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PHYSICS III COMMITTEE

PROPOSAL FOR A BEAM OF STOPPED K^- MESONS

by

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Several experiments proposed to the Physics III Committee last year need stopped K^- mesons. At the moment, there exists no beam at CERN suitable for these experiments.

We propose here a compact and simple lay-out for such a beam, which allows a good separation between π's and K's and is at the same time very short (total beam length 9 m), a fact which yields a minimum loss by decay in flight.

The lay-out of the beam and its characteristics are shown in the attached drawing. The beam will operate as follows: Particles of 700 MeV/c are selected by the first half of the bending magnet and focussed by the quadrupole lenses q_1 and q_2 into the momentum slit in the middle of the magnet. The particles are slowed down in 50 g/cm^2 of carbon, placed in the momentum slit. The π's leave the carbon with 600 MeV/c, the K's with 540 MeV/c momentum. Due to the 10% difference in their momenta, π's and K's will then be separated by the bending in the second half of the magnet. The quadrupoles q_3 and q_4 focus the K^-'s at 4.5 m from the momentum slit. At this distance, the π focus will be displaced by $\sim$ 15 cm from the K focus.

The rms multiple scattering angle of the K's in the carbon moderator, $\vartheta_{rms} \simeq$ 35 mrad, is of the same order as the acceptance of the first part of the beam. Multiple scattering will therefore not cause a sizeable loss.

The interaction loss in the moderator is not a disadvantage compared to a conventional beam with a separator, as the kaons will be stopped in any case.

In order to test the separation power of such a system, we measured the momentum distribution of 700-MeV/c π^-, passing through 50 g/cm^2 of carbon. At

540 MeV/c, the number of π's observed in a momentum band of $\frac{\Delta p}{p} = \pm 3\%$ was 3% of the π's contained in the peak at 600 MeV/c.

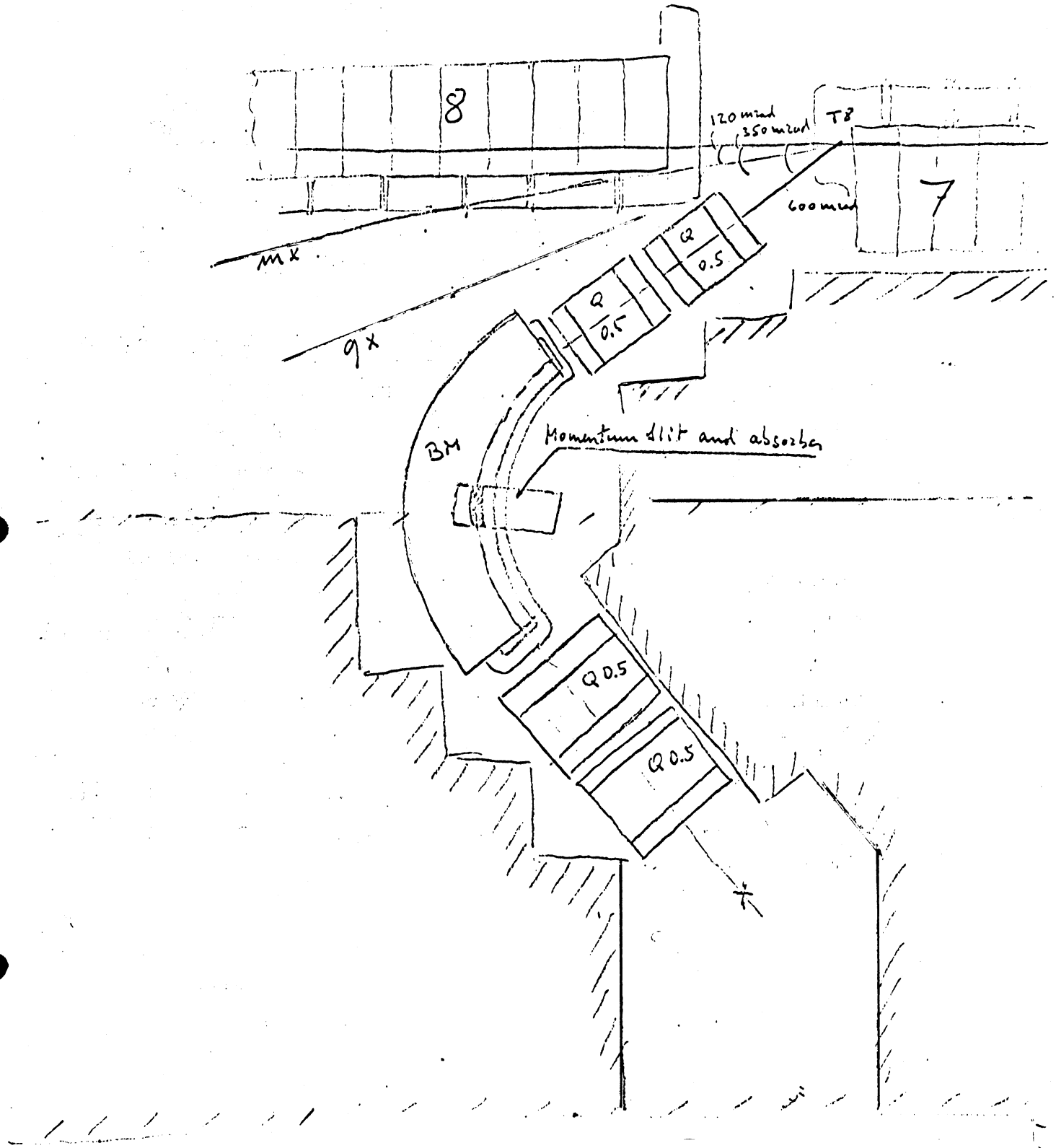
From K^- at 700 MeV/c, 10% can be brought to rest, the others being lost through interactions in the moderator (experimental, private communication by A. Minten).

In the beam lay-out proposed here, 85% of the K^- would decay in flight between the production target in the PS and the experimental target. Therefore, 1.5% of the K^- falling into the solid angle and the momentum bite accepted by the beam can be stopped in the experimental target.

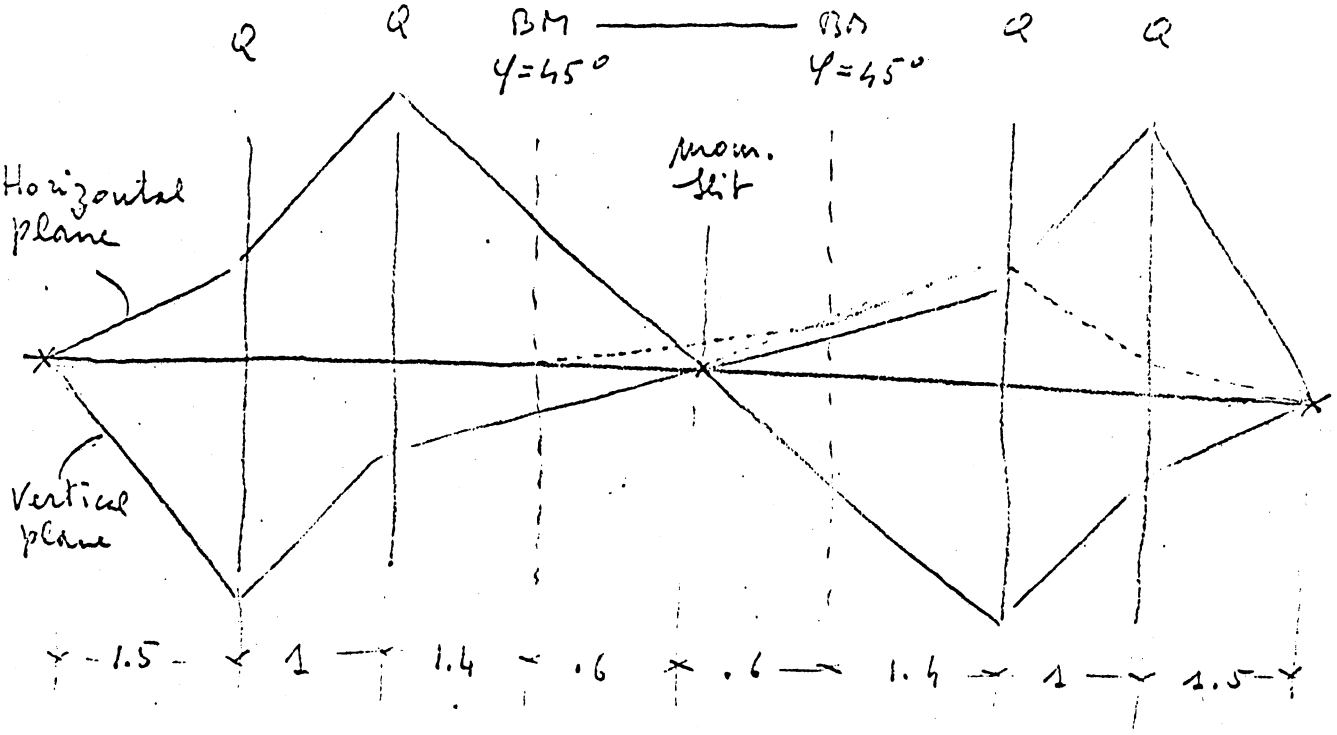
The possibility of installing the proposed beam at target 8 in addition to the planned m and q beams is under study. For a production angle of 600 mrad, which could be achieved without interfering with the other beams, and at 19 GeV PS energy, about 3000 $K^-/10^{11}$ protons fall into the solid angle and the momentum bite accepted by the beam (Hagedorn, private communication), giving rise to 45 K^- stopped in the experimental target per 10^{11} protons on the production target.

This beam is intended to be used for work on hypernuclei and on K^--mesic X rays. The Heidelberg-Karlsruhe Group (Backenstoss et al.) has expressed strong interest in this beam.

We are grateful to Professor B. Gregory who suggested a study of this kind of beam lay-out for the production of stopping K^- mesons.



Layout of KX beam from target 8



Optical diagram of Kx beam.

angular acceptance : $\alpha_H \simeq \pm 17$ mrad

$\alpha_V \simeq \pm 62$ mrad

total length 9 m

maximum momentum 800 Mev/c

momentum dispersion at slit 4.8 mm /% $\Delta p/p$

all quadrupoles with 20 cm aperture ; max. gradient 800 g/cm

BM (C type)
- gap = 6 cm
- field = 15 Kgauss

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