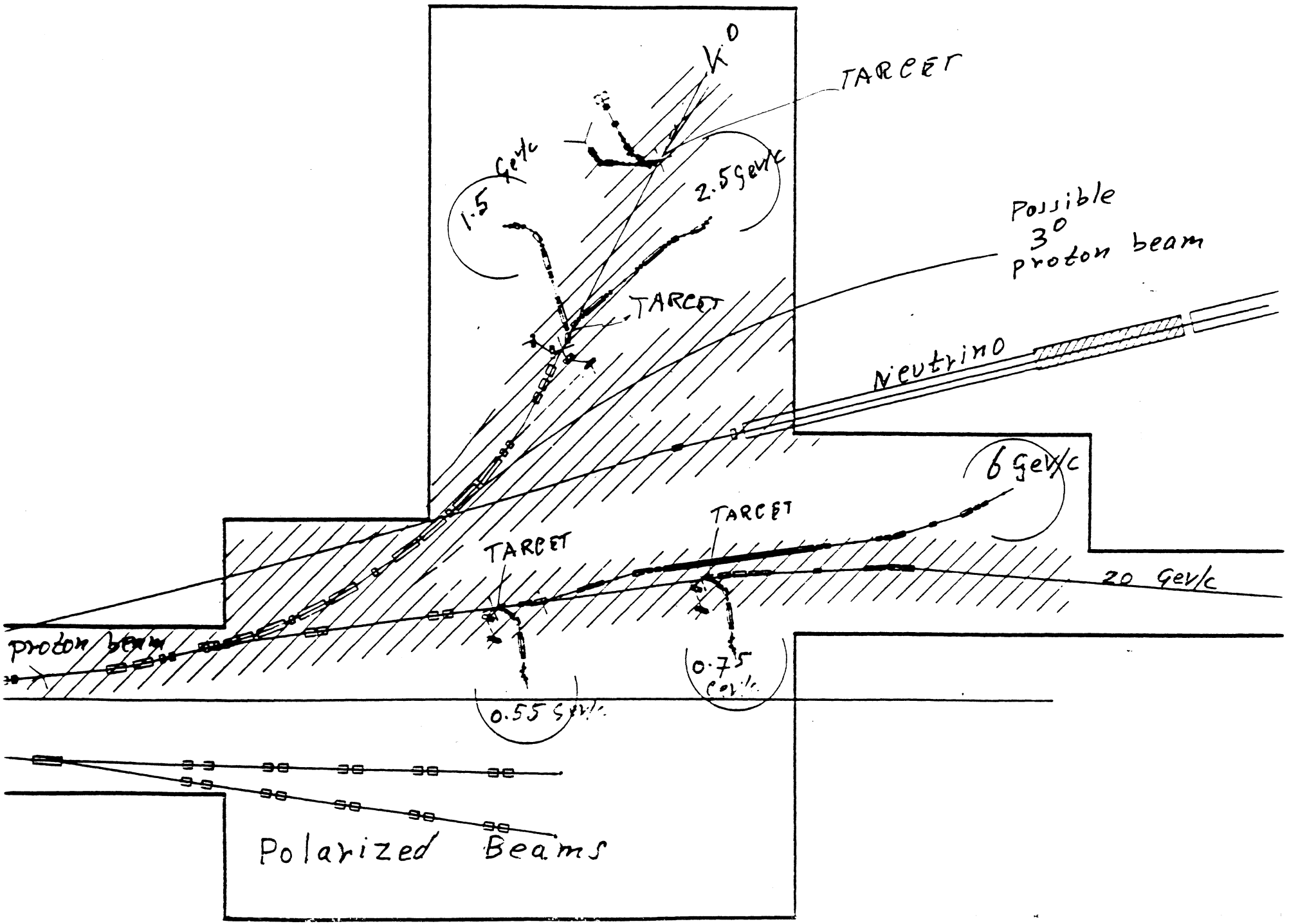

EXPERIMENTAL AREA 'A' BLD'G.
ST
K6
K 1.5
K±0.8
μ 0.2
MAXIM 1
MAXIM 2
Magnetized Shielding
Steel Shielding
Target 1
Target 2
Concrete Shielding
Target 3
Beam Dun
μ 0.2
K±0.8
Test Beam
K 2.5
BLD'G. OVER
BIO-MED
EHF + AHF Proposals.
ADDITION FOR LAMF II

Fig. 2. Layo


K^0
TARGET
1.5 Gev/c
2.5 Gev/c
Possible
3^0
proton beam
TARGET
Neutrino
6 Gev/c
TARGET
TARGET
20 Gev/c
proton beam
0.75
0.55 Gev/c
Polarized Beams

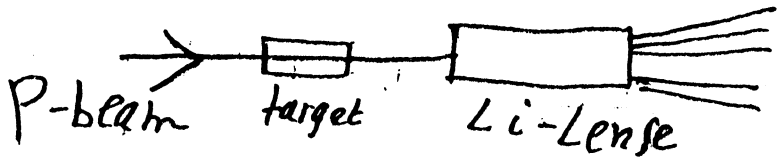
SIX SEPARATED BEAMS AT KAON

Channel	Momentum GeV/c	Solid Angle msr	Momentum Acceptance Δp/p in %	Length m	Type of Separation
K20	20 -6	0.1	1	160	RF, 3 cavities, 2.8 GHz
K6	6 -2.5	0.08-0.30	3	110	RF, 3 cavities, 1.3 GHz
K2.5	2.5 -1.25	0.5 -2.0	4	54	DC, 2 stages
K1.5	1.5 -0.75	2.0	4	30	DC, 2 stages
K0.80	0.80-0.55	6.0	5	18	DC, 2 stages
K0.55	0.55-0.40	8.0	6	14	DC, 1 stage, extra optics

Channel	P GeV/c	K^- 10^6/s	K^+ 10^6/s	π^- 10^9/s	π^+ 10^9/s	$\bar{p}$ 10^6/s	p 10^9/s
K20	23 17 6	0.04 1.2 2.4	0.8 27 4.8	0.2 0.21 1.4	0.2 0.9 2.3	0.0012 0.0022 15	130 41 3.3
K6	6 3	15 2.5	34 4.5	1.9 3.2	3.6 5.0	23 43	
K2.5	2.5 2.0 1.5 1.25	66 39 14 5.4	119 76 27 9.7	16 21 25 27	24 30 36 37	110 91 52 26	
K1.5	1.5 1.2 1.0 0.8	193 52 18 3.7	366 93 31 6.3	49 36 27 18	69 49 36 23	81 25 8.3 1.9	
K0.8	0.8 0.65 0.55	99 32 10	203 59 19	87 63 44	113 80 55	7.1 2.6 1.0	
K0.55	0.55 0.50 0.45 0.40	41 21 9.2 3.8	80 44 21 9.4	80 67 50 33	101 82 61 44	1.5 0.93 0.53 0.30	

100 μA 30 GeV 6 cm Pb

Anti protons from 10 m pulsed driver 30 GeV, 100 μA.



Spot ± 1.5 mm ± 100 mr

→ 150 π mm mr

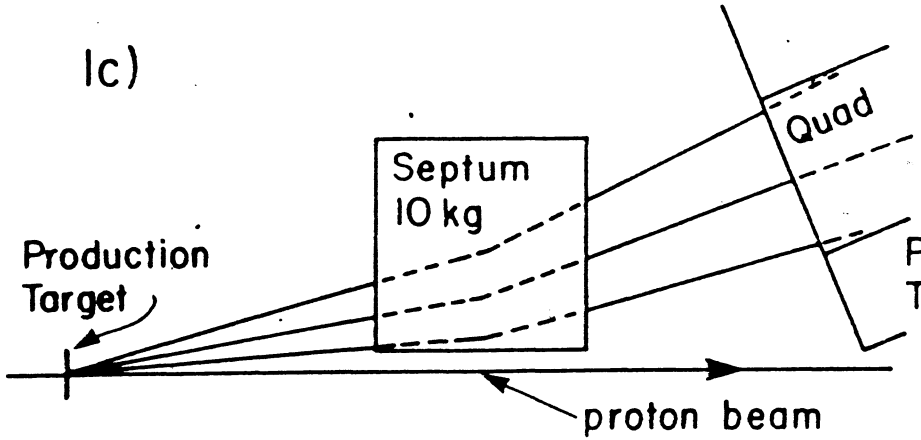
4 % Δp/p

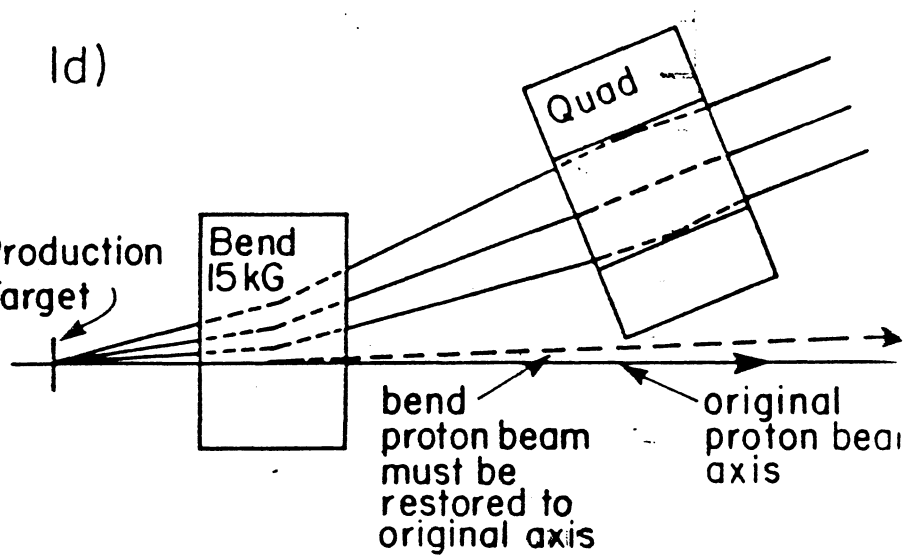
⟹ 4 * 10^9 $\bar{p}$/sec

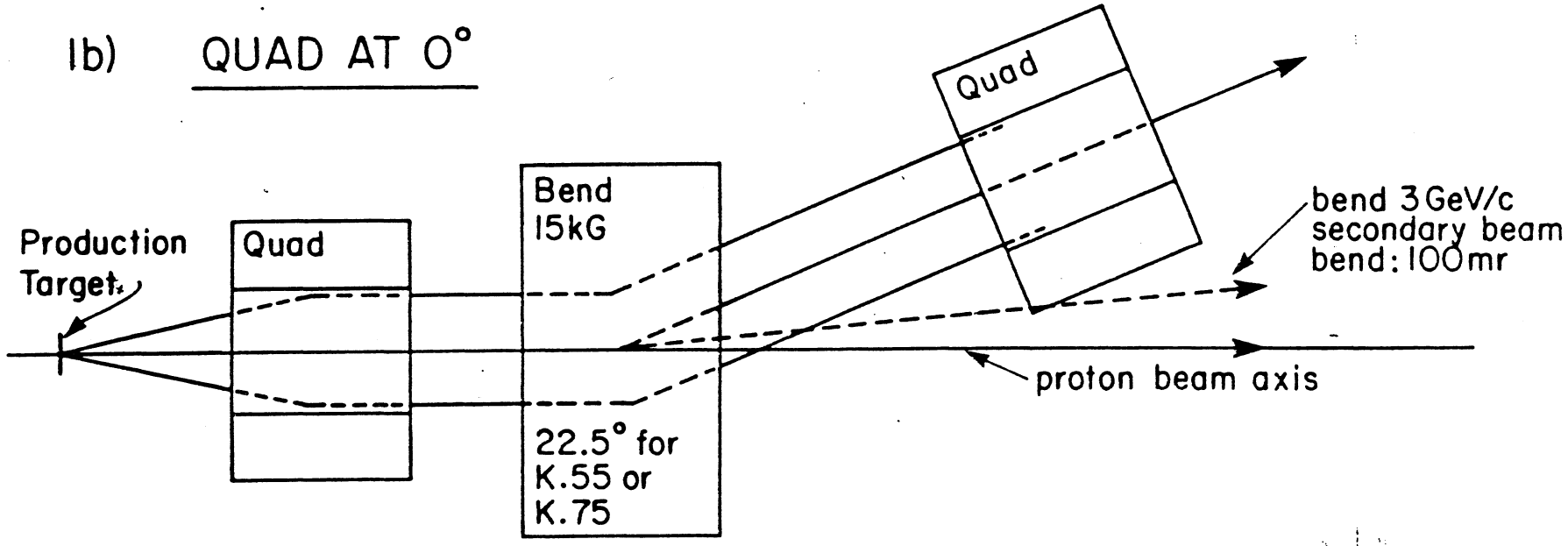
@

3-4 GeV/c

How to cool ?

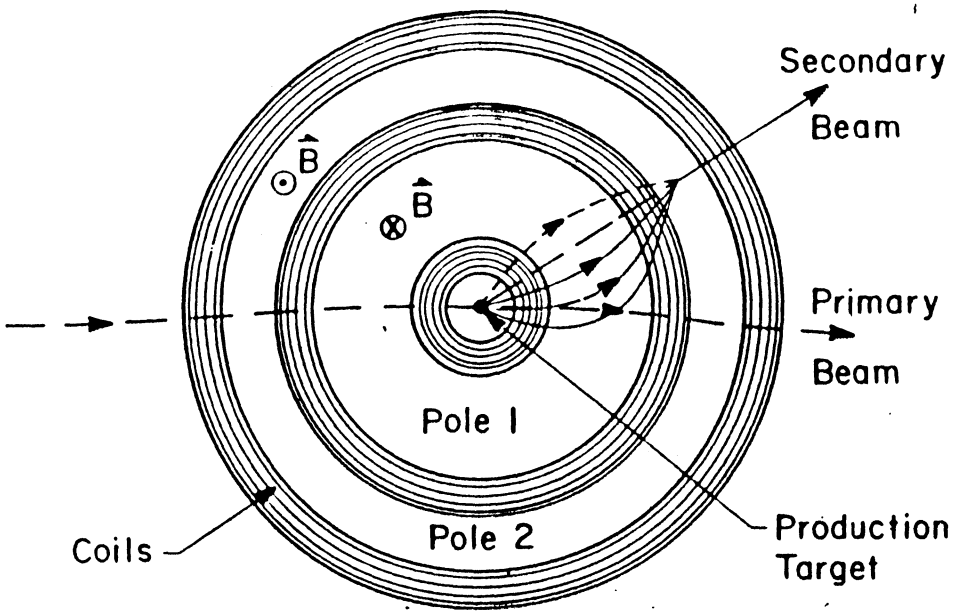

Ic)
Septum
10 kg
Quad
Production
Target
proton beam


Id)
Quad
Production
Target
Bend
15kG
bend
proton beam
must be
restored to
original axis
original
proton bea
axis

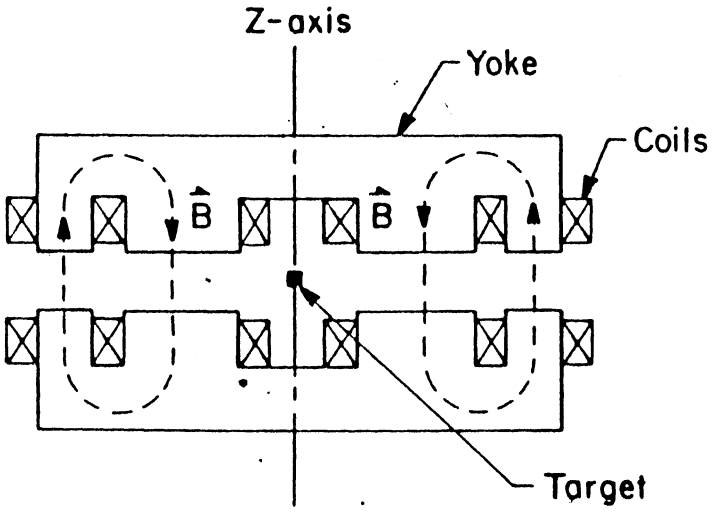

Ib) QUAD AT 0°
Quad
Bend
15kG
Production
Target
Quad
bend 3 GeV/c
secondary beam
bend: 100mr
proton beam axis
22.5° for
K.55 or
K.75

Tschälär

Koerts



Horizontal Cross Section



Vertical Cross Section

Fig. 1. Schematic layout of MAXIM.

of

FMF/AMF proposal

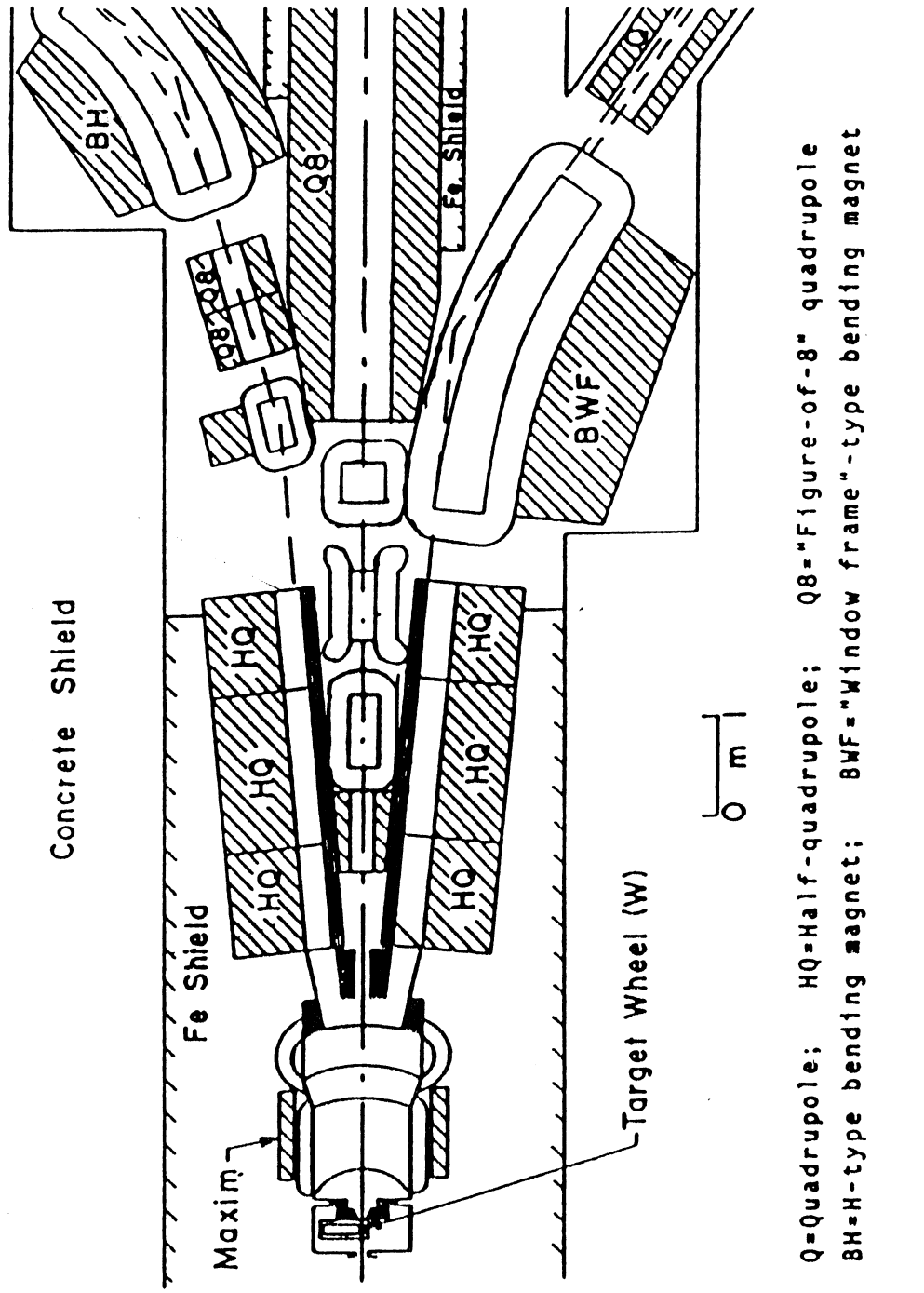
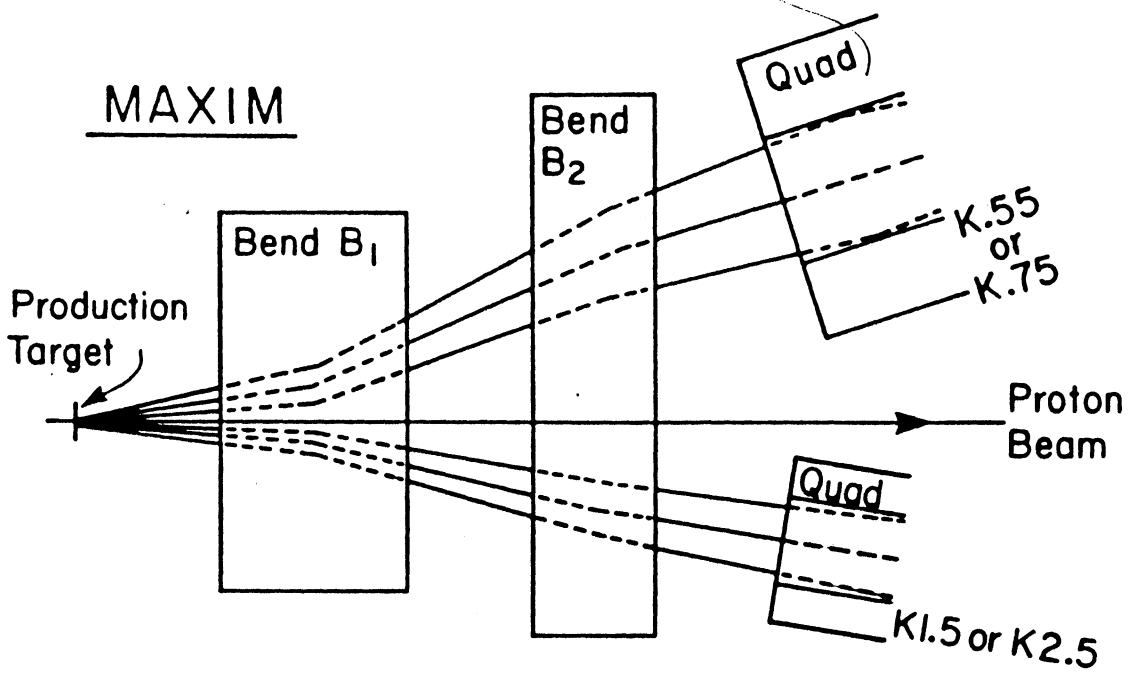


Figure 20.3: MAXIM extraction geometry for target 2.

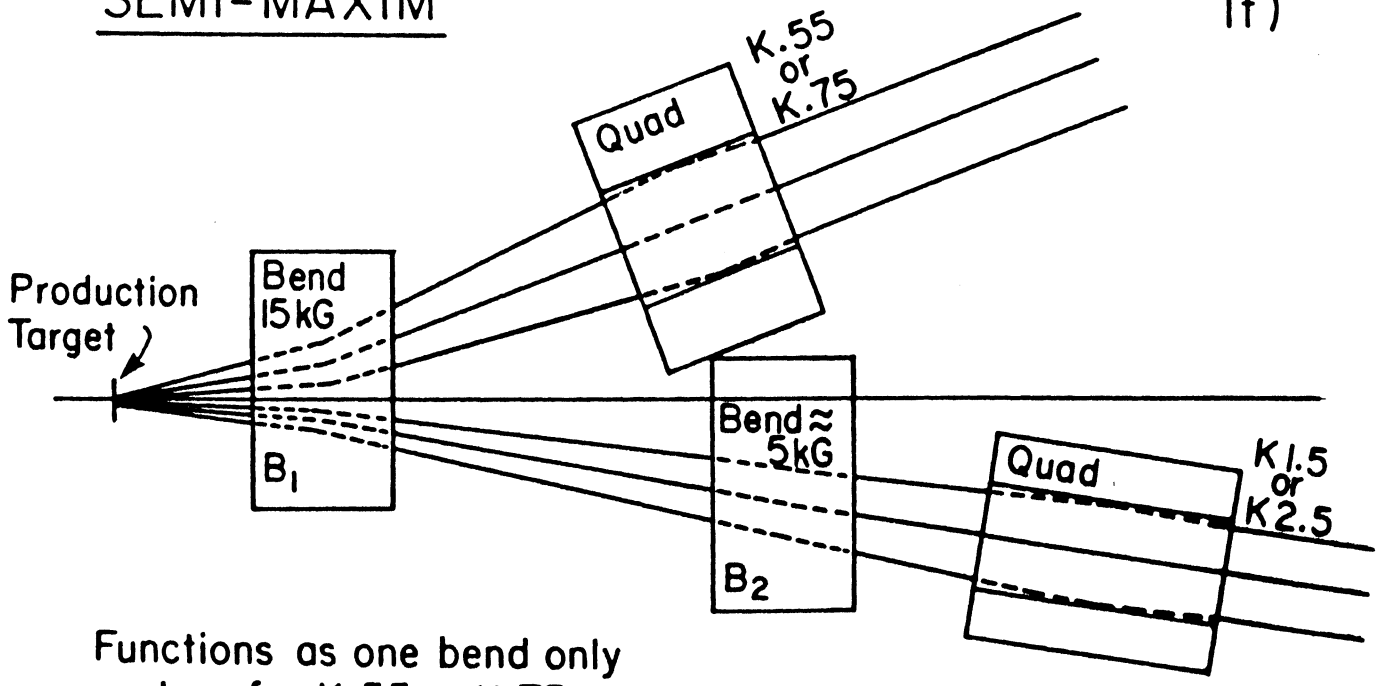
1e)

MAXIM



1f)

SEMI-MAXIM

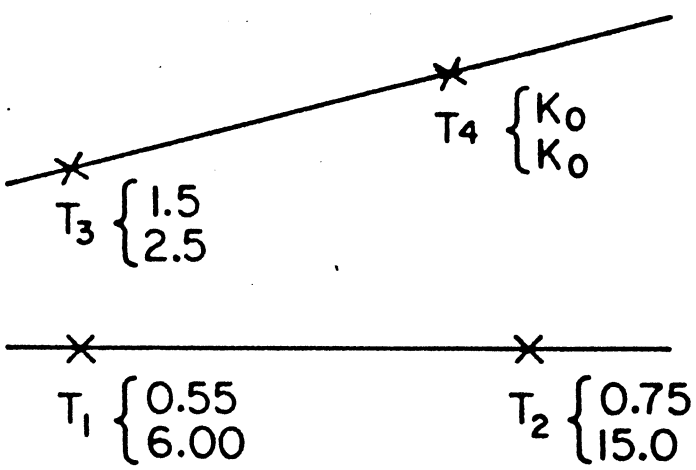


Functions as one bend only system for K.55 or K.75 and as MAXIM for K1.5 or K2.5.

The rays exiting B_2 seem to go straight through the production target.

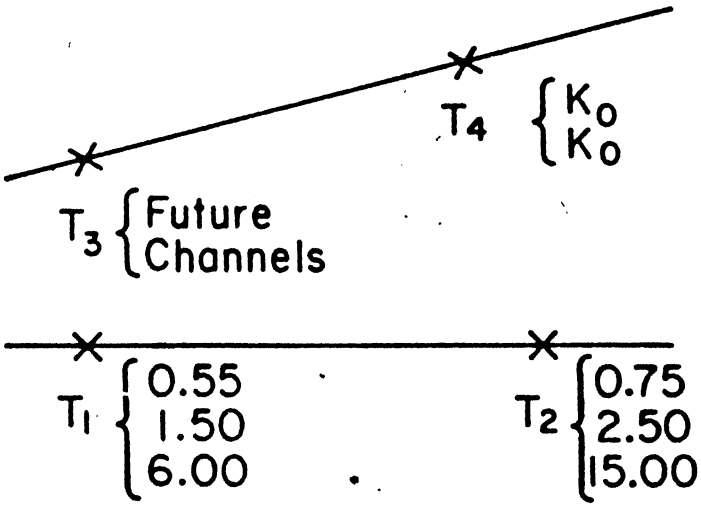
THE THREE LAYOUTS

3a)

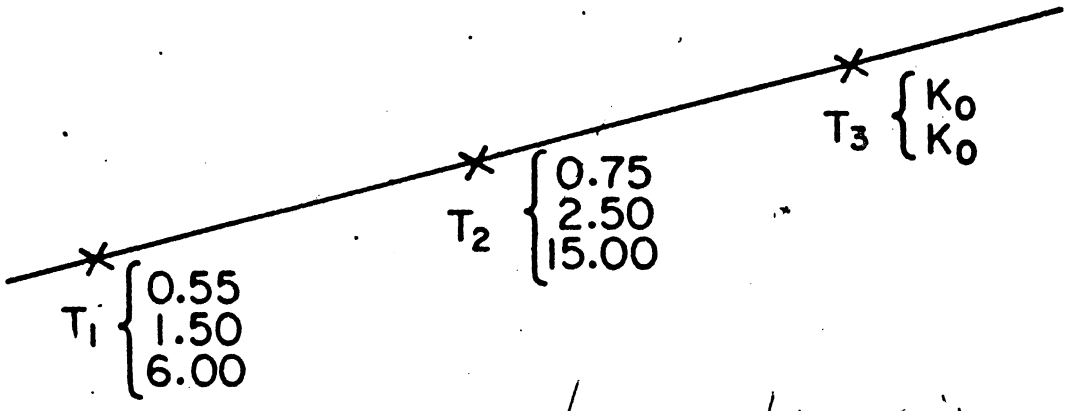


presently adopted by KAON for study

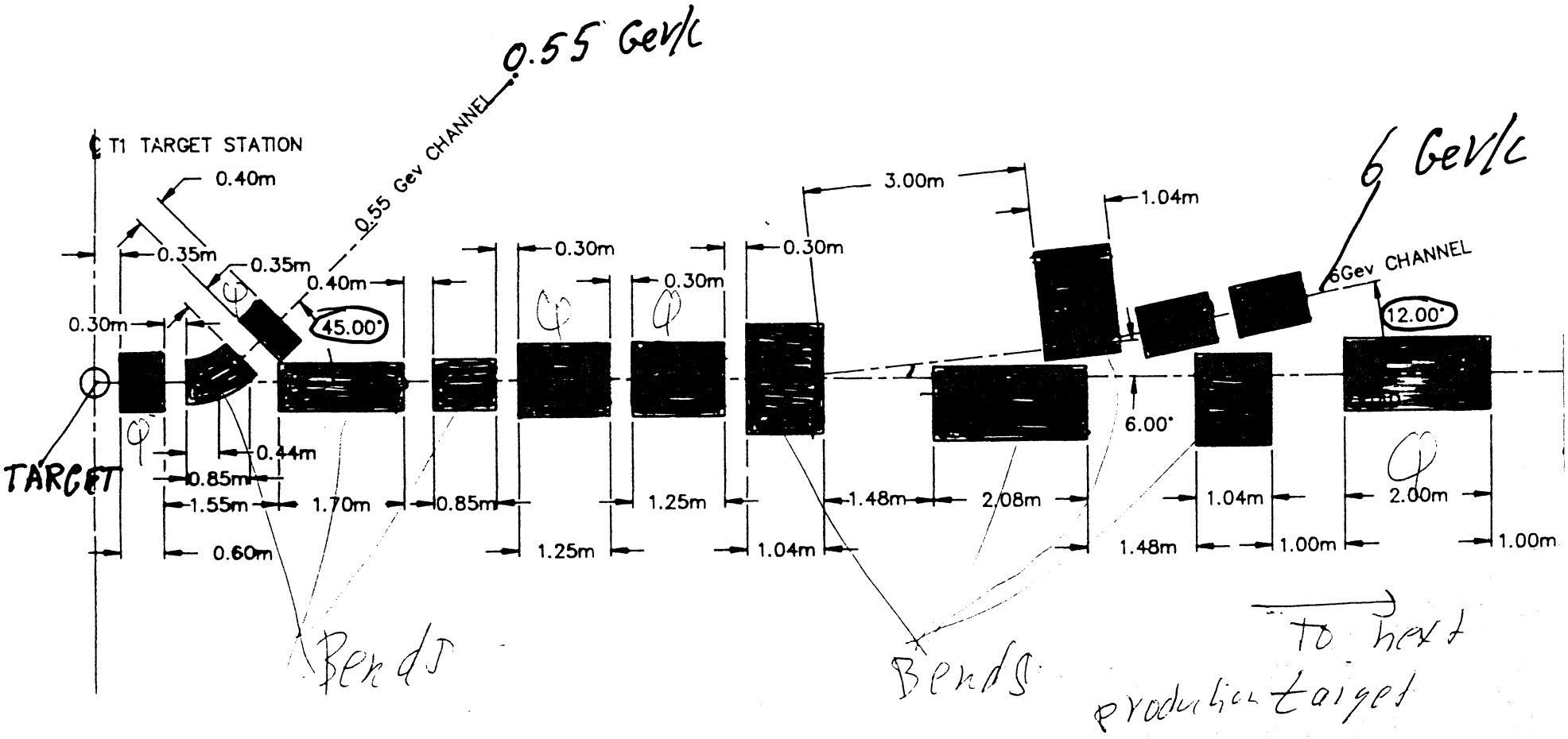
3b)



3c)



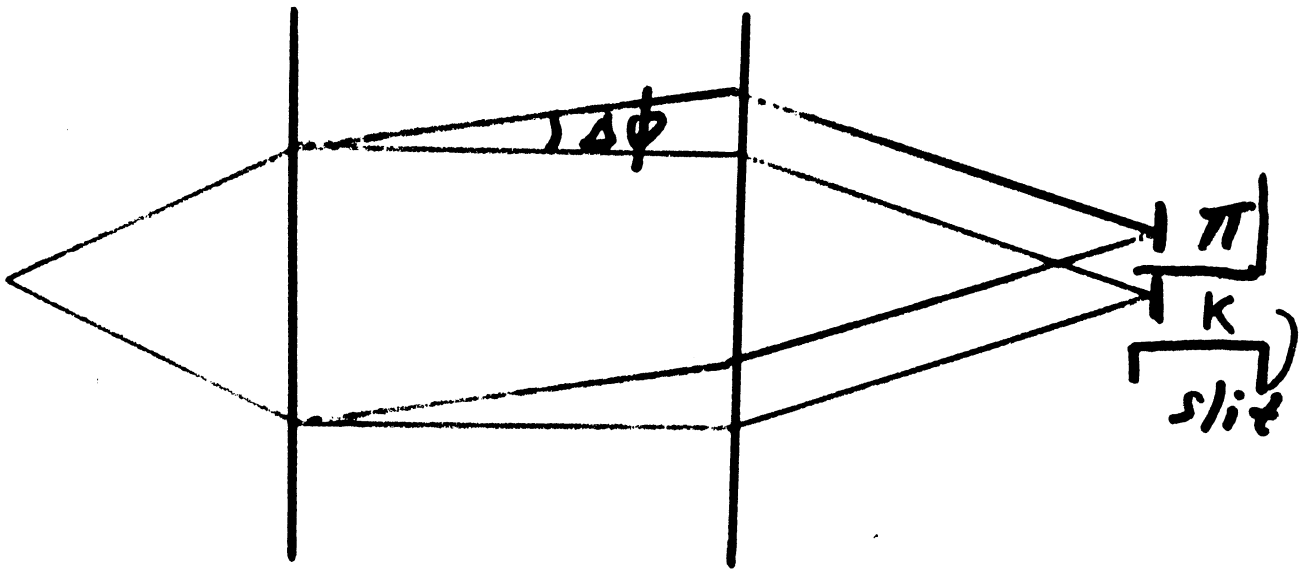
All three layouts give roughly same total kaon intensity for all channels combined


0.55 Gev/c
℄ T1 TARGET STATION
0.40m
0.55 Gev CHANNEL
0.35m
0.35m
0.40m
45.00°
0.30m
0.30m
0.30m
3.00m
1.04m
6 Gev/c
6Gev CHANNEL
12.00°
6.00°
TARGET
0.44m
0.85m
1.55m
1.70m
0.85m
1.25m
1.48m
2.08m
1.04m
2.00m
0.60m
1.25m
1.04m
1.48m
1.00m
1.00m
Bends
Bends
To next
production target

DC Separation

Crossed E and B field

$E = 300 \times \beta_K \cdot B \rightarrow$ K not deflected



$$\Delta\phi \approx \frac{E \times L}{P}\left\{\frac{1}{\beta_\pi} - \frac{1}{\beta_K}\right\} \approx \frac{E \times L}{P^3}$$

$L = 5$ m
$P = 1.5$ Gev/c
$\Delta\varphi = 1.2$ mr

$L = 30$ m $E = 7.5$ KV/cm

Deflection : 0.08 mr at 6 Gev/c

0.64 mr " 3 "

Separation at mass slit $\simeq$ 6 mm

P > 6 Gev/c then use RF separation.

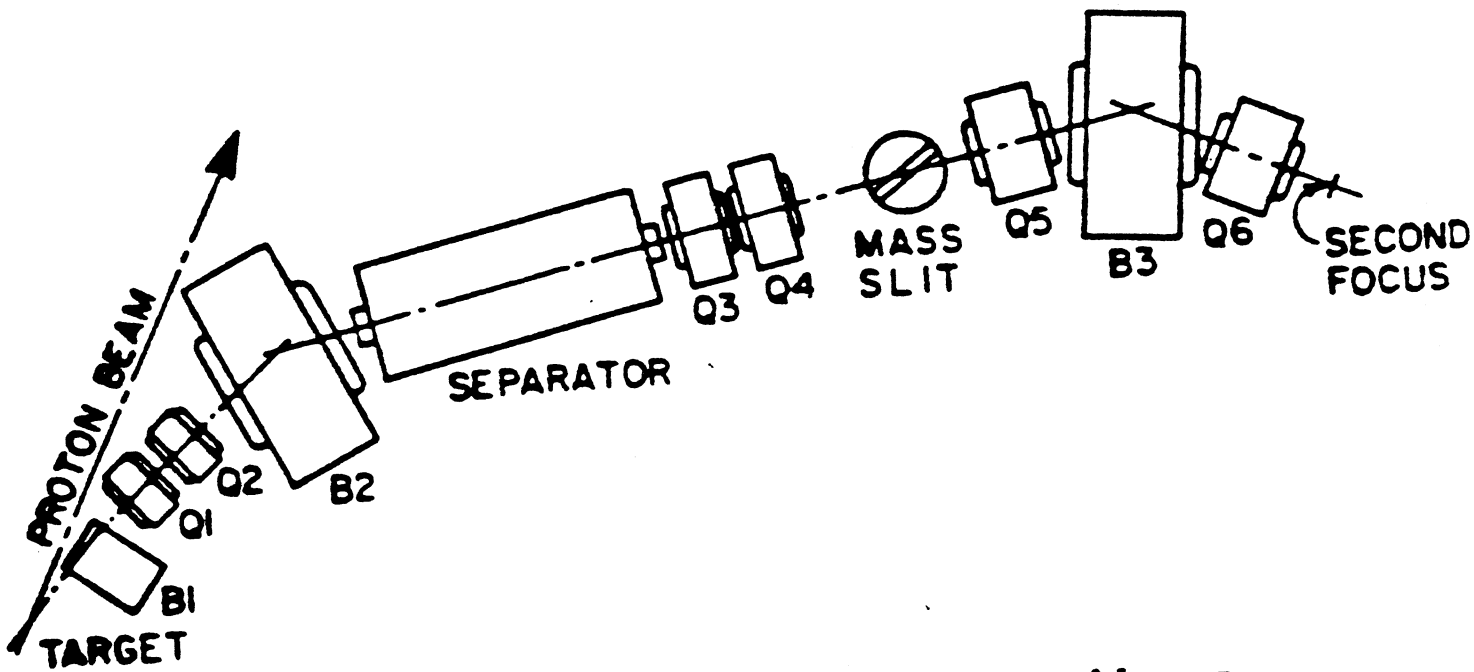
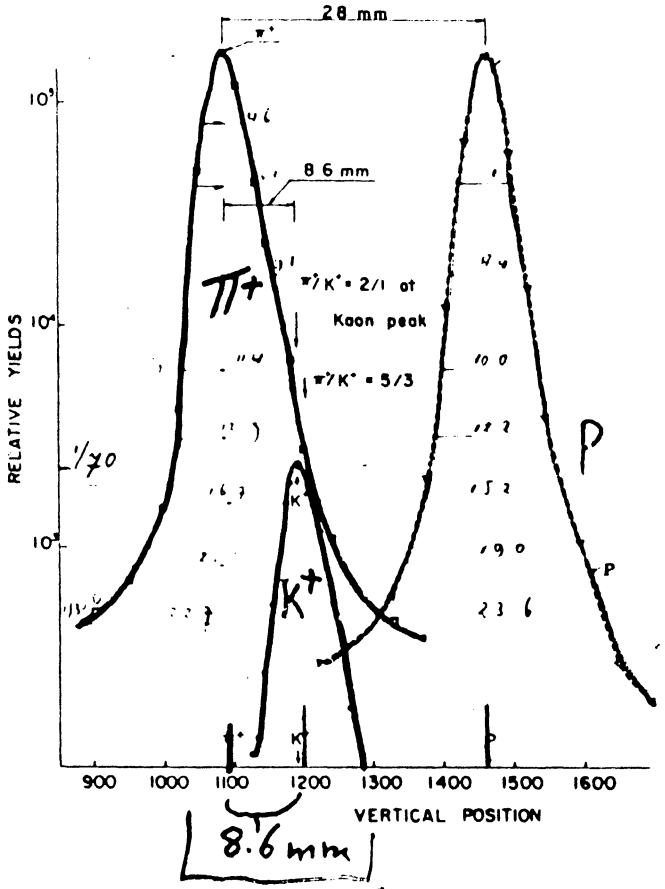


Fig. 1. The LESB1 beam line at Brookhaven.

800 MeV/c

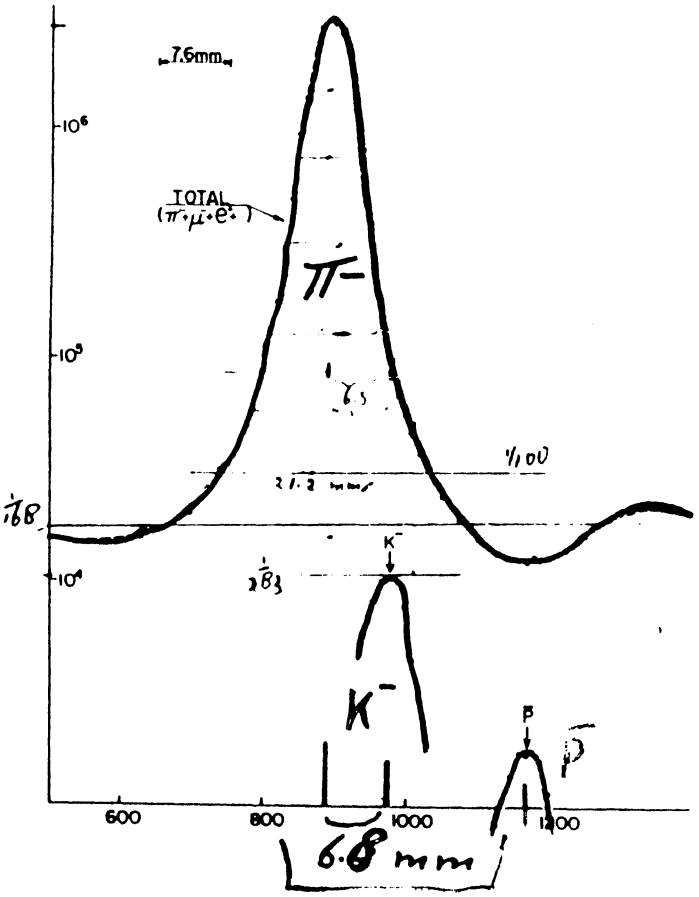
EXPERIMENTAL RESULTS

same scale in mm for horizontal axis



Δp/p = 1.0 % FWHM

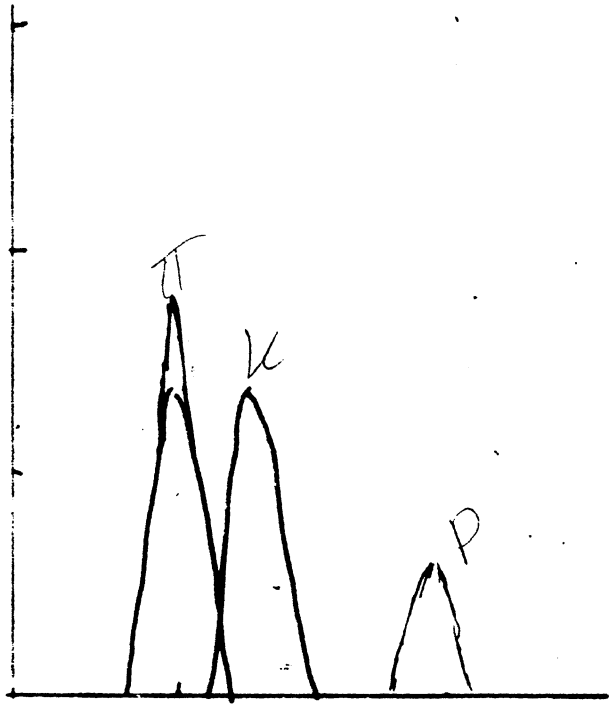
Separator at 70 kV/cm



Δp/p = 6 % FWHM

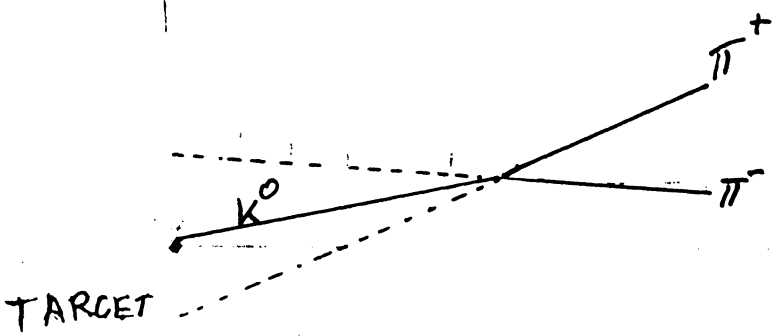
Separator at 55 kV/cm

2 GeV/c K⁻ channel at KEK



After one more separation stage.

Extra length.



$K0 \rightarrow \pi^+ + \pi^-$

2) Cloud pions.

---

3) $\pi \rightarrow \mu + \nu$

4) Scattering

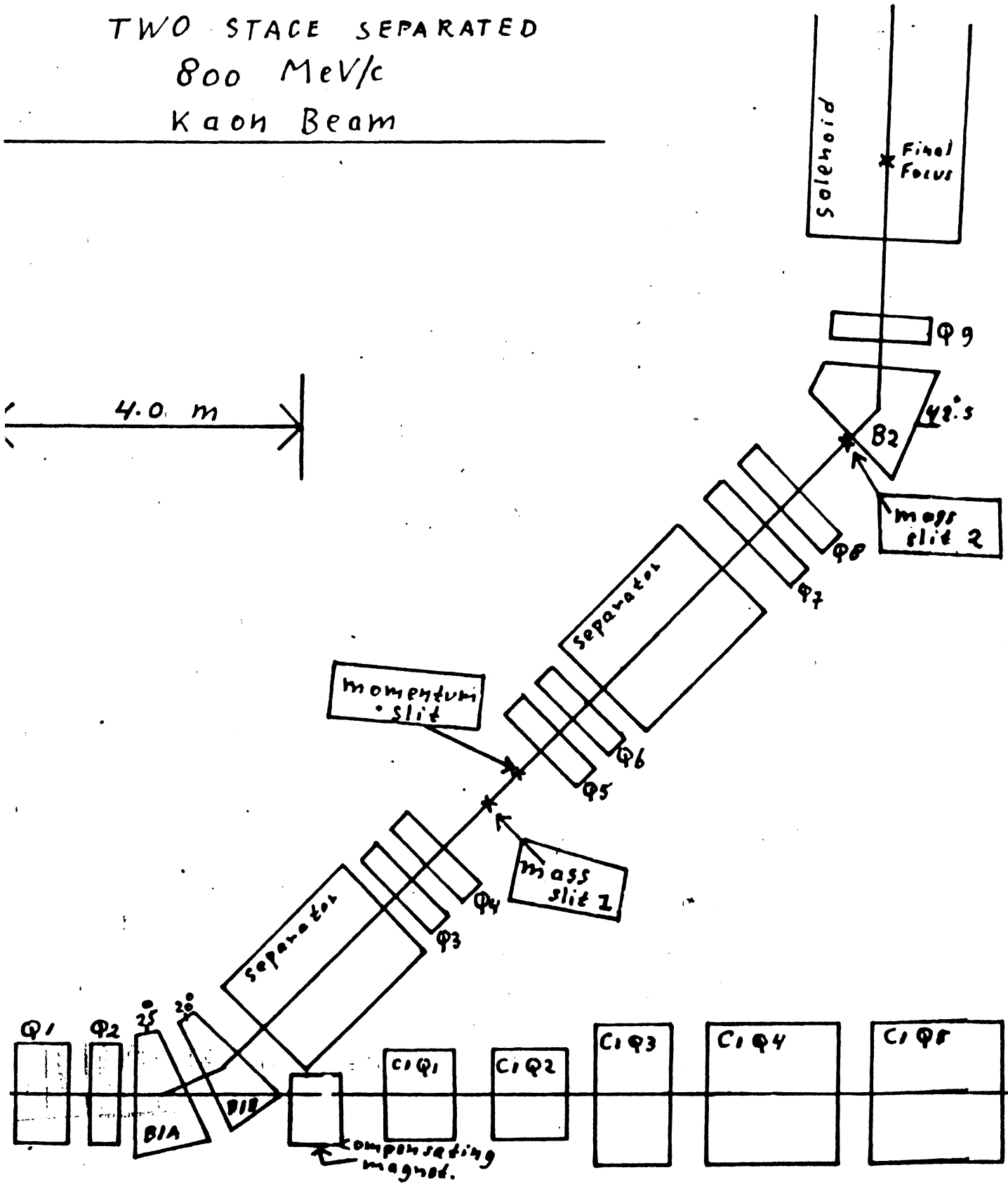
Sources of contamination.

Figure 1

Experiment 787

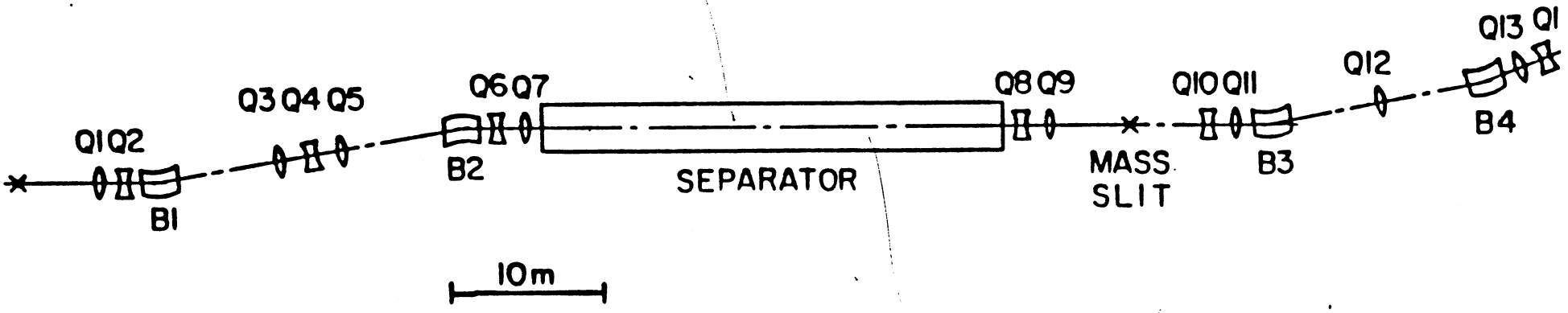
$K^+ \to \pi^+ + \nu + \bar{\nu}$

TWO STACE SEPARATED
800 MeV/c
Kaon Beam



DC separation
no good

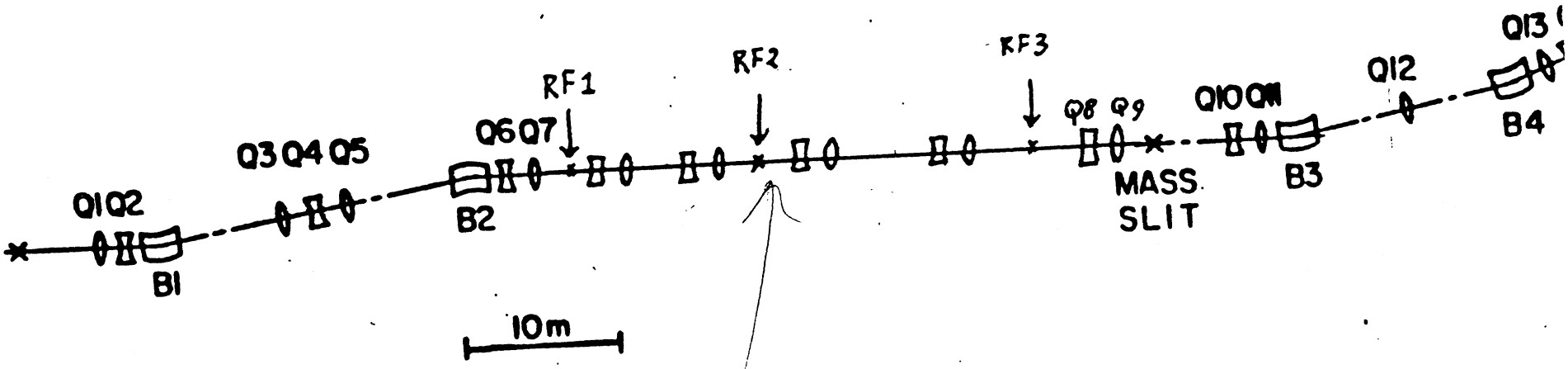
6 GeV/c KAON BEAMLINE K4
LENGTH 115m



small separation
long (30 m)
separator

Figure 4

6 GeV/c KAON BEAMLINE
LENGTH 115m



better

RF separation

1.3 GHz superconducting

cavities

20 GeV/c KAON BEAMLINE
LENGTH 160m