A3 line tune/beam line information

G. M. Bunce

June 1985

Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

DISCLAIMER

Alternating Gradient Synchrotron Department
BROOKHAVEN NATIONAL LABORATORY
Associated Universities, Inc.
Upton, New York 11973

EP&S Division Technical Note
No. 111

A3 Line Tune/Beam Line Information

Gerry M. Bunce

June 3, 1985

A Transport display of the A3 beam envelope for the E749 magnet settings is enclosed, along with magnet listings and curves and collimator information. Note that the actual spot achieved at A3 is approximately 1 to 2 mm half width vs the Transport result of 2 mm(H) x 4 mm (V).

Tunes:

A3-A   Tune of E749, 2/4/84, $\Delta p/p = \pm .2\%$

A3-B   Q6/7 and Q8/9 polarities are reversed to give a smaller horizontal divergence to match the aperture of the beam dump in the K_L collimator. $\Delta p/p = \pm .2\%$

A3-C   Same as B, but $\Delta p/p = \pm 2\%$, to show effects of momentum shifts.

A3-D $\Delta p/p = \pm .2\%$, Q7/8 = 0. (Q9 then runs at a high gradient-- not ideal.)

A3 "Tunes"   A3-A

Magnet	I *	BL	Dibbuk Counts *	Remarks
Q12	2428 B	$-3.03 \frac{kg}{in} \times 52"$		
Q34	1973 A	$2.50 \frac{kg}{in} \times \frac{36" \ (Q3)}{52" \ (Q4)}$		
P01	0			
D1	1897 A	$17.90 \ kg \times 78"$		
D2	1700 A	$18.37 \ kg \times 76"$		
Q5	565 A	$.723 \frac{kg}{in} \times 36"$		
D3	1550 A	$25.8 \ kg \times 74"$	2480	
D4	1771 A	"	2835	
D5	1453 A	"	2325	
D6	1130 A	$20.1 \ kg \times 74"$	2150	
Q6	2125 B	$-2.69 \frac{kg}{in} \times 52"$		
Q7/8	900 B/A	$\mp 3.70 \frac{kg}{in} \times 37.5"$	1800	
Q9	1800 A	$7.98 \frac{kg}{in} \times 38"$		

£ calculated for use in transport.

Comments on tune: from expt. 749 logbook.

Transport spot at A3: 2 mm × 4.5 mm

                   H   V

            ($\frac{1}{2}$ full width)

* The current is the Dibbuk count value, except as indicated in the last column.

A3 Magnet List

	Type*	gap	B/I or BL/I[†]	L effective [†,††]
Q1	8Q48		$.0649 \frac{kg \times inches}{amp}$	(52")
Q2	8Q48		.0649	(52")
Q3	8Q32		$.001275 \frac{kg}{amp}$	35.8"
Q4	8Q48		$.0660 \frac{kg \times inches}{amp}$	(52")
P1	8P24			
D1	18D72	6"	$.718 \frac{kg \times inches}{amp}$	(78")
D2	18D72	4"	~18.37 kg/1700 amps	(76")
Q5	8Q32		$.00128 \frac{kg}{amp}$	36.0"
D3	18D72	2"	~25.8 kg/1550 amps	(74")
D4	18D72	2"	~25.8 kg/1771	(74")
D5	18D72	2"	~25.8 kg/1453	(74")
D6	10D72	2"	~20.1 kg/1130	(74")
Q6	8Q48		$.0658 \frac{kg \times inches}{amp}$	(52")
Q7	5Q36		$.0041 \frac{kg}{amp}$	37.5"
Q8	5Q36		.0041	37.5"
Q9	N3Q36		$.1685 \frac{kg \times inches}{amp}$	(38")
D7	18D72	2"	17.7 kg/1245 amps (2000 Dibbds)	
D8	18D72	4"		
D9	18D72	6.5"	7.9 kg/938 amps	

†† Parentheses indicate nominal lengths for Transport purposes.

† Field at 1" radius for quadrupoles. Transfer functions are given in the operating region of the tune of 2/4/84.

* Notation: iLj => i = inside diameter of quads; unshimmed gap width for dipoles. j = length of poles.

A3 Tune based on A3-A
file 16 (2/4/84)

A3 LINE, HIGH POWER TUNE, 5/2/85

meters

RUN PLTR

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

```
DRIFT  1.          5.00000    0.00000    0.00000    0.00000
QUAD*  5.  "A1Q1"  1.32000   -3.03000    2.54000   -5.82200
DRIFT  3.          0.28000    0.00000    0.00000    0.00000
QUAD*  5.  "A1Q2"  1.32000   -3.03000    2.54000   -5.82200
DRIFT  3.          1.52000    0.00000    0.00000    0.00000
QUAD*  5.  "A1Q3"  0.91000    2.50000    2.54000   10.76700
DRIFT  3.          0.28000    0.00000    0.00000    0.00000
QUAD*  5.  "A1Q4"  1.32000    2.50000    2.54000    7.54100
DRIFT  3.          1.97000    0.00000    0.00000    0.00000
ROTAT  2.          1.03300    0.00000    0.00000    0.00000
BEND*  4.  "A1D1"  1.98000   17.90000    0.00000    2.13600
ROTAT  2.          1.03300    0.00000    0.00000    0.00000
DRIFT  3.          0.51000    0.00000    0.00000    0.00000
ROTAT  2.          1.03300    0.00000    0.00000    0.00000
BEND*  4.  "A1D2"  1.93000   18.37000    0.00000    2.13600
ROTAT  2.          1.03300    0.00000    0.00000    0.00000
DRIFT  3.         16.13000    0.00000    0.00000    0.00000
QUAD*  5.  "A1Q5"  0.91000    0.72300    2.54000   36.85300
DRIFT  3.          1.37000    0.00000    0.00000    0.00000
ROTAT  2.          1.41200   25.80000    0.00000    2.92300
BEND*  4.  "A3D3"  1.88000    0.00000    0.00000    0.00000
ROTAT  2.          1.41200    0.00000    0.00000    0.00000
DRIFT  3.          0.56000    0.00000    0.00000    0.00000
ROTAT  2.          1.41200   25.80000    0.00000    2.92300
BEND*  4.  "A3D4"  1.88000    0.00000    0.00000    0.00000
ROTAT  2.          1.41200    0.00000    0.00000    0.00000
DRIFT  3.          0.56000    0.00000    0.00000    0.00000
ROTAT  2.          1.41200   25.80000    0.00000    2.92300
BEND*  4.  "A3D5"  1.88000    0.00000    0.00000    0.00000
ROTAT  2.          1.41200    0.00000    0.00000    0.00000
```

RUN PLTR

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

DRIFT	3.			0.51000	0.0000L	0.00000	0.00000
ROTAT	2.			1.10000	0.00000	0.00000	0.00000
BEND**	4.	"A3D6		1.88000	20.10000	0.00000	2.27700
ROTAT	2.			1.10000	0.00000	0.00000	0.00000
DRIFT	3.			0.51000	0.00000	0.00000	0.00000
QUAD**	5.	0 1	"A3Q6	1.32000	-2.69000	2.54000	-6.58500
DRIFT	3.			0.39000	0.00000	0.00000	0.00000
QUAD**	5.		"A3Q7	0.95300	-3.70000	2.54000	-6.69100
DRIFT	3.			0.27000	0.00000	0.00000	0.00000
QUAD**	5.		"A3Q8	0.95300	3.70000	2.54000	7.00900
DRIFT	3.			0.57000	0.00000	0.00000	0.00000
QUAD**	5.	0 1	"A3Q9	0.97000	17.98200	2.54000	3.28600
DRIFT	3.			3.64000	0.00000	0.00000	0.00000
FIT	10.			1.00010	0.10000	0.01000	0.19800
FIT	10.			3.00030	0.10000	0.01000	0.44800
	10.			0.00000	0.00000	0.00000	0.00000

RUN PLTR

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

Δp/p = .2%

A3-B

DRIFT	3.		5.00000	0.00000	0.00000	0.00000
QUAD*	5.	"A1Q1	1.32000	-3.03000	2.54000	-5.82200
DRIFT	3.		0.28000	0.00000	0.00000	0.00000
QUAD*	5.	"A1Q2	1.32000	-3.03000	2.54000	-5.82200
DRIFT	3.		1.52000	0.00000	0.00000	0.00000
QUAD*	5.	"A1Q3	0.91000	2.50000	2.54000	10.76700
DRIFT	3.		0.28000	0.00000	0.00000	0.00000
QUAD*	5.	"A1Q4	1.32000	2.50000	2.54000	7.54100
DRIFT	3.		1.97000	0.00000	0.00000	0.00000
ROTAT	2.		1.03300	0.00000	0.00000	0.00000
BEND*	4.	"A1D1	1.98000	17.90000	0.00000	2.13600
ROTAT	2.		1.03300	0.00000	0.00000	0.00000
DRIFT	3.		0.51000	0.00000	0.00000	0.00000
ROTAT	2.		1.03300	0.00000	0.00000	0.00000
BEND*	4.	"A1D2	1.93000	18.37000	0.00000	2.13600
ROTAT	2.		1.03300	0.00000	0.00000	0.00000
DRIFT	3.		16.13000	0.00000	0.00000	0.00000
QUAD*	5.	"A1Q5	0.91000	0.72300	2.54000	36.85300
DRIFT	3.		1.37000	0.00000	0.00000	0.00000
ROTAT	2.		1.41200	0.00000	0.00000	0.00000
BEND*	4.	"A3D3	1.88000	25.80000	0.00000	2.92300
ROTAT	2.		1.41200	0.00000	0.00000	0.00000
DRIFT	3.		0.56000	0.00000	0.00000	0.00000
ROTAT	2.		1.41200	0.00000	0.00000	0.00000
BEND*	4.	"A3D4	1.88000	25.80000	0.00000	2.92300
ROTAT	2.		1.41200	0.00000	0.00000	0.00000
DRIFT	3.		0.56000	0.00000	0.00000	0.00000
ROTAT	2.		1.41200	0.00000	0.00000	0.00000
BEND*	4.	"A3D5	1.88000	25.80000	0.00000	2.92300
ROTAT	2.		1.41200	0.00000	0.00000	0.00000

RUN PLTR

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

DRIFT	3.		0.51000	0.00000	0.00000	0.00000
ROTAT	2.		1.10000	0.00000	0.00000	0.00000
BEND*	4.	"A3D6	1.88000	20.10000	0.00000	2.27700
ROTAT	2.		1.10000	0.00000	0.00000	0.00000
DRIFT	3.		0.51000	0.00000	0.00000	0.00000
QUAD*	5.0 1	"A3Q6	1.32000	3.78800	2.54000	5.05500
DRIFT	3.		0.39000	0.00000	0.00000	0.00000
QUAD*	5.	"A3Q7	0.95300	3.70000	2.54000	7.00900
DRIFT	3.		0.27000	0.00000	0.00000	0.00000
QUAD*	5.	"A3Q8	0.95300	-3.70000	2.54000	-6.69100
DRIFT	3.		0.57000	0.00000	0.00000	0.00000
QUAD*	5.0 1	"A3Q9	0.97000	-8.26700	2.54000	-2.85500
DRIFT	3.		3.64000	0.00000	0.00000	0.00000
FIT	10.		1.00010	0.00000	0.01000	0.16860
FIT	10.		3.00030	0.10000	0.01000	0.09980
	0.		0.00000	0.00000	0.00000	0.00000

RUN PLTR

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

ΔP/P = 2%

A3-C

A3 LINE, HIGH POWER TUNE, 5/2/85

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

$$\beta^* = \frac{4}{12} \quad 12\,mm = 3\,mrad$$

Type	#	Label				
DRIFT	3.		5.00000	0.00000	0.00000	0.00000
QUAD*	5.	"A1Q1	1.32000	-3.03000	2.54000	-5.82200
DRIFT	3.		0.28000	0.00000	0.00000	0.00000
QUAD*	5.	"A1Q2	1.32000	-3.03000	2.54000	-5.82200
DRIFT	3.		1.52000	0.00000	0.00000	0.00000
QUAD*	5.	"A1Q3	0.91000	2.50000	2.54000	10.76700
DRIFT	3.		0.28000	0.00000	0.00000	0.00000
QUAD*	5.	"A1Q4	1.32000	2.50000	2.54000	7.54100
DRIFT	3.		1.97000	0.00000	0.00000	0.00000
ROTAT	2.		1.03300	0.00000	0.00000	0.00000
BEND*	4.	"A1D1	1.98000	17.90000	0.02000	2.13600
ROTAT	2.		1.03300	0.00000	0.00000	0.00000
DRIFT	3.		0.51000	0.00000	0.00000	0.00000
ROTAT	2.		1.03300	0.00000	0.00000	2.13600
BEND*	4.	"A1D2	1.93000	18.37000	0.00000	0.00000
ROTAT	2.		1.03300	0.00000	0.00000	0.00000
DRIFT	3.		16.13000	0.72300	2.54000	36.85300
QUAD*	5.	"A1Q5	0.91000	0.00000	0.00000	0.00000
DRIFT	3.		1.37000	0.00000	0.00000	0.00000
ROTAT	2.		1.41200	0.00000	0.00000	2.92300
BEND*	4.	"A3D3	1.88000	25.80000	0.00000	0.00000
ROTAT	2.		1.41200	0.00000	0.00000	0.00000
DRIFT	3.		0.56000	0.00000	0.00000	0.00000
ROTAT	2.		1.41200	0.00000	0.00000	2.92300
BEND*	4.	"A3D4	1.88000	25.80000	0.00000	0.00000
ROTAT	2.		1.41200	0.00000	0.00000	0.00000
DRIFT	3.		0.56000	0.00000	0.00000	0.00000
ROTAT	2.		1.41200	0.00000	0.00000	2.92300
BEND*	4.	"A3D5	1.88000	25.80000	0.00000	0.00000
ROTAT	2.		1.41200	0.00000	0.00000	0.00000

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:
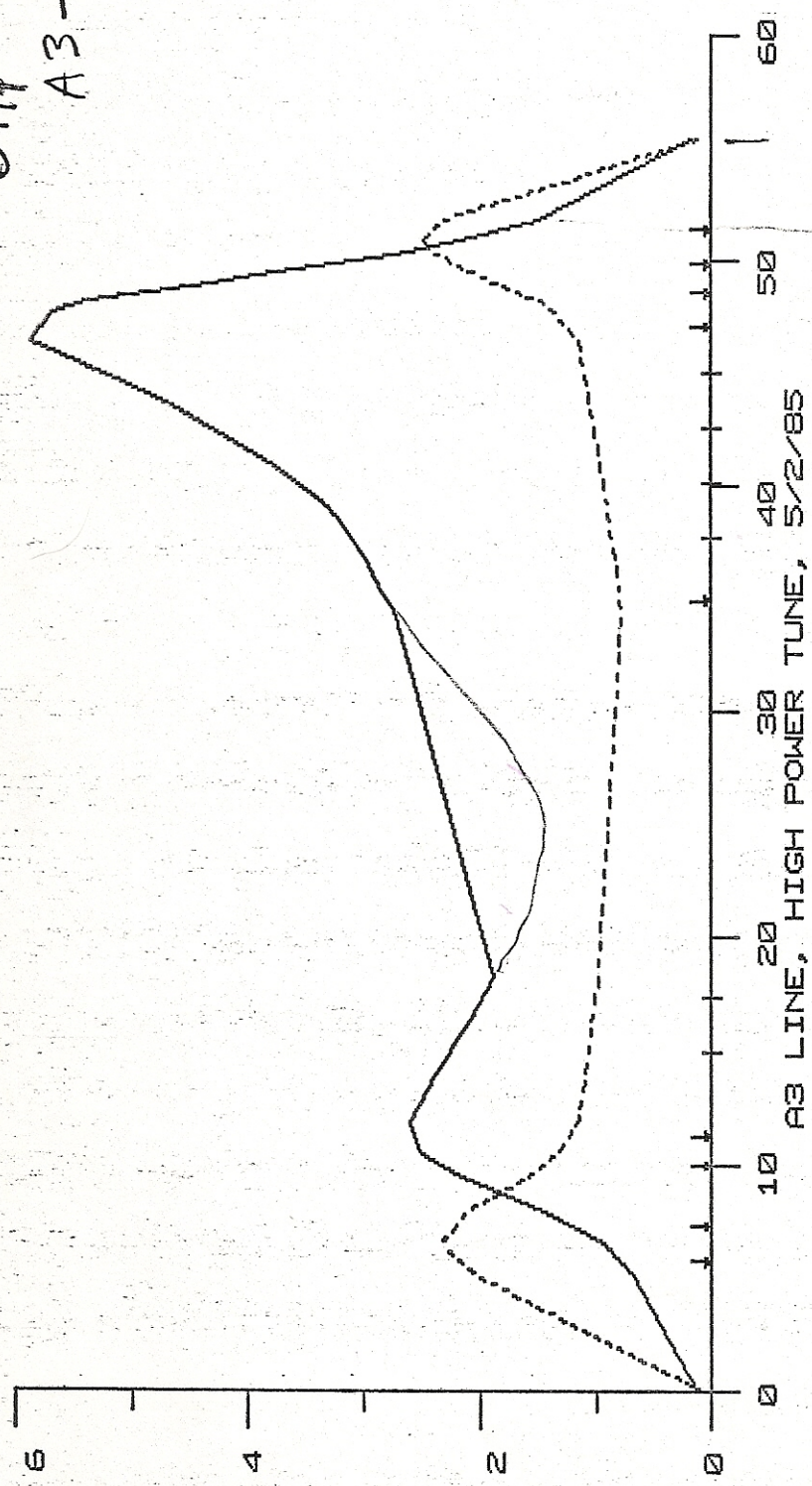
```
DRIFT    3.         0.51000    0.00000    0.00000    0.00000
ROTAT    2.         1.10000    0.00000    0.00000    0.00000
BEND*    4.   "A3D6 1.88000   20.10000    0.00000    2.27700
ROTAT    2.         1.10000    0.00000    0.00000    0.00000
DRIFT    3.         0.51000    0.00000    0.00000    0.00000
QUAD*    5. 0 1 "A3Q6 1.32000  3.82700    2.54000    5.00600
DRIFT    3.         0.39000    0.00000    0.00000    0.00000
QUAD*    5.   "A3Q7 0.95300    3.70000    2.54000    7.00900
DRIFT    3.         0.27000    0.00000    0.00000    0.00000
QUAD*    5.   "A3Q8 0.95300   -3.70000    2.54000   -6.69100
DRIFT    3.         0.57000    0.00000    0.00000    0.00000
QUAD*    5. 0 1 "A3Q9 0.97000 -8.28100    2.54000   -2.85000
DRIFT    3.         3.64000    0.00000    0.00000    0.00000
FIT     10.         1.00010    0.10000    0.01000    0.17200
FIT     10.         3.00030    0.10000    0.01000    0.09990
FIT     10.         0.00000    0.00000    0.00000    0.00000
```

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

ENTER UP TO 55 CHARACTERS OF DESCRIPTION:

A3-D

Q7/8=0, Q6/9 REVERSED POLARITY.   4-Jun-85 09:11
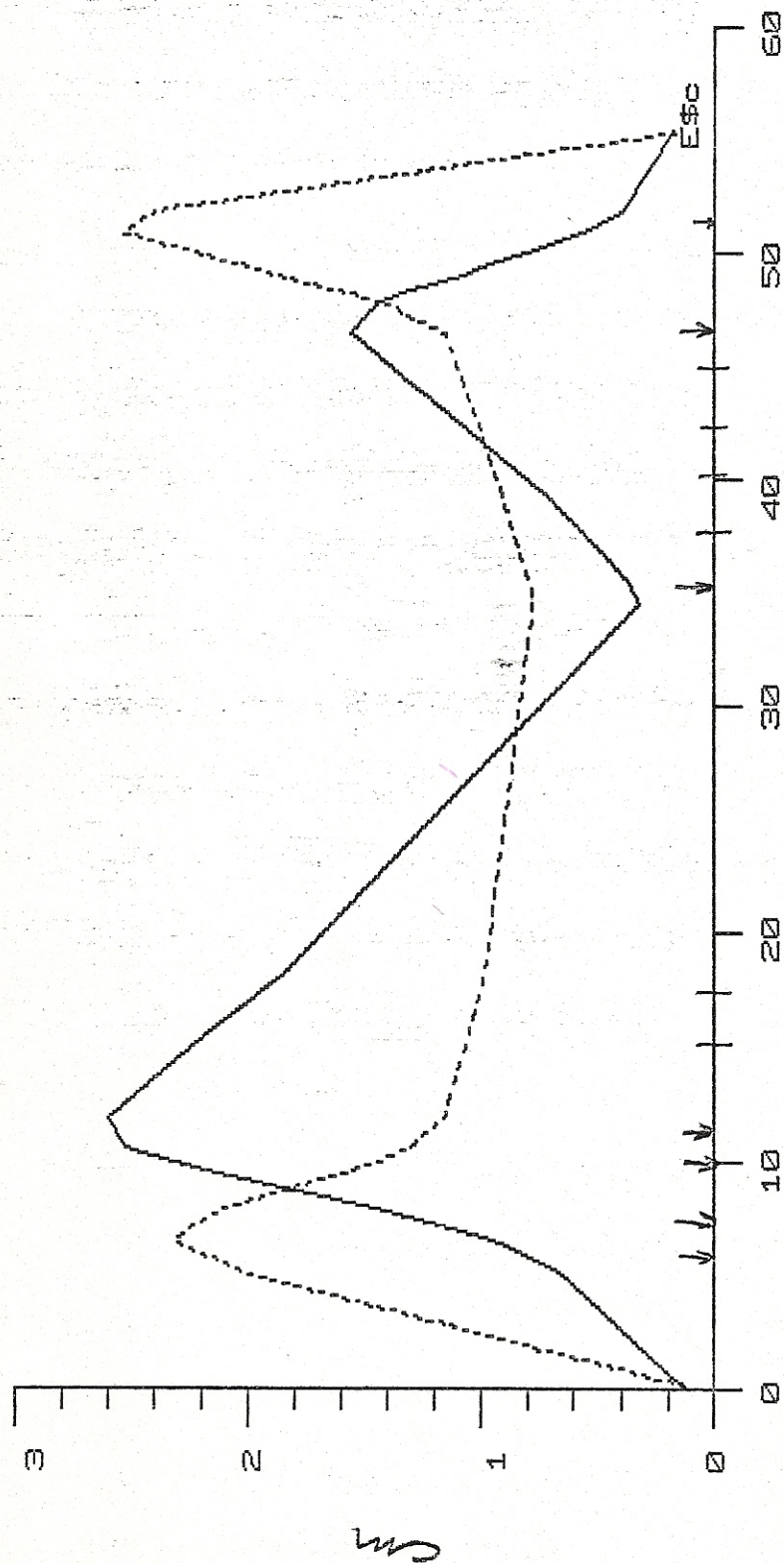
A3 LINE — meters

```
"A3 LINE, HIGH POWER TUNE, 5/2/85
DRIFT 3.          5.00000   0.00000   0.00000   0.00000
QUAD* 5. "A1Q1    1.32000  -3.03000   2.54000  -5.82200
DRIFT 3.          0.28000   0.00000   0.00000   0.00000
QUAD* 5. "A1Q2    1.32000  -3.03000   2.54000  -5.82200
DRIFT 3.          1.52000   0.00000   0.00000   0.00000
QUAD* 5. "A1Q3    0.91000   2.50000   2.54000  10.76700
DRIFT 3.          0.28000   0.00000   0.00000   0.00000
QUAD* 5. "A1Q4    1.32000   2.50000   2.54000   7.54100
DRIFT 3.          1.97000   0.00000   0.00000   0.00000
ROTAT 2.          1.03300   0.00000   0.00000   0.00000
BEND* 4. "A1D1    1.98000  17.90000   0.00000   2.13600
ROTAT 2.          1.03300   0.00000   0.00000   0.00000
DRIFT 3.          0.51000   0.00000   0.00000   0.00000
ROTAT 2.          1.03300   0.00000   0.00000   0.00000
BEND* 4. "A1D2    1.93000  18.37000   0.00000   2.13600
ROTAT 2.          1.03300   0.00000   0.00000   0.00000
DRIFT 3.         16.13000   0.00000   0.00000   0.00000
QUAD* 5. "A1Q5    0.91000   0.72300   2.54000  36.85300
DRIFT 3.          1.37000   0.00000   0.00000   0.00000
ROTAT 2.          1.41200   0.00000   0.00000   0.00000
BEND* 4. "A3D3    1.88000  25.80000   0.00000   2.92300
ROTAT 2.          1.41200   0.00000   0.00000   0.00000
DRIFT 3.          0.56000   0.00000   0.00000   0.00000
ROTAT 2.          1.41200   0.00000   0.00000   0.00000
BEND* 4. "A3D4    1.88000  25.80000   0.00000   2.92300
ROTAT 2.          1.41200   0.00000   0.00000   0.00000
DRIFT 3.          0.56000   0.00000   0.00000   0.00000
ROTAT 2.          1.41200   0.00000   0.00000   0.00000
BEND* 4. "A3D5    1.88000  25.80000   0.00000   2.92300
ROTAT 2.          1.41200   0.00000   0.00000   0.00000
```

@7/8 = 0

Δp/p ≈ 2.2%

A3-D

```
DRIFT    3.    0.51000    0.00000    0.00000    0.00000
ROTAT    2.    1.10000    0.00000    0.00000    2.27700
BEND*    4.    1.89000   20.10000    0.00000    0.00000   "A3D6
ROTAT    2.    1.10000    0.00000    0.00000    0.00000
DRIFT    3.    0.51000    0.00000    0.00000    4.04800
QUAD*    5. 0 1  1.32000    4.78900    2.54000    0.00000   "A3Q6
DRIFT    3.    0.39000    0.00000    2.54000    0.00000
QUAD*    5.    0.95300    0.00000    2.54000    0.00000   "A3Q7
DRIFT    3.    0.27000    0.00000    2.54000    0.00000
QUAD*    5.    0.95300    0.00000    2.54000    0.00000   "A3Q8
DRIFT    3.    0.57000    0.00000    0.00000   -2.40200
QUAD*    5. 0 1  0.97000   -9.73500    0.00000    0.00000   "A3Q9
DRIFT    3.    3.64000    0.00000    0.00000    0.00000
FIT     10.    1.00010    0.10000    0.01000    0.17500
FIT     10.    3.00030    0.10000    0.01000    0.09980
        0.00000    0.00000    0.00000    0.00000
```

Q7/8 = 0

$\Delta p / p = .2\%$

FROM THE LOG BOOK M8

	Set	I
Q12	2428	2428
Q34	1973	1973
P01	0	0
D1	1897	1897
D2	1700	1700
Q5	565	565
D4	2834	1770
D5	2325	1453
Q6	2125	2125
Q78	1800	900
Q9	1800	1800
D10	3333	2498

A Target

A'

A3
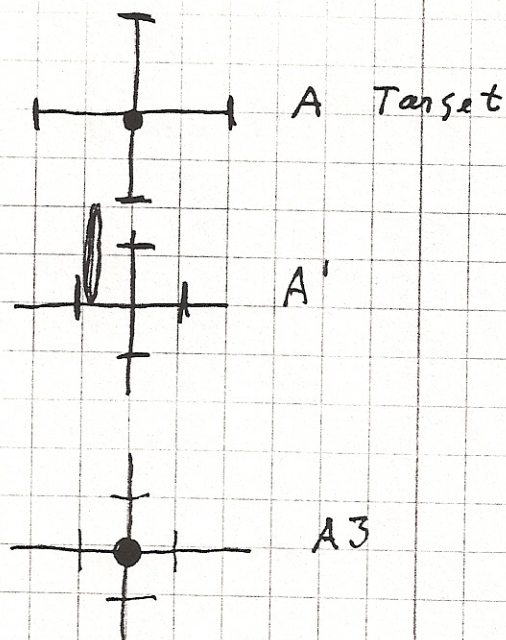
See page 13 for Counting Characteristics

D9	2750	1032

Beam / pulse   13:15   Feb 4   RHA

A (SEC)	1600
A3 (SEC)	1000
EeL	~~50~~ 170
T4·T5	30,000
OR-0	650,000
Events	150

K-short

Software Bells and Beam time seem
coterminus — ie software appears
to be keeping up with no problem

Feb 4   13:35   Go to K_L   (RHA)

Feb 4   13:35   Set D10 — 3313 Set point   2484 Amps

           14:30   DIBBUK FILE #16 HAS CURRENT
                                      SETTING

COMPUTER BOMBS ON P.O.   LPA -LINE 50 (PC= 02?

11:25   K°$_L$ P.O. - SWITCH TO K°$_S$.

Saved on File 16

Feb 4 - 14:48   Rcl
                        MS
                        QKA

Collimators on Dibbuk

	Max. Opening	Max Close	Collimation (looking downstream)		Currents Max. opening (mm)	Tuning Address
K1	3245	2090	A1C1: Horizontal		189.77	050
K2	3180	2056	A1C2	Vert. top	84.90	051
K3	3175	2059	A1C2	Vert. Bottom	84.52	052
K4	3130	2066	A1C3	Vert. top 2700	81.00	072
K5	3085	2067	A1C3	Vert. bottom 2700	-77.85	073
K6	3250	2072	A1C3	Horiz. Right	-90.22	074
K7	3250 3300	2070	A1C3	Horiz. Left	93.82	075
~~K8~~	~~3070~~	~~2067~~	~~A1C4~~	~~Vert. Top~~	~~76.57~~	~~062~~
~~K9~~	~~3080~~	~~2068~~	~~A1C4~~	~~Vert. Bottom~~	~~-77.47~~	~~063~~
~~K10~~	~~3285~~	~~2068~~	~~A1C4~~	~~Horiz. Right~~	~~-92.85~~	~~064~~
~~K11~~	~~3155~~	~~2069~~	~~A1C4~~	~~Horiz. Left~~	~~83.82~~	~~065~~

(There is no A1C4 in the A3 beam line.)

K1 is two pieces (left and right) controlled together. The maximum opening at A1C1 is thus 180 mm, or twice the Dibbuk reading.

BEAM COMPONENTS					COORDINATES	
SYMBOL	TYPE	BEARING	ANGLE	DISTANCE	NORTH	EAST
"A" STATION		16.9345°	16°56'04"		13165.997	12966.042
ABSORBER	series of holes			114."		
A1C1	COLL.	Hor.	197" drift 5.00 m	167."		
A1Q1	M210 8Q48 $l_{eff}=52"$		1.32 m $l=11"$ .28 m	223."	-2.779 kg/inch	
A1Q2	M220 8Q48 $l_{eff}=52"$		1.32 m	286."	"	
A1C2	COLL.	Vert. top bottom	$l=60"$ 1.52 m	341."		
A1Q3	8Q32-3	$l_{eff}=36"$ $l=11"$	.91 m .28 m	390."	2.045 kg/inch	
A1Q4	M226 8Q48	$l_{eff}=52"$	1.32 m	445."	"	
A1P1	8P24		$l=77.5"$ 1.97 m	499."		
A1D1	M717 18D72 gap=6"	-2.0651° 14.8694°	-2°03'54" $l_{eff}=78"$ 1.98m $l=20"$ .51m	587A.57"	17.90 kg	
A1D2	M708 18D72 gap=4"	-2.0651° 12.8043°	-2°03'54" $l_{eff}=76"$ 1.93m	97."	18.37 kg	
A1C3	COLL.	Vert, Hor.	$l=635"$ 16.17 m	638."		Pick up primary beam to clean up
A1Q5	8Q32-9		$l_{eff}=36"$ .91m $l=54"$ 1.37m	692."	off	
Flag → (see a sweep here)						
A3D3	M702 18D72 2" gap	-2.8233° 9.981°	-2°49'24" $l_{eff}=74"$ 1.88m $l=22"$ .56m	801.014"	25.80 kg	
A3D4	M802 18D72 2" gap	-2.8232° 7.1578°	-2°49'23" $l_{eff}=74"$ 1.88m $l=22"$ .56m	96."	25.80 kg	
A3D5	M730 18D72 2" gap	-2.8233° 4.3345°	-2°49'24" $l_{eff}=74"$ 1.88m $l=20"$ .51m	96"	25.80 kg	
A3D6	K.O.A. 10D72	-2.2° 2.1345°	-2°12' $l_{eff}=74"$ 1.88m $l=20"$ .51m	94"	20.10 kg	
A3Q6	M206 8Q48		$l_{eff}=52"$ 1.32m $l=17.8"$ .39m	82.987"	-4.105 kg/in	
A3Q7	M5Q36-1		$l_{eff}=41"$ $l=71.0.5"$ .27m	743.237"	off	

(left margin notes:)
SWICs
Flag &
SEC

not named? for string

Flag

BEAM _A·3_ EXP. NO. _180_ DATE _11-5-84_

REF. D'W'G. NOS. _D14-1188-C-5A1_ BY _Ruiz_ ORIG. _____

in series ↑

SWC FWy) SEC I.C. →

BEAM COMPONENTS					COORDINATES	
SYMBOL	TYPE	BEARING	ANGLE	DISTANCE	NORTH	EAST
A3Q8	M5Q36-2	ℓ_{eff}=41"	.953m 1.04m	191.237"	off	
		ℓ=20.8"	.57m .53m			
A3Q9	MN3Q3G10	ℓ_{eff}=38"	.97m	251.487"	7.941 kg/in	
		ℓ=143.5"	3.64m			
A-3 TARGET				429.987"		
A3D7	M715 18072			473.987"		
A3D8	M712 18072			587.987"		
A3D9	M727 18072			704.987"		
A3D10	M72018-3			980.98"		

HIGH POWER TUNE

BY _Schwaner_ DATE _4/23/85_ SHEET _1_ OF _2_

EXPERIMENT NAME _Morse/Schmidt_ NO. _780_ LIAISON _T. Blair_

BEAM CONDITION _POSITIVE_ MOMENTUM _28.5 GeV/c +_

REQUESTED BY _____ DATE ____ TIME ____

COMPLETED-WATCH SUP. _____ DATE ____ TIME ____

Field
Feb 4, 1984

DESIG.	MAG.	P.S.	R.V.	POL.	POS.	INIT.	T.S.	POS.	INIT.	TAP	INIT.	MAG. I	INIT.
A₁Q₁	210	407	69	B					Eddooks ✓	2		2430	✓
A₁Q₂	220	417ᵐ	/	B					✓	2		"	✓
A₁Q₃	8Q32-3	401ᵐ	67	A					✓	4		1975	✓
A₁Q₄	221	425	/	A					✓	4		"	✓
A₁P₁	8P24-1	10-3	BI	B						—		138	off
A₁D₁	717	402	62	A					✓	2		1882	1897
A₁D₂	708	436	BI	A					✓	3		1640	1700
A₁Q5	8Q32-9	412	80	A					✓	4		565	✓
A₁D₃	702	324	BI	A					2480	3		1550	✓
A₁D₄	802	322	BI	A					2835	1		1770	✓
A₃D5	730	318	36	A					2325	3		1500	1453
A₃D6	CATH OF ARGON	5125-1	NA	A					2150	1		(269)	1130
A₃Q6	206	421	PS4	B				81	✓	4		2600	2125
A₃Q7	5Q36-1	252	45	B				41	1800	1		1100	900
A₃Q8	5Q36-2			A					↓			1100	900
A₃Q9	N3Q36-10	420	68	A				90	✓	4		2200	1800
A₃D7	715	307	NA	B				88		3		1200	
A₃D8	712	405	AS2	B				63		2		1867	
A₃D9	727	923	BI	A				38		1		1000	
A₃D10	72D18-3	268 450-5	BI	A				44		1		2500	
A₃D10T	18C72 Coils	468	BI	A						3		1500	

SENSITROLS SET BY _____ DATE _____

EXPERIMENTAL BEAM COMPUTER SET UP

BEAM LINE [A3] STATUS [PRIME] SHEET 2 OF 2

EXPERIMENT NAME MORSE/SCHMIDT NO. 780 MOMENTUM 28.5 GeV/c+

COMPUTER B PORT NO. 3 TERMINAL NO. 6 TUNE BOX 7

REQUESTED BY _____ DATE _____ LIAISON _____

COMPLETED BY _____ DATE _____ FILE LOCATION [____]

IN CTS

ID	POWER SUPPLY	SET POINT	TOL	POL	STATUS	MAGN LIMIT	ADD
Q12	417	2430	4.0	B	ON	2564	201
Q34	401	1975		A	ON	1996	202
P01	10-3	2208·		B	ON	4000	203
D01	402	1882		A	SECURITY INTL'K ON	2409	204
D02	436	1640		A	SECURITY INTL'K ON	2409	205
Q05	412	565		A	ON	3000	206
D03	324	2480·		A	SECURITY INTL'L. ON	2496	207
D04	322	2832·		A	ON	2848	210
D05	318	2400·		A	ON	2416	214
D06	S125-1	2152·		A	ON	2232	215
Q06	421	2600		B	ON	3200	212
Q78	252	2200·		B/A	ON	2400	220
Q09	420	2200		A	ON	2400	213
D07	307	1920·		B	ON	2000	221
D08	405	1867		B	ON	1900	217
D09	923	2666·		A	ON	2693	222
D10	450-5	3333		A	ON	3346	223
D10T	468	1500		A	ON	1800	224

COMMENTS: HIGH POWER TUNE

SECURITY INTL'K. P.S. 402, 436, 324

HIGH RISK ELEMENTS A3D6, A3D10, A3D10T

WATCH SUPERVISOR _____

12-76

A-A3

Tune STRONG

A1Q5 = 0.

A-A3   A1C3 High

4/2/8
10:05
1982
R. H Brown

AIQI-4 , Q6

Multiply by kamps to get gradient

G$_{POINT}$ 8" QUAD.
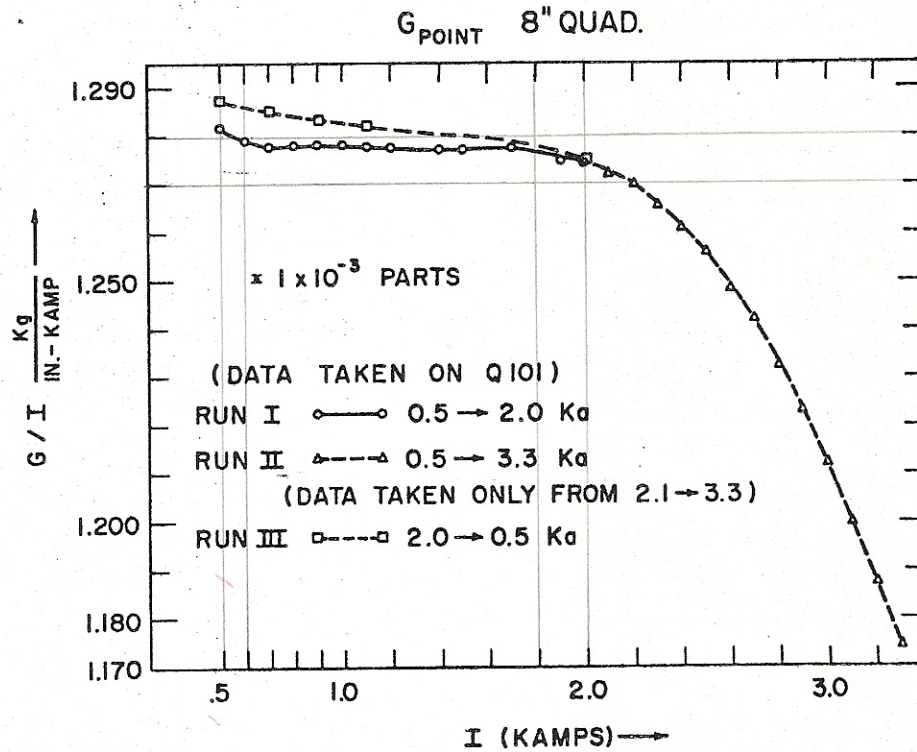

Fig. 6. Gradient, G point, vs I for 8 inch quadrupoles.

A.D. GTD-2

Danby

A1Q1-4, Q6
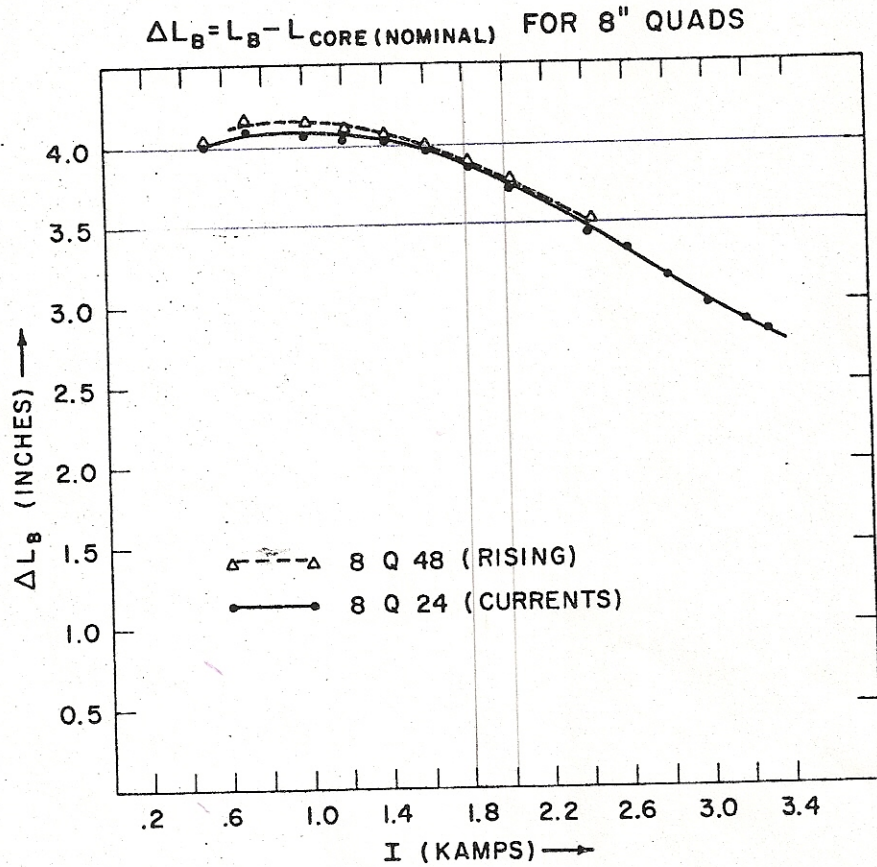

$\Delta L_B = L_B - L_{CORE(NOMINAL)}$ FOR 8" QUADS

Fig. 7. Magnet length, L_B, vs I for 8 inch quadrupoles. ($L_B = \Delta L_B + L_{core}$).

5Q36   A3 Q7, Q8

35.1

45.2   5 Q 36

TOP VIEW

END VIEW

5.375 in. Bore

5 Q 36

88.2

66

SIDE VIEW

5Q 36

Eff. Length 37.5 Inches

Field Gradient (Kilogauss per Inch)

I – Magnet Current (Amps x 10^2)
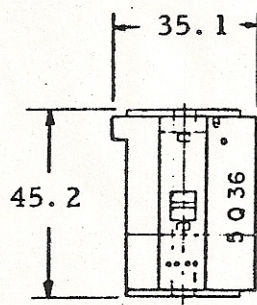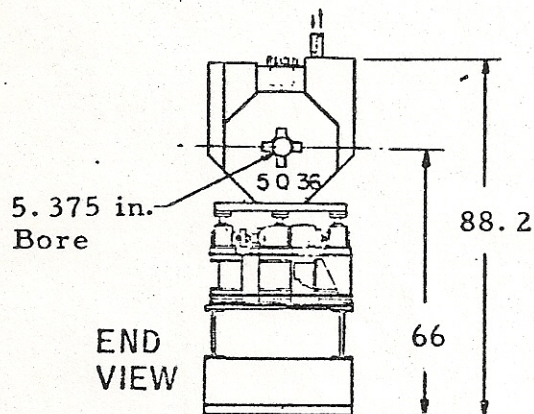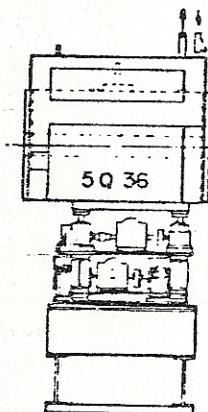
Total Weight: 3.5 Tons
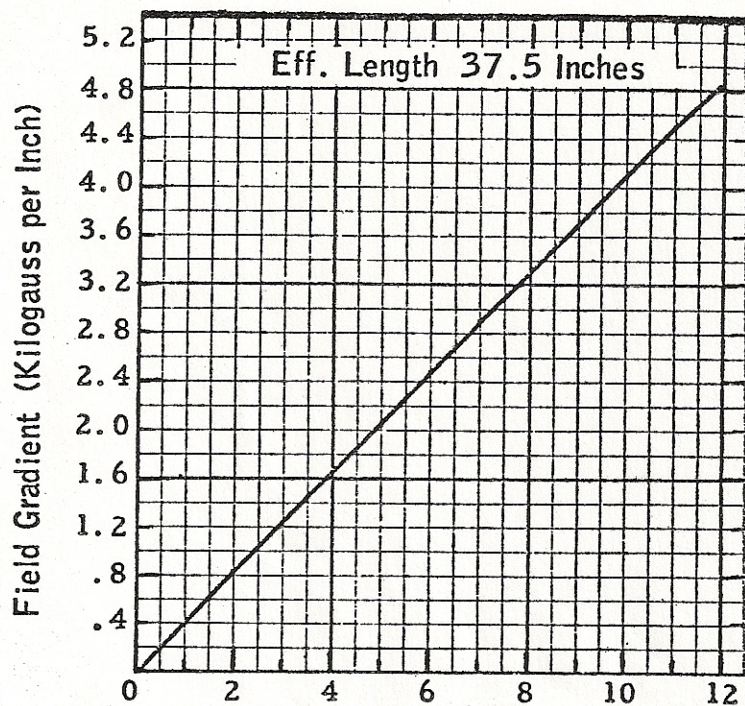
Measured Data:
Voltage   122 Volts dc
Current   1200 Amps dc
Power   146 kW
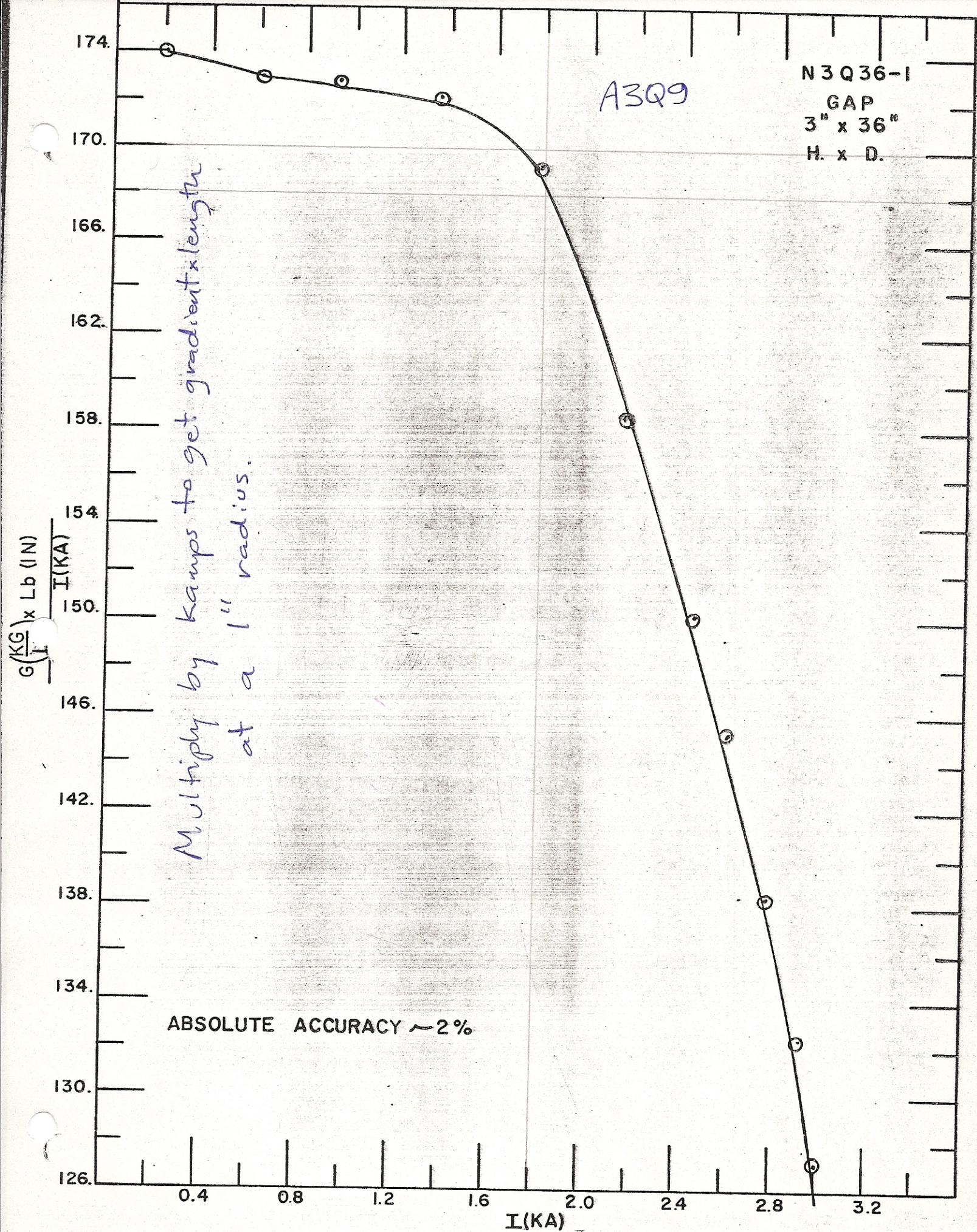Field Strength   13.0 kG

Cooling Water
(System Pressure Drop 200 psi)

No. of Circuits   24
Pressure Drop   75 psi
Flow   14 gpm
Temp. Rise   72°F

Current (Amps)	Terminal Voltage (Volts)	Gauss/ Inch
200	19	831
300	28	1244
400	38	1658
500	48	2075
600	58	2488
700	68	2907
800	78	3317
900	90	3724
1000	101	4116
1100	112	4489
1200	122	4832
Errors	± 2%	+1 to +3%

N3Q36-1
GAP
3" x 36"
H. x D.

A3Q9

$\dfrac{G\left(\frac{KG}{I}\right) \times Lb \, (IN)}{I(KA)}$

Multiply by kamps to get gradient x length at a 1" radius.

ABSOLUTE ACCURACY ~ 2%

I(KA)

Danby

18D72 (6" gap)

$$(SIN\,\theta_f - SIN\,\theta_i)\,P\,(Bev/C) = \frac{1}{1313.22}\int B_s ds\,(kg\text{-}IN.)$$

$$= \frac{BL_B\,(kg\text{-}IN.)}{1313.22}$$

RUN # I

a) △——△
500 → 2100 AMPS

b) ○——○
2100 → 600 AMPS

RUN # II

☆--☆
50 → 300 AMPS

RUN # III

a) ✕--✕
100 → 1400 AMPS

b) ■
BACK TO 1200 AND
UP TO 1400 AMPS
AGAIN

c) ●--●
1400 → 100 AMPS

_1022 kg·in_

_18.06 kg_

NOTE
THIS DATA SHOULD
BE INCREASED BY
1.0025
(18D72 ONLY)

y-axis: BL_B/I (k GAUSS/KAMP × INCHES)

x-axis: I (KAMPS) →

Fig. 2. $\int B_s ds$ vs I for 18D72 magnets.

1 kamp ⇒ 735 $\frac{kg}{kamp}$ × inches
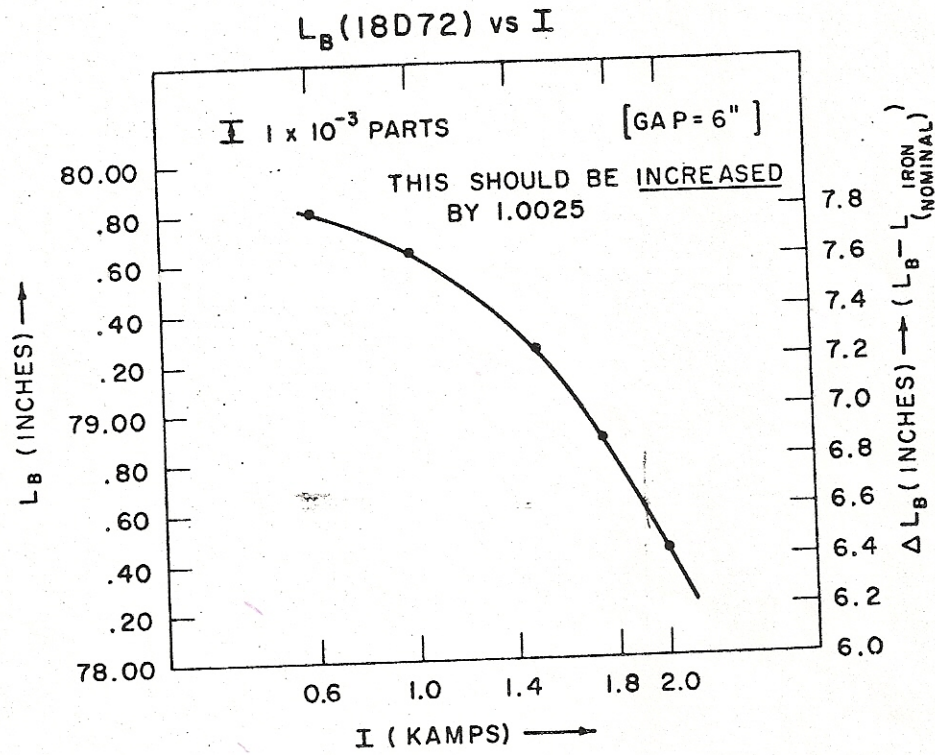
$L_{eff} = 79.6$

$B \simeq 735/79.6 = 9.23\ kg$

AIDI

Fig. 3.   Magnet length, L_B, vs I for 18D72 magnets.

(6" gap)