BNL-104466-2014-TECH

AGS/AD/Tech Note No. 25;BNL-104466-2014-IR

LOW ENERGY K BEAM

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June 1965

Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

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AGS DIVISION TECHNICAL NOTE

No. 25

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June 11, 1965

LOW ENERGY K BEAM

A new low energy separated K beam to be used with the 30-in. bubble chamber is being installed at the AGS. The beam will deliver 5-10 K^- at rest in the bubble chamber per 10^{11} protons and can operate parastically on a continuous basis without causing a significant reduction in the AGS intensity available to other users.

The beam has two double foci, the first at 10 meters and the second at 19 meters from the target. A septum C-magnet which deflects the beam away from the synchrotron and a narrow Danby-Jackson[1] quadrupole permit extraction of the beam at a smaller production angle than would otherwise be possible with conventional magnets. Two quadrupoles focus the beam on a slit where a first momentum analysis and mass separation are done. A field lens at the first focus helps contain the beam in the second stage which is nearly a mirror image of the first. At the second double focus there is, therefore, almost no momentum dispersion for particles which originate at the target. Another mass separation is done at the second focus and finally, a single quadrupole shapes the beam for the bubble

[1] G. Danby, Private communication.

chamber.

The source of particle flux is confined to a region near the target by the Near Collimater while the solid angle subtended by the system is defined by the First Far Collimator. The Second Far Collimators define the aperture of the second stage. Their purpose is to shadown secondary sources of radiation.

The optical and beam design parameters are shown in Table I. Figure 1 illustrates the beam envelope and Figure 2 is an assembly drawing of the components. Although the beam is not yet operating, estimates of the fluxes have been made. They are listed in Table II.

TABLE I

Beam #2 Parameters

	1st Stage	2nd Stage
Solid Angle	1.0 millist.	
horizontal acceptance	± 36 mρ	
vertical acceptance	± 7 mρ	
horizontal magnification	- 3.6	.68
vertical magnification	- .78	.76
momentum dispersion	1.66 "/%	.14 "/%
separator dispersion	.106 "/mρ	.11 "/mρ
momentum bite		±.5%
vertical image size (.1" x .1" target)	.078"	.068"
aberrations (chromatic)	.062"	.129"
K-π Separation (Separator Field 50 kV/cm)		
700 MeV/c	.31"	.32"
800 MeV/c	.21"	.22"
900 MeV/c	.15"	.16"
length		850" to chamber
maximum momentum	1.2 BeV/c	1.2 BeV/c

TABLE II

Particles at Chamber/10^{11} Circulating Protons

momentum (BeV/c)	$\pi^{\pm}$	K^-	K^+	$\bar{p}$
0		10	40	4
600		35	140	6
800	$\sim 10^5$	180	700	12
1000		750	3000	50

DB:1s1

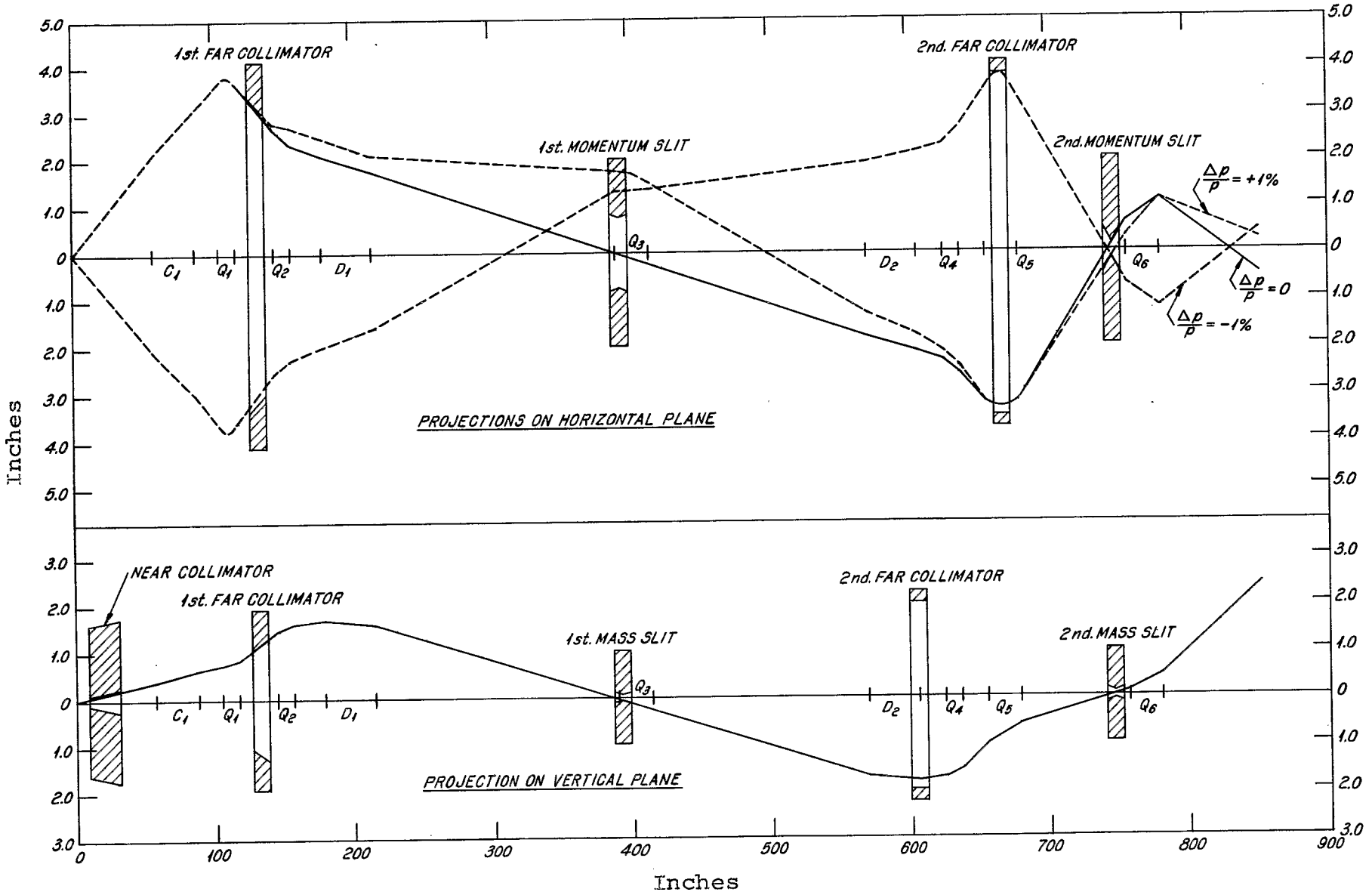
1st. FAR COLLIMATOR
2nd. FAR COLLIMATOR
1st. MOMENTUM SLIT
2nd. MOMENTUM SLIT
Δp/p = +1%
Δp/p = 0
Δp/p = -1%
C1
Q1
Q2
D1
Q3
D2
Q4
Q5
Q6
PROJECTIONS ON HORIZONTAL PLANE
NEAR COLLIMATOR
1st. FAR COLLIMATOR
2nd. FAR COLLIMATOR
1st. MASS SLIT
2nd. MASS SLIT
PROJECTION ON VERTICAL PLANE
Inches
Inches

Fig. 1

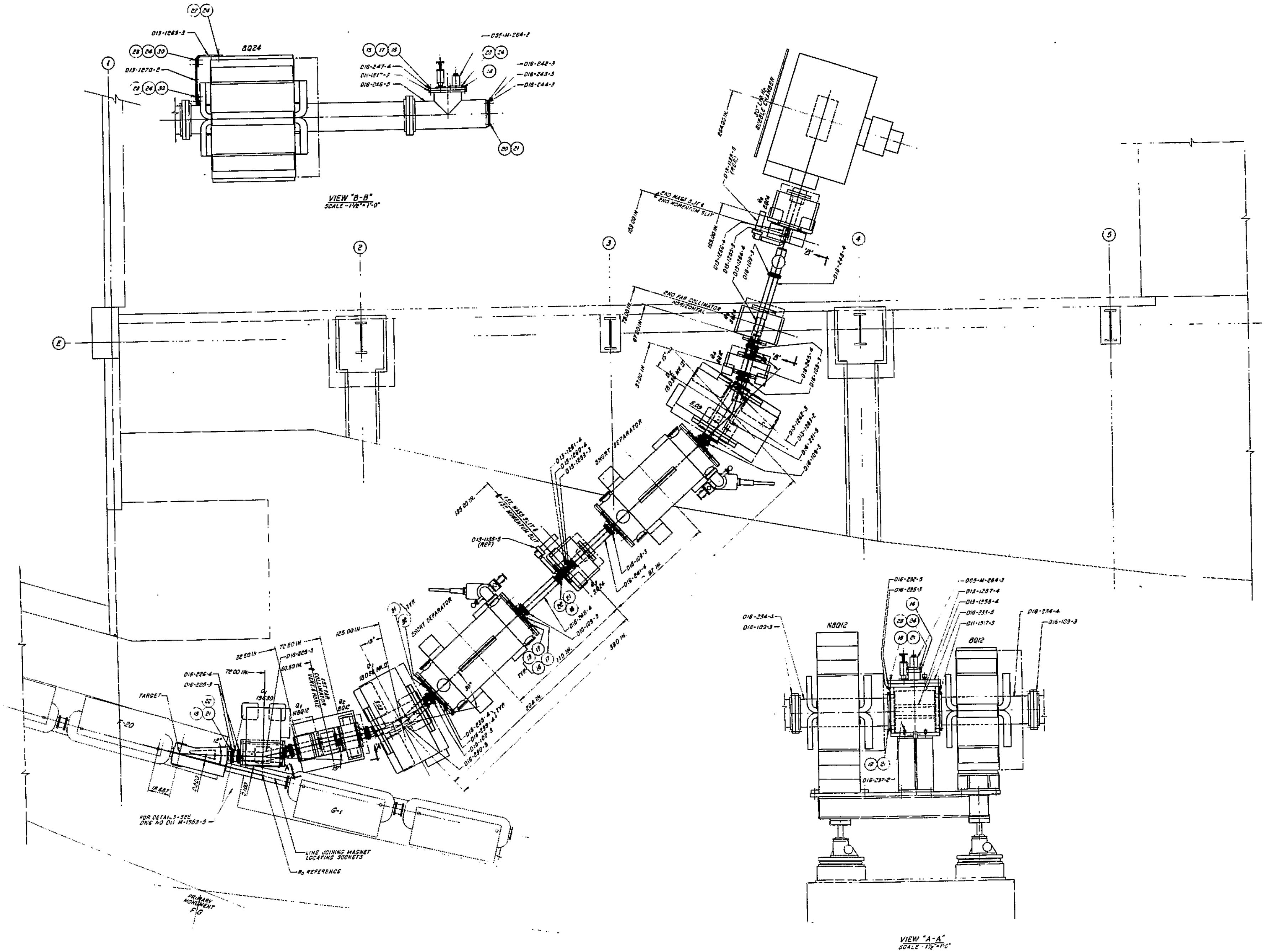
BQ24
VIEW "B-B"
SHORT SEPARATOR
SHORT SEPARATOR
TARGET
T-20
G-1
NBQ12
BQ12
VIEW "A-A"
LINE JOINING MAGNET LOCATING SOCKETS
R0 REFERENCE
PRIMARY MONUMENT
2ND FAR COLLIMATOR HORIZONTAL
390 IN.
204 IN.
97 IN.

Fig. 2