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Proposal for an Intense Low-Energy Beam

1. Introduction

We propose to build a new low-energy beam which has two separation stages and is able to provide enough K^- flux to operate the Saclay 80cm chamber for stopping K^- experiments with a low P.S. percentage. A shorter version of the present K-beams was already proposed in (1). An ultrashort design for counter use was recently given by M. Morpurgo and G. Petrucci (2). The beam proposed here is a version between these, it is shorter than (1) but it should meet the purity conditions which are required for bubble chamber experiments.

2. Beam optics

The layout of the beam is shown in Fig. 1, the optics in Fig. 2. The relevant parameters are given in Table I.

Table I

Length	17 m (centre (BC)
Solid angle	$2 \cdot 10^{-3}$ sterad
Momentum bite	$\pm 1.5^{o}/o$
Momentum range	0.5 - 0.8 GeV/c
Dispersion	2.8 cm for $1^{o}/o \frac{\Delta p}{p}$
Separation Kπ	1.0 cm at 0.7 GeV/c

The length is 14.8 m from the target upto the second mass slit and 17 m to the centre of the bubble chamber. The beam passes the separators convergently, two special bending magnets are required, one small special quadrupole serves as a field lens.

3. Flux computations

The fluxes are obtained taking the production values from (3), extrapolating the point at 500 MeV/c. We use

$$F = P\, dp\, d\Omega\, e^{-\frac{e}{L}}$$

where P [$\frac{\text{particles}}{10^{11} \text{ protons, GeV/c sterad}}$] production factor

dp [GeV/c] momentum bite

$d\Omega$ [sterad] solid angle

$\exp.(-\frac{e}{L})$ decay factor

L decay length = $7.5 \cdot p$ [m]

Table II

$\frac{dp}{p} = \pm$ 1.5°/o, $d\Omega = 2.10^{-3}$ sterad, $\ell = 17$ m

F	0.5	0.6	0.7	0.8 GeV/c
K^-	35	170	640	1100
K^+	100	500	1900	3300
$\bar{p}$	3	10	40	90

In practice, one has to assume a 50°/o efficiency for targetting, transmission through slits, etc. But we see that it should be possible to degrade and stop 20 K^- from 700 MeV/c with 10^{11} protons on the target, assuming stopping efficiency of 10°/o and accepting a momentum bite of $\pm$ 1°/o.

4. Technical considerations

The beam can be built either in the East Hall, starting together with the m6-beam from an external target, or in the North Hall using target 6 when the m5-beam has been dismantled to be replaced by the m6. The production angle would be 15^{o} in the latter case.

The elements required are listed in Table III.

Table III

No.	Element	Remark
2	Quadrupoles 50 cm	Normal
2	Quadrupoles 30 cm	Normal
2	Bending magnets	Special 60 x 20 x 8 cm^3
2	Zadig separators	Plates tilted, 50 kV/cm
1	Quadrupole	Special 15 cm x 6 cm 1000 G/cm

The estimated price of the bending magnets is 25,000.- S.F. The special quadrupole is negligible in price. To keep the beam as short as proposed, the degrader of the CBH 81 has to be redesigned.

A stimulating discussion with B. Aubert and L. Montanet should be acknowledged.

References : (1) A. Minten, G. Petrucci, TC/BEAM 63-2

(2) M. Morpurgo, G. Petrucci, NP-Internal 65-

(3) J. Duboc, A. Minten, S. Wojcicki, CERN 65-2.

Fig.1 : Layout K6

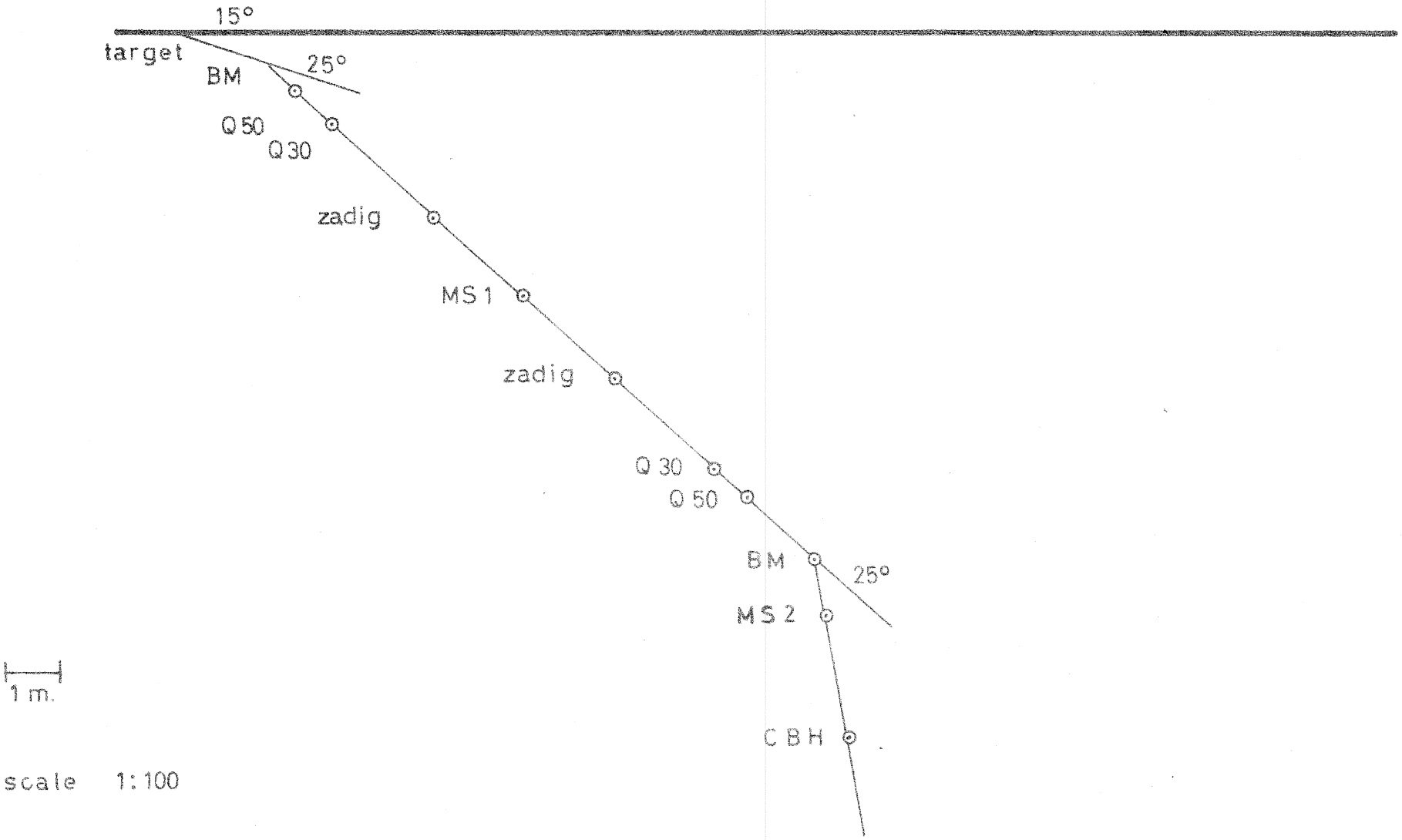

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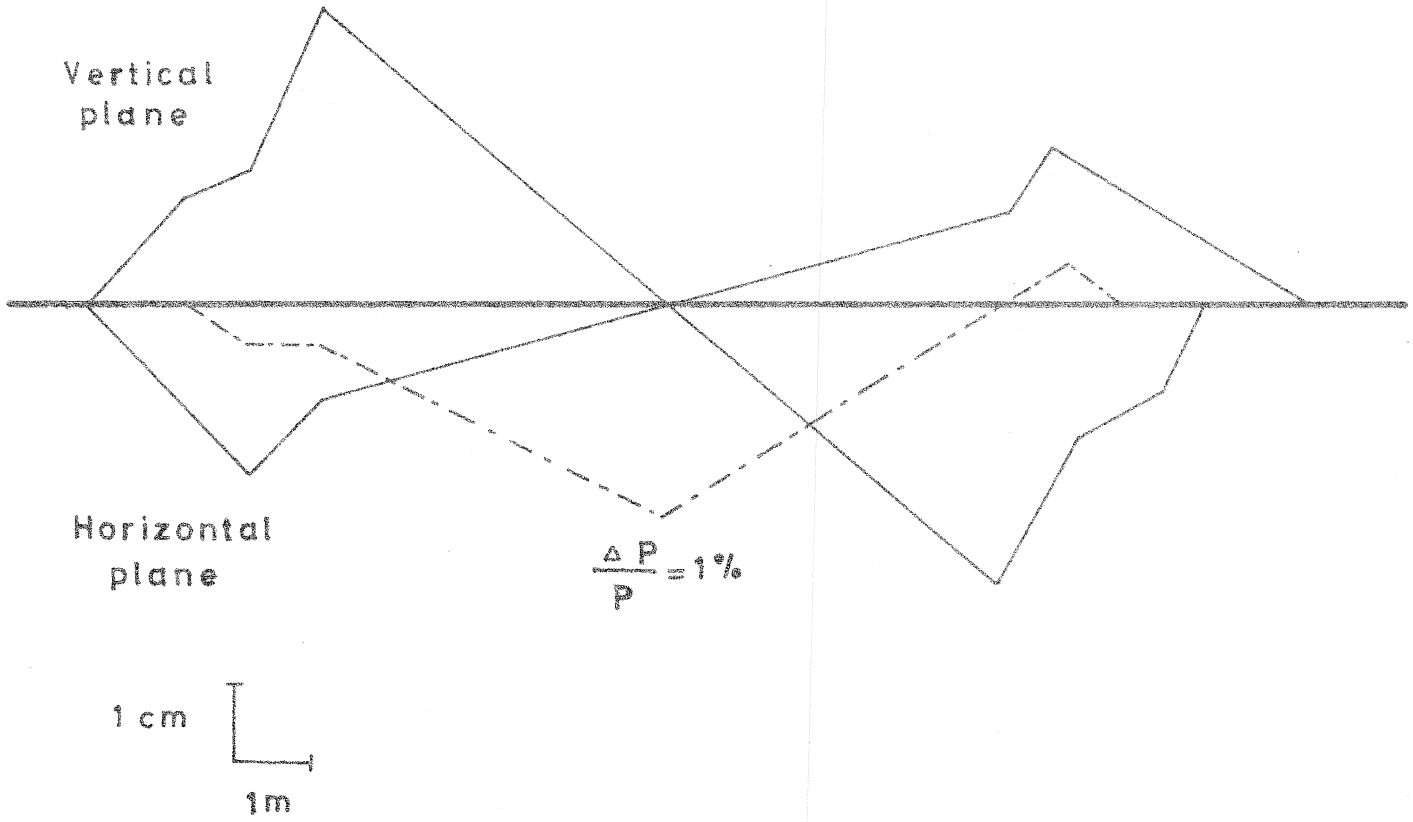
Fig.2 : Optics K6



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