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Abstract

The Bevatron K^- beam separated by the velocity spectrometer has been analyzed with the aid of an emulsion stack, and particle density and distributions are given.

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We have exposed a stack consisting of 108 pellicles of K.5 emulsion, 600 μ by 3 by 6 inches, to the K^- beam separated by the coaxial velocity spectrometer.[1] The stack was placed with its face 6 inches behind the 1×1/2-in. aperture of collimator C-2 and oriented so that the beam entered parallel to the 6-in. axis of the assembled stack. This face was protected from x-rays by 1/4-in. Pb, and additional shielding of Pb, Cd, and paraffin was used for the remaining faces of the stack. The duration of the exposure was about 50 hours, during which 3.25×10^{14} protons were incident on the Bevatron target.

From our analysis of the exposed stack we are able to make the following observations:

1. From data taken at the entrance face of the stack:

(a) beam size (defined by C-2)	1×1.7 in. at face
(b) flux of near-minimum tracks	$6.7\times10^4/cm^2$
(c) flux of K^- tracks	$670/cm^2$
(d) K^-/near-minimum ratio	~1/100

2. From the distribution of stopping K^- particles:

(a) Nearly all stopping K^- particles are contained in a volume of about 50 cm^3, therefore the density of stopping K^- particles is about $70/cm^3$ in this volume, and about 200 per cubic centimeter in the region of highest density.

(b) The range distribution of stopping K^- mesons is as shown in the histogram in Fig. 1 (by range, we mean the distance of penetration into the emulsion stack. This is about 1 mm shorter than the true range because of scattering in the emulsion and the divergence of entrance angles). The momentum corresponding to the true range represented by the maximum of this distribution is 430 Mev/c, with a momentum spread of about ± 5% at the half-maximum points.

(c) The distributions of stopping K^- particles in the vertical and horizontal directions respectively are as represented in Figs. 2 and 3. The stack was situated so that the horizontal direction was normal to the pellicle surfaces; hence, the horizontal distribution is obtained by counting the total number of stopping K^- particles in each pellicle. We have in our possession only one

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[1] Horwitz, Murray, Ross, and Tripp, 450-Mev/c K^- and $\bar{p}$ Beams at the Northwest Target Area of the Bevatron Separated by the Coaxial Velocity Spectrometer, UCRL-8269, June 1958.

half of the original stack, so that we can establish only one-half the horizontal distribution. (The other half is at present being studied by Dr. Howard Taft at Yale University.

A schematic drawing of the geometry is shown in Fig. 4.

This work was done under the auspices of the U. S. Atomic Energy Commission.

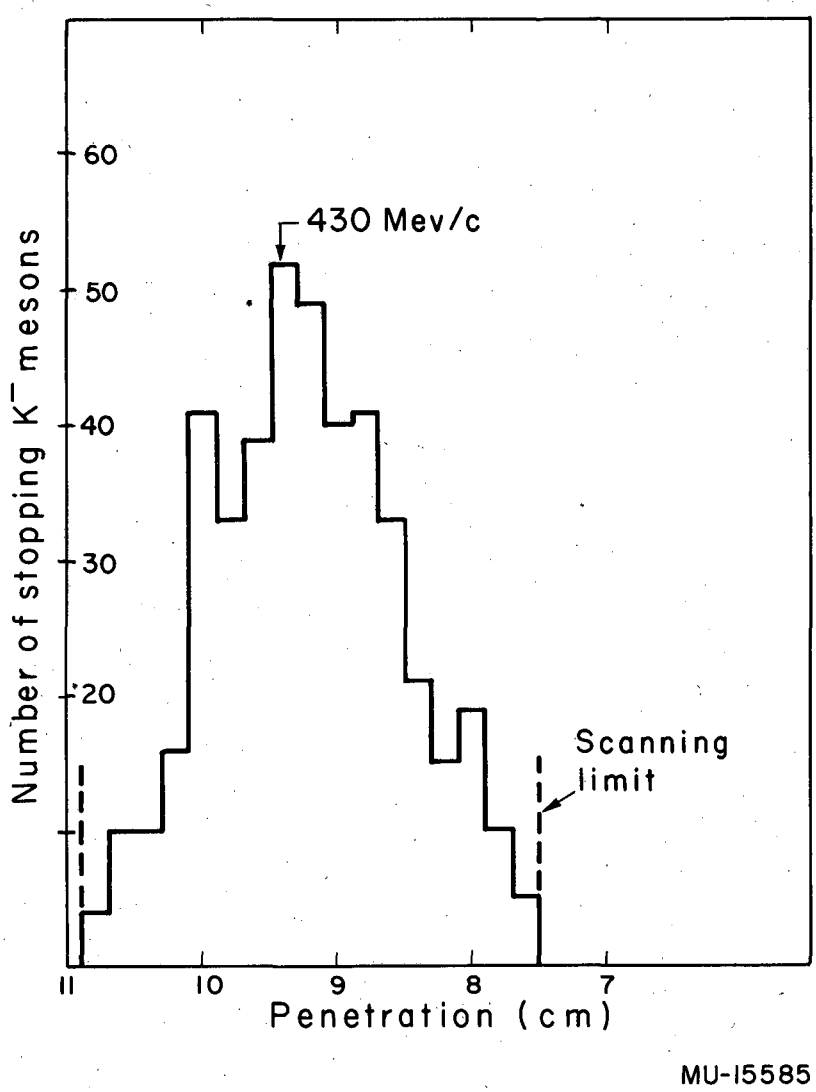

Fig. 1. Range distribution of stopping K^- mesons in emulsion.

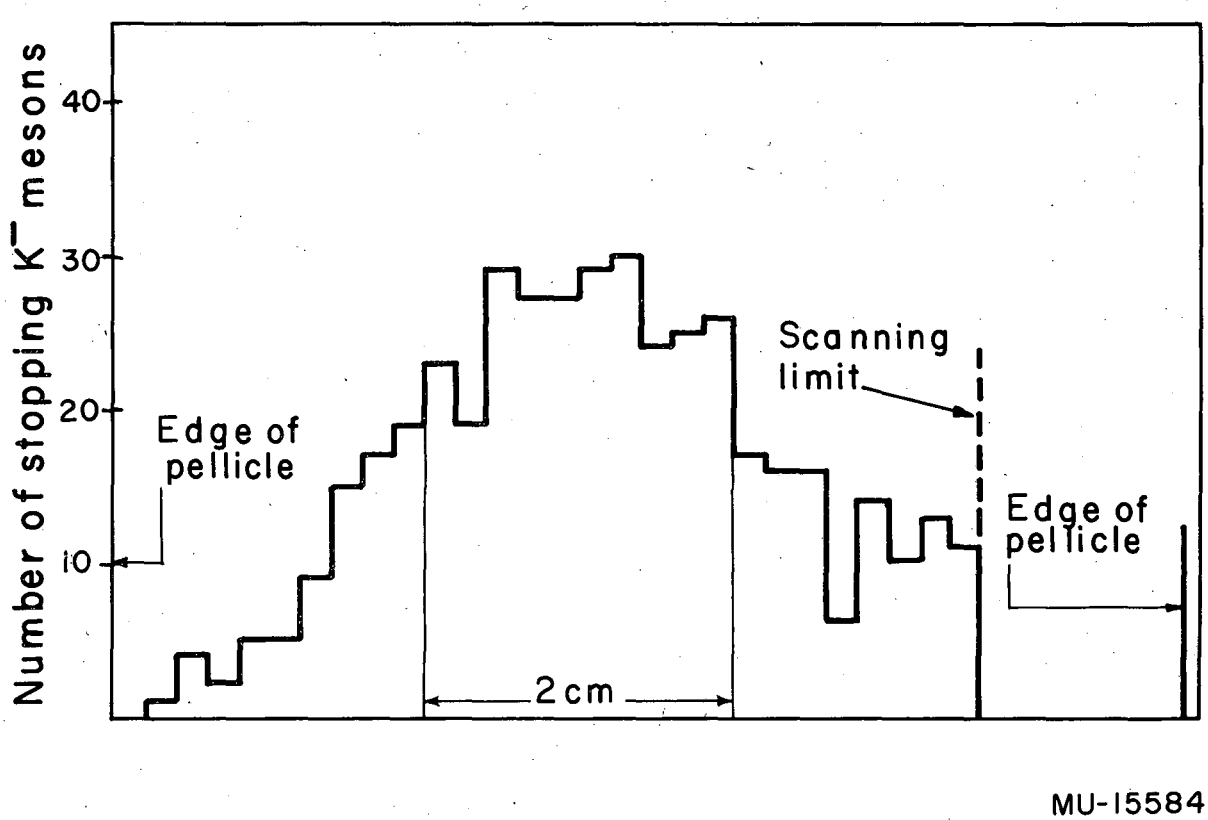

Fig. 2. Vertical distribution of stopping K^- mesons in emulsion.

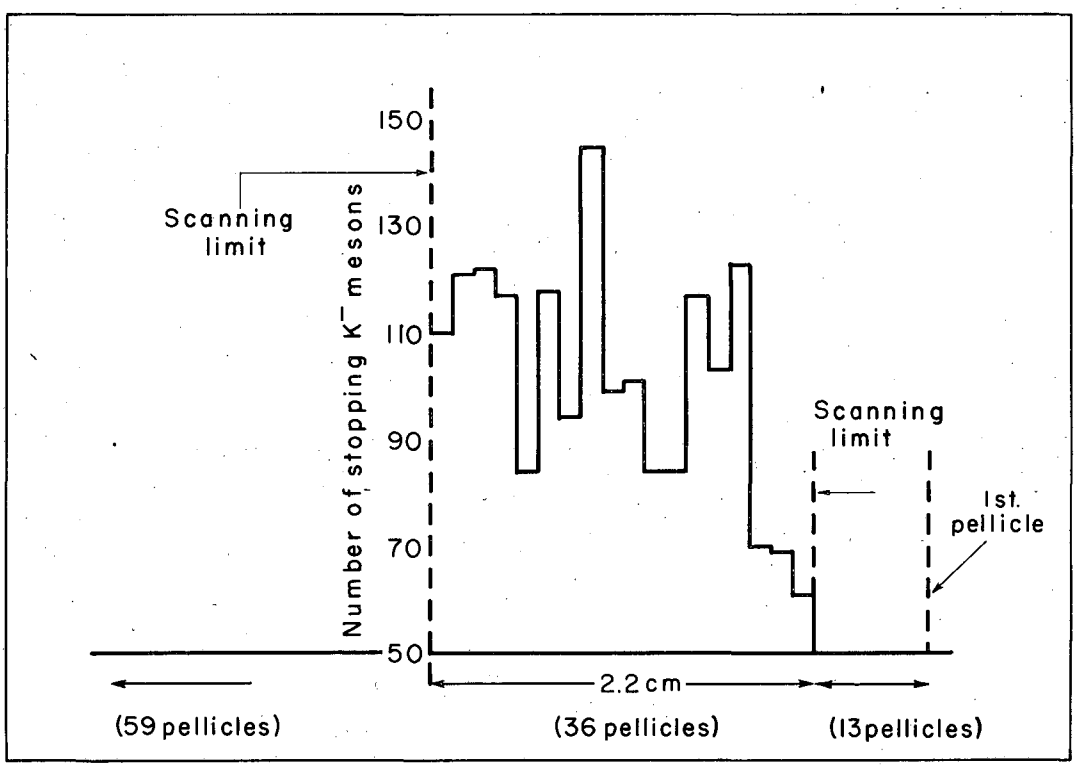

Fig. 3. Horizontal distribution of stopping K^- mesons in emulsion.

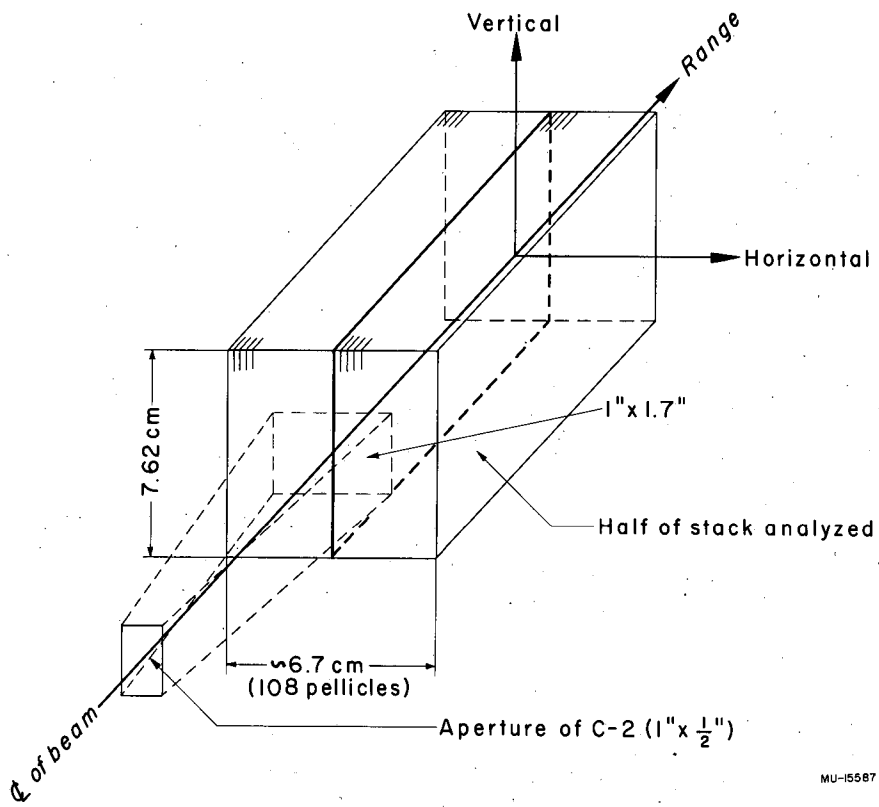

Fig. 4. Geometry of beam and emulsion stack.