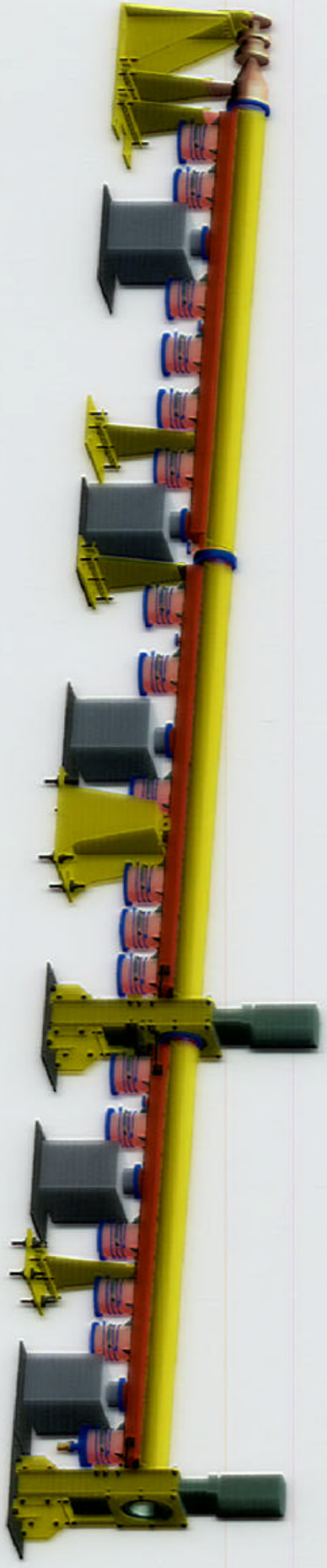
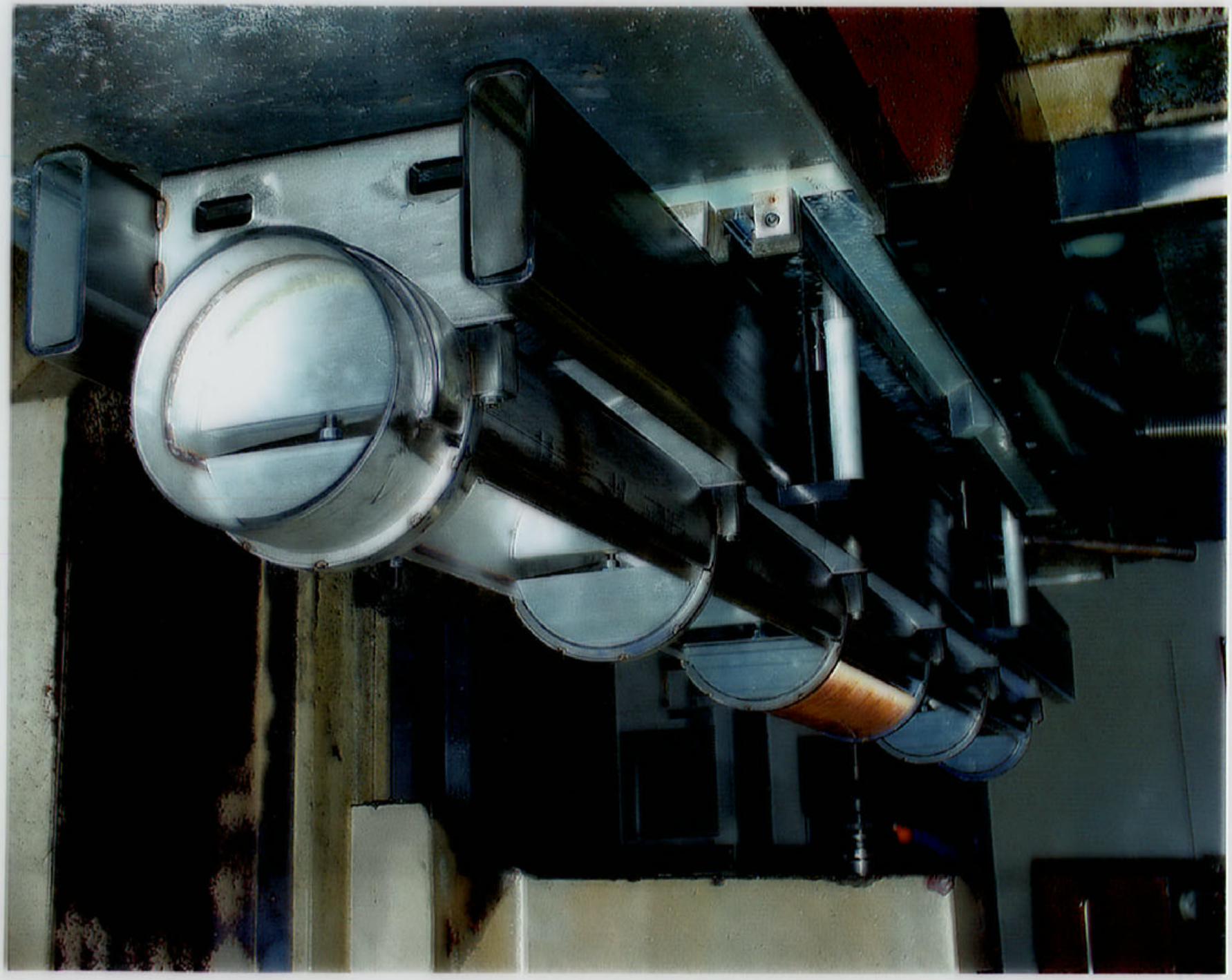
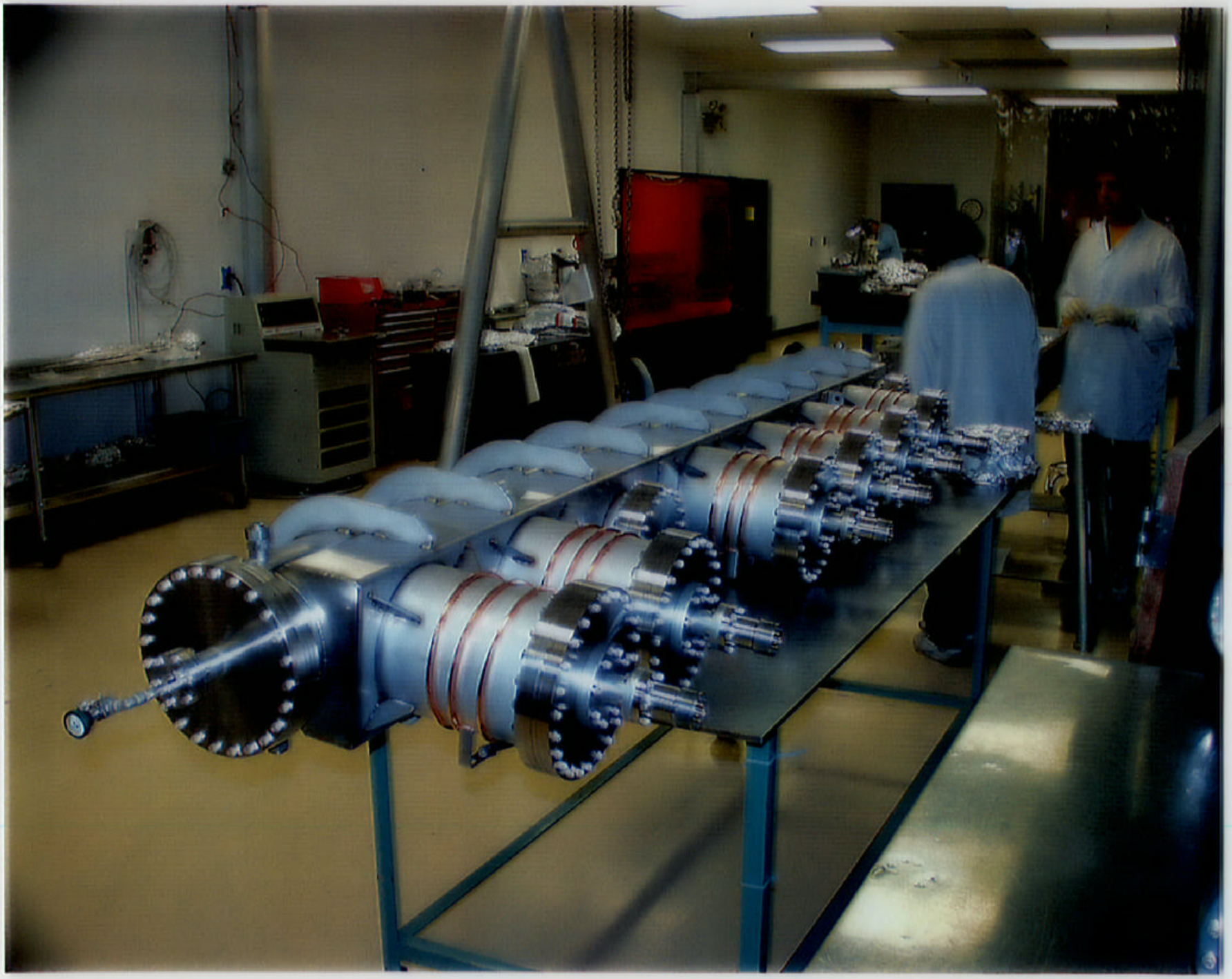
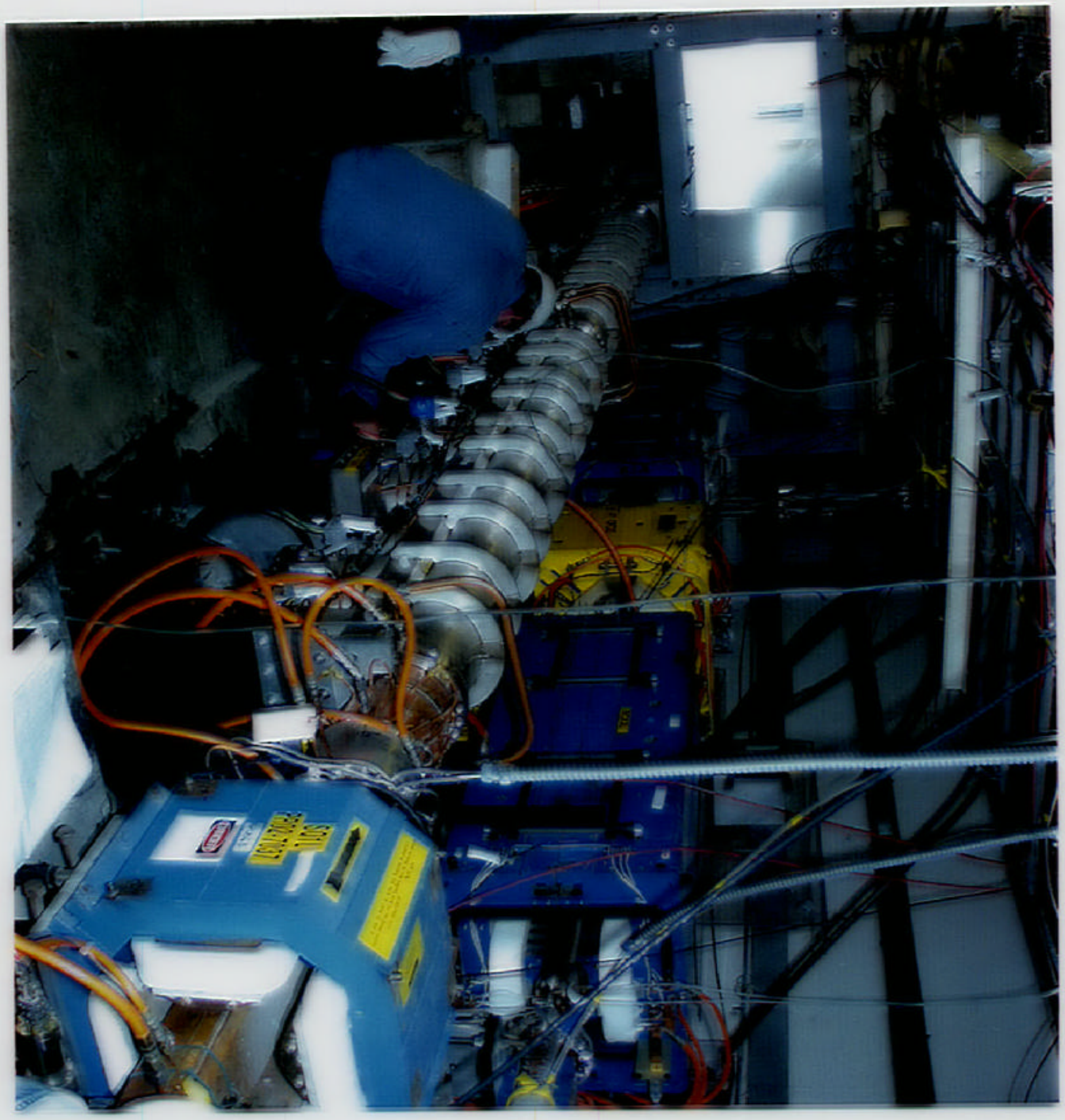
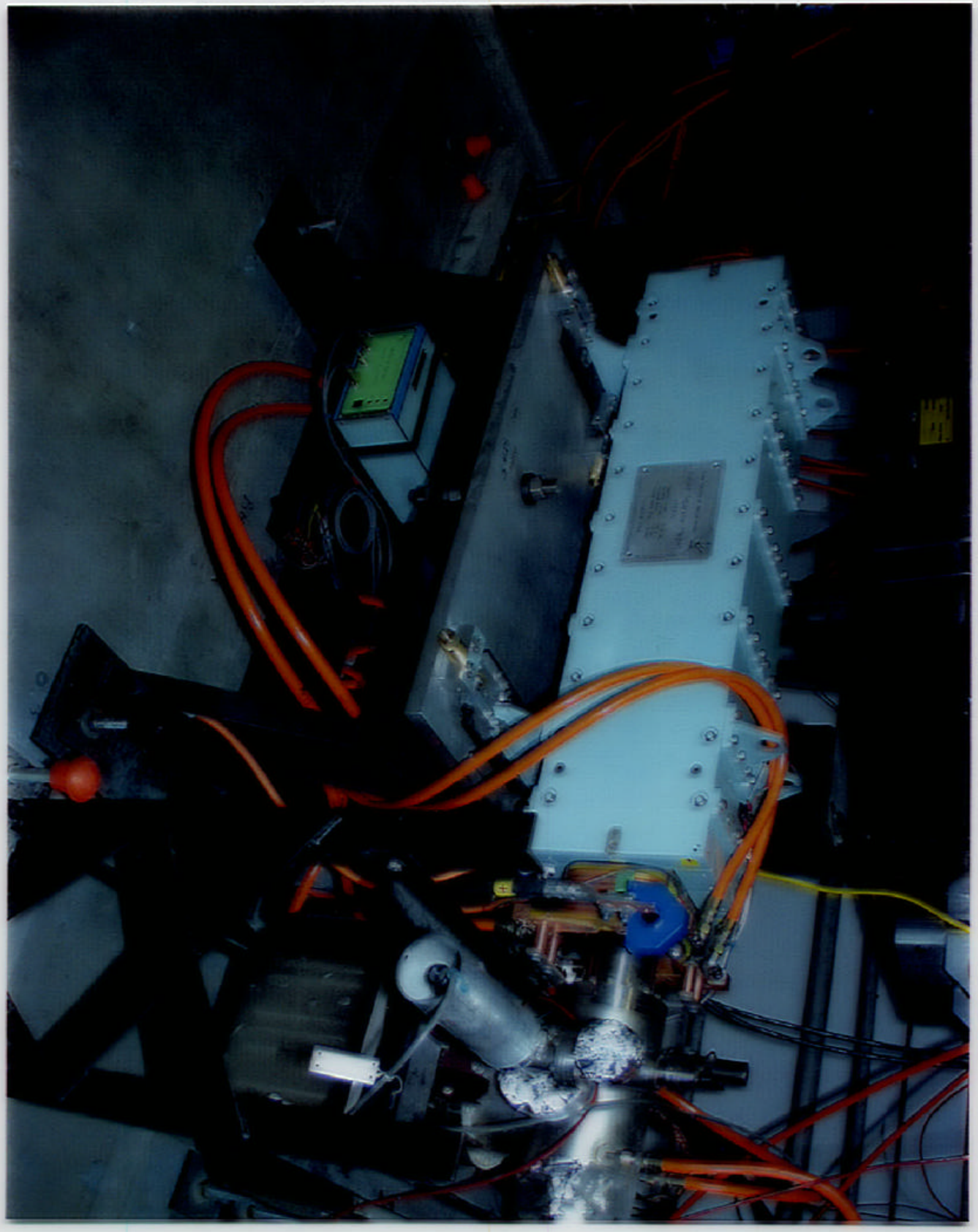
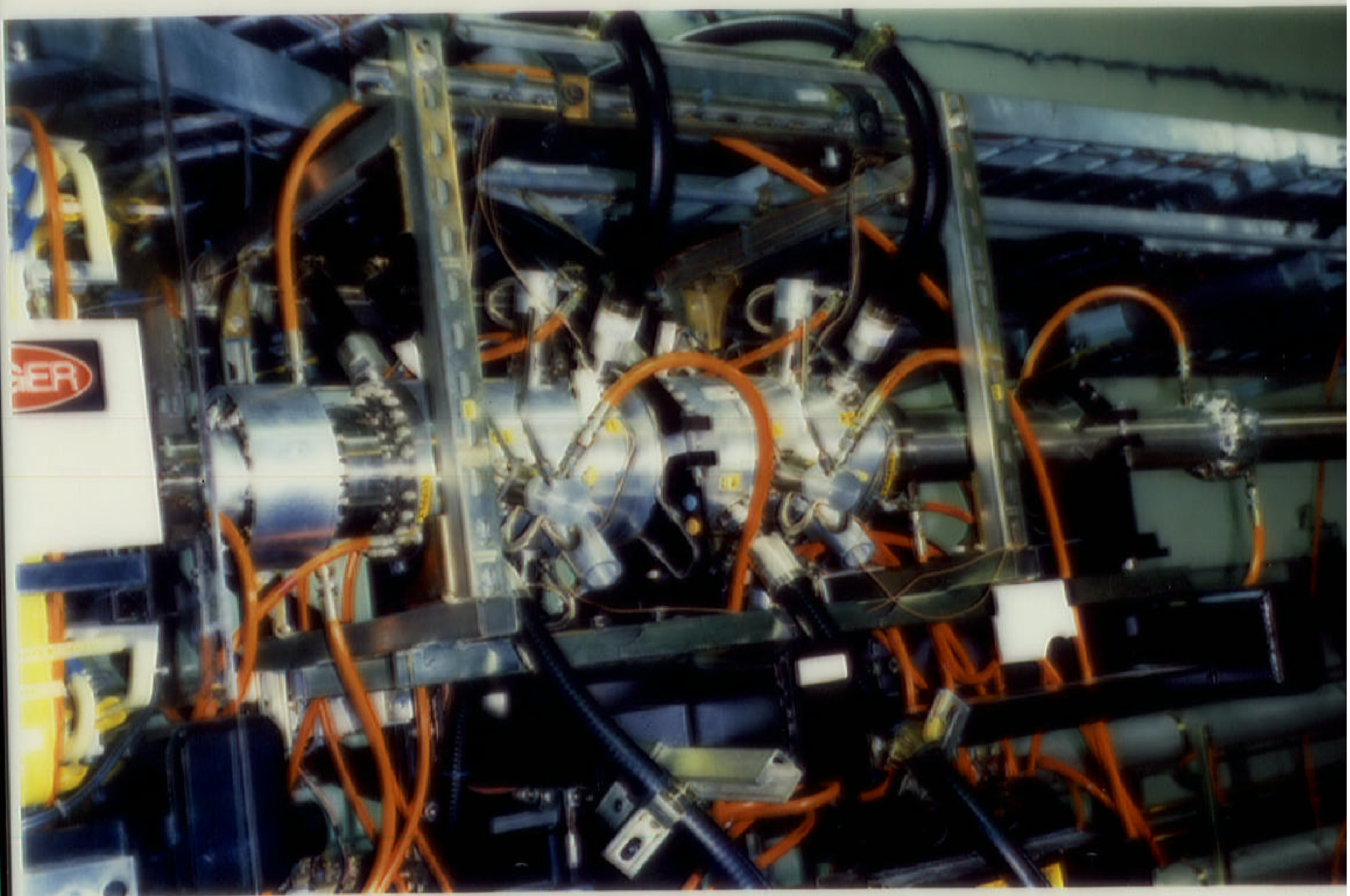








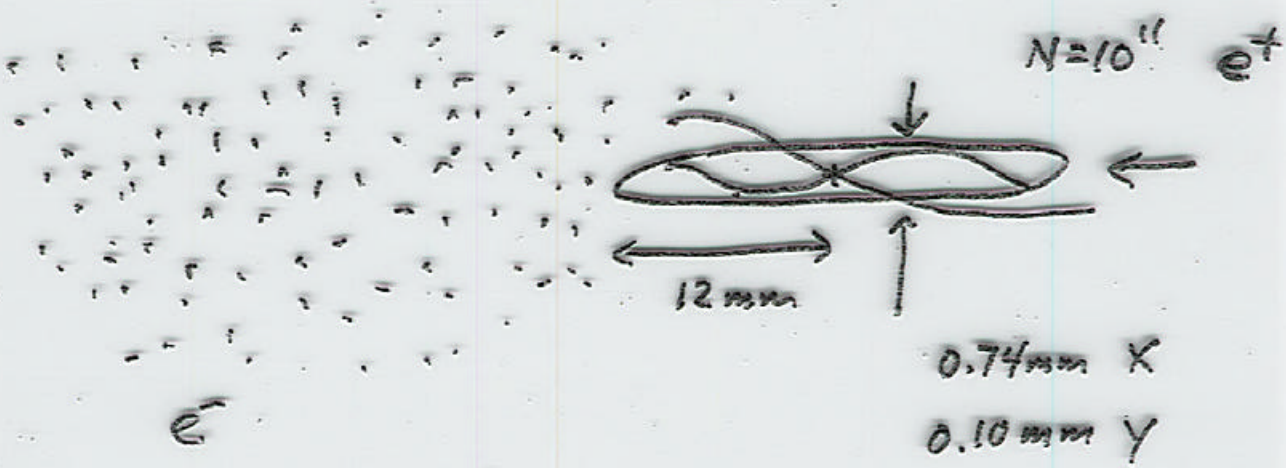




Low Energy Ring Longitudinal Kicker

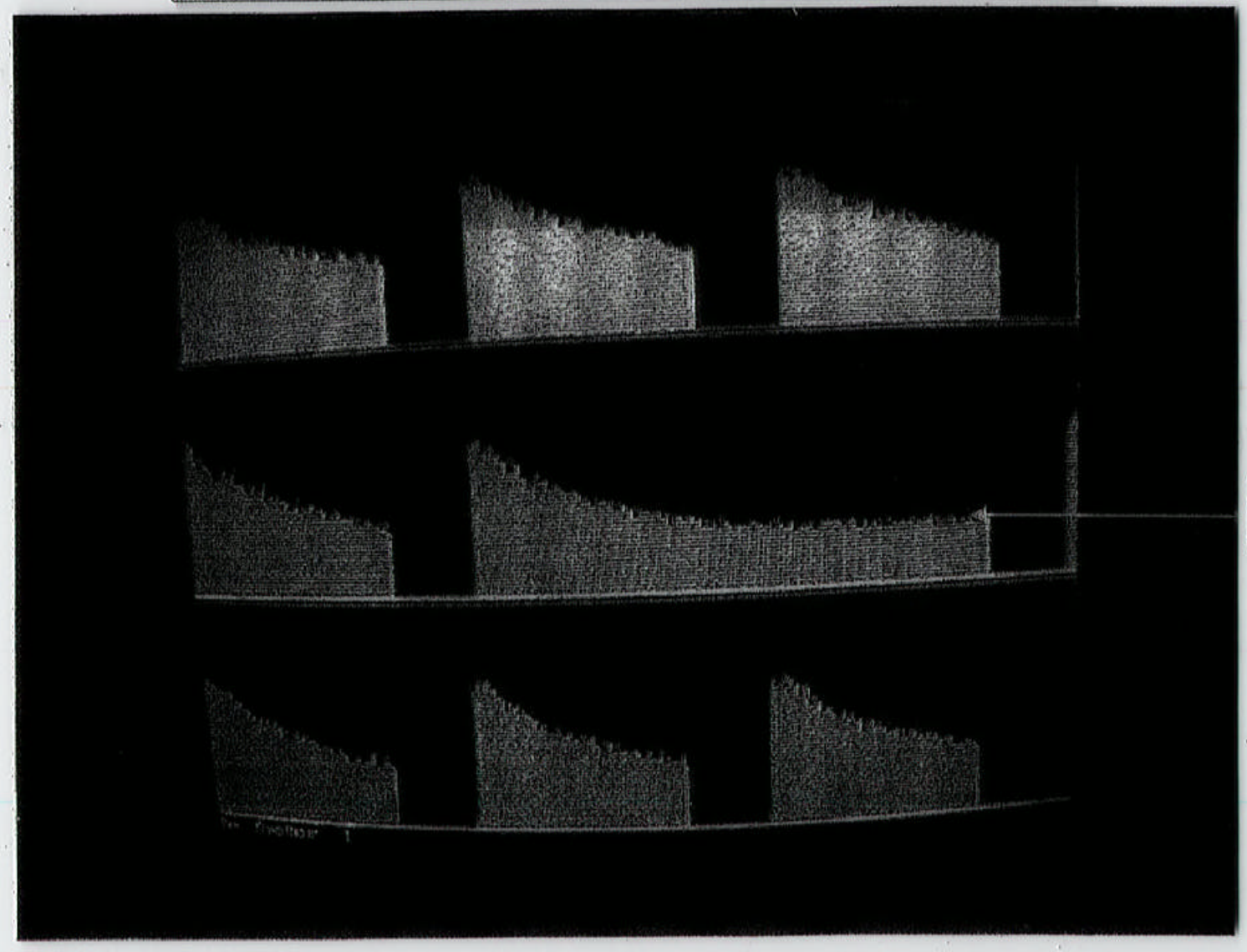
PEP-II Electron Cloud Instability

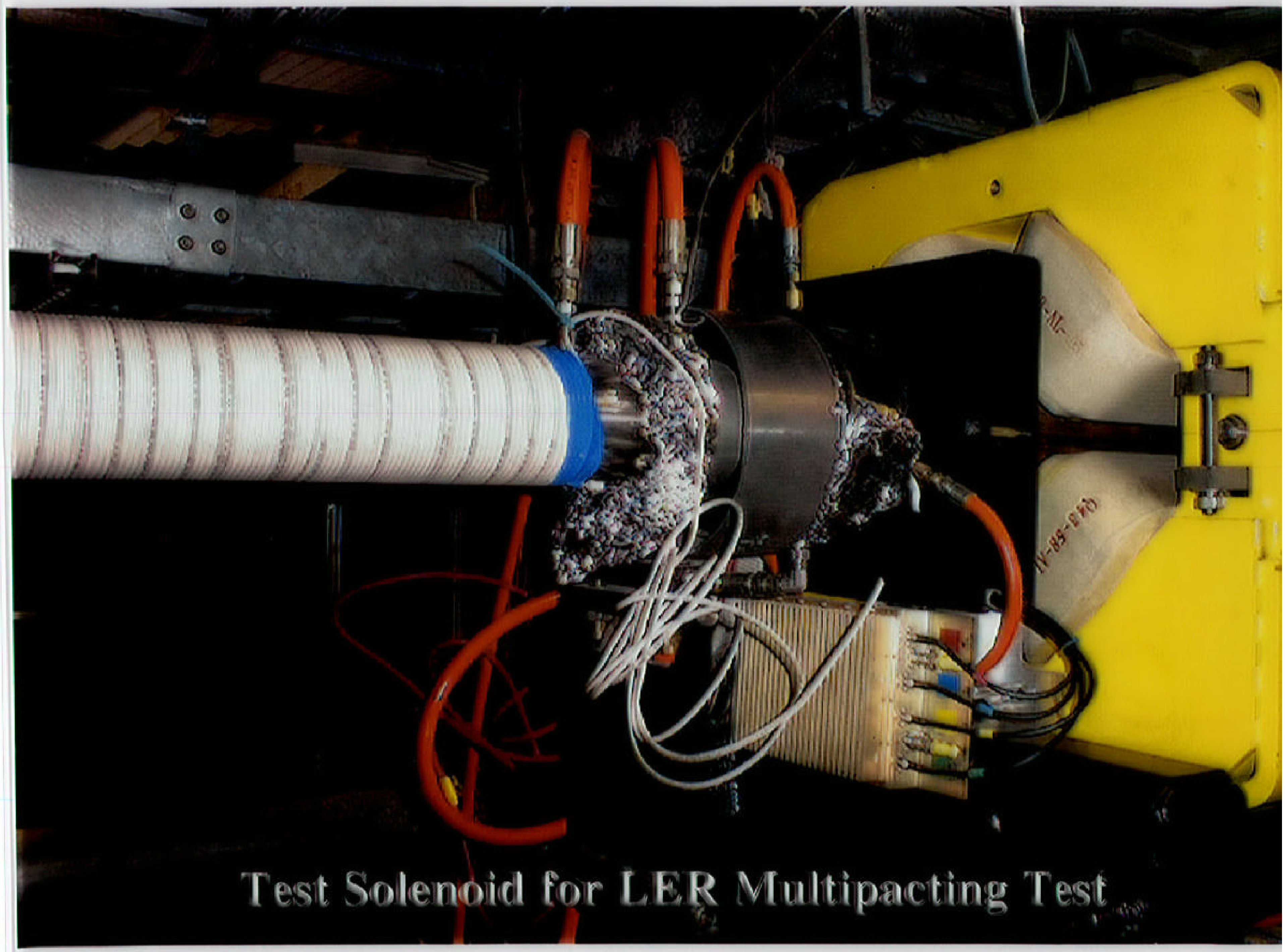
Head Tail Instability



Luminosity versus Bunch Number

Pattern: by-4 with 8-1 additional big gaps (July 2000)

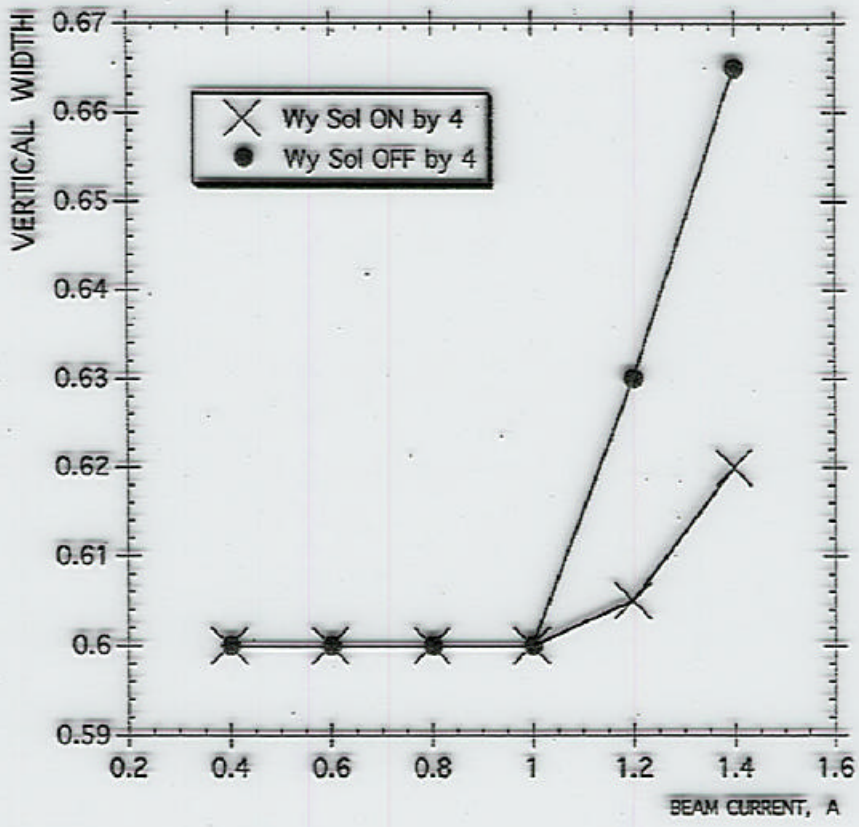




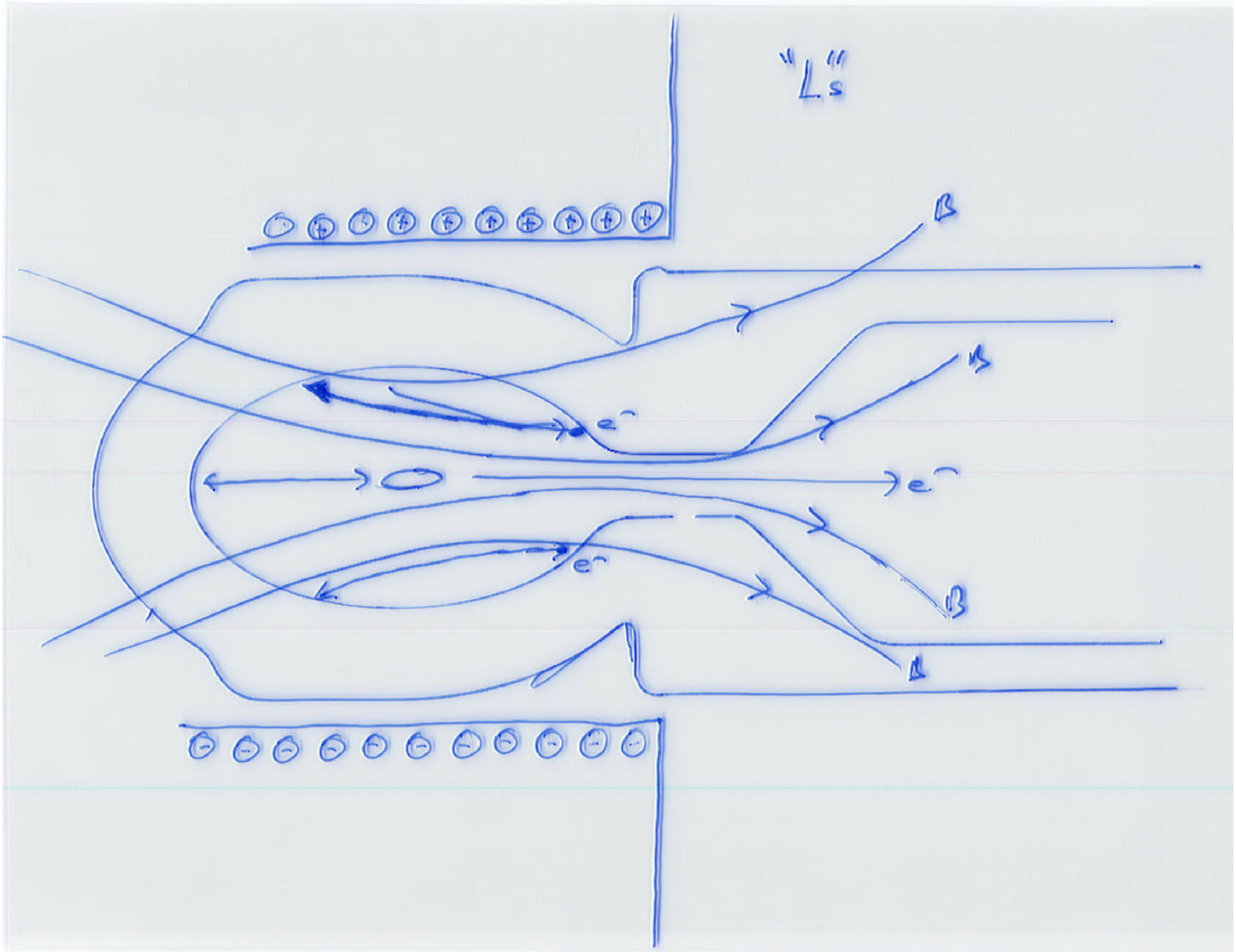
Test Solenoid for LER Multipacting Test

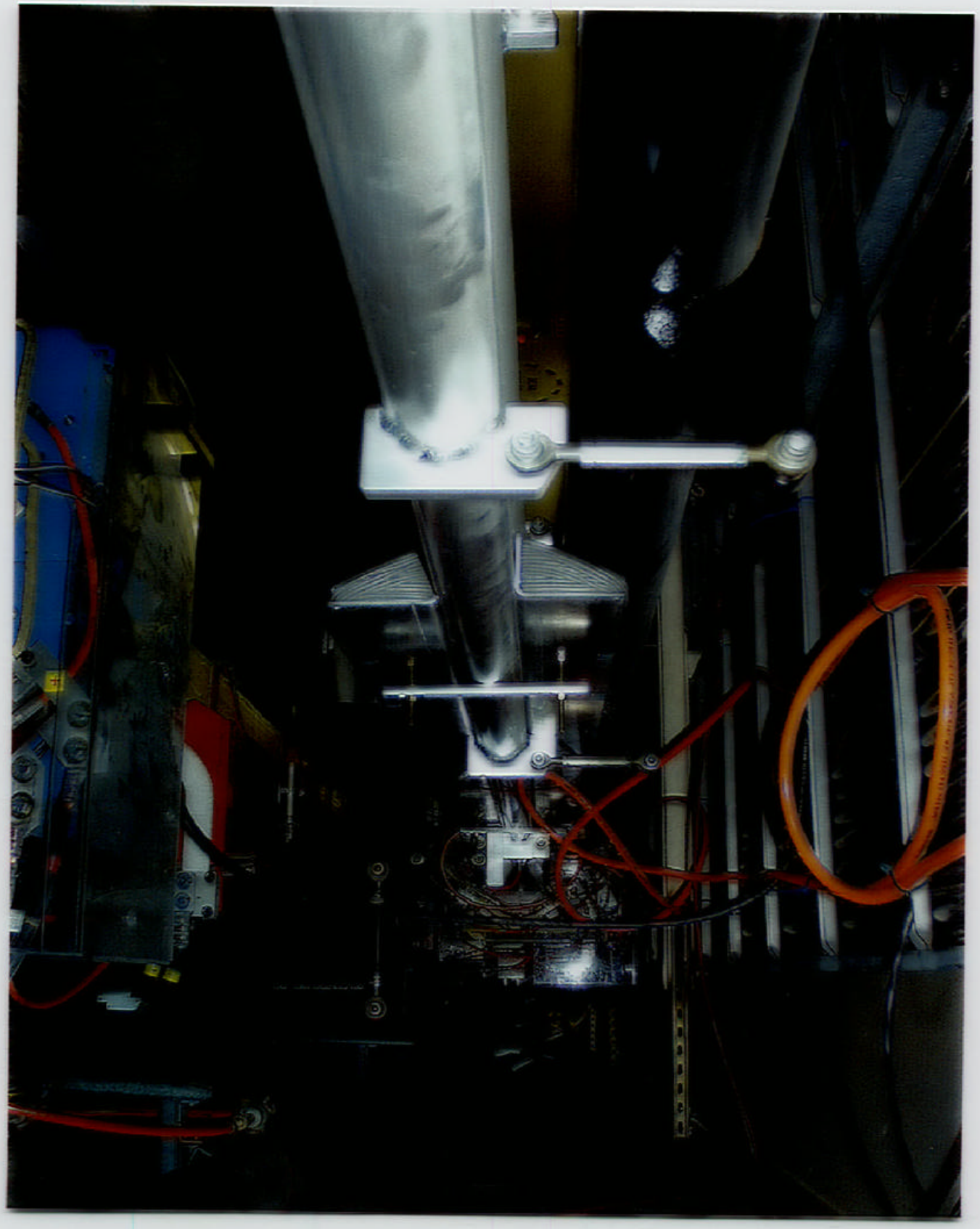
LER Beam Blowup

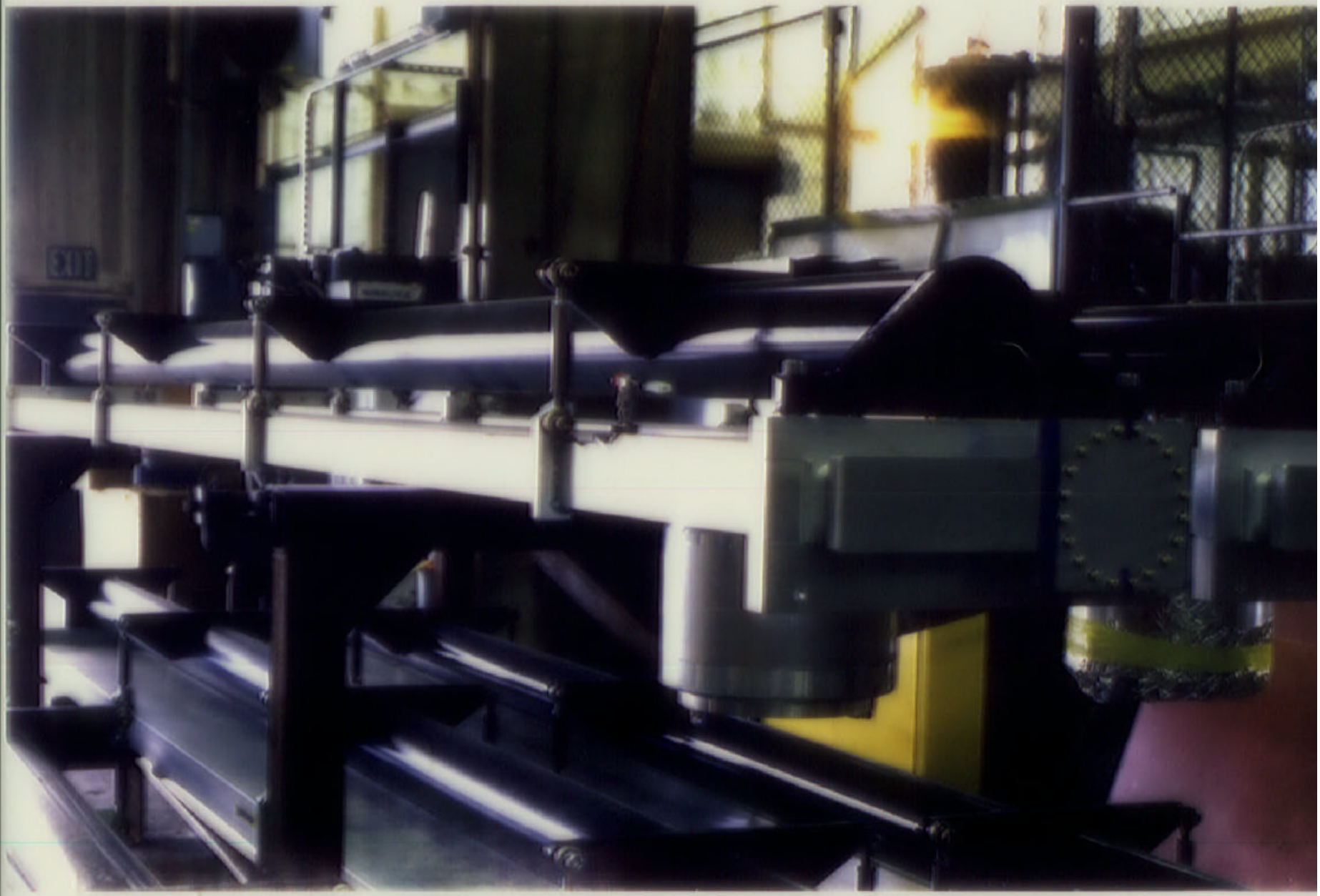
LER beam size vs beam current



LER blowup.cvs; 12/12/0 12:12


"L"
s
B
B
B
e⁻
e⁻
e⁻

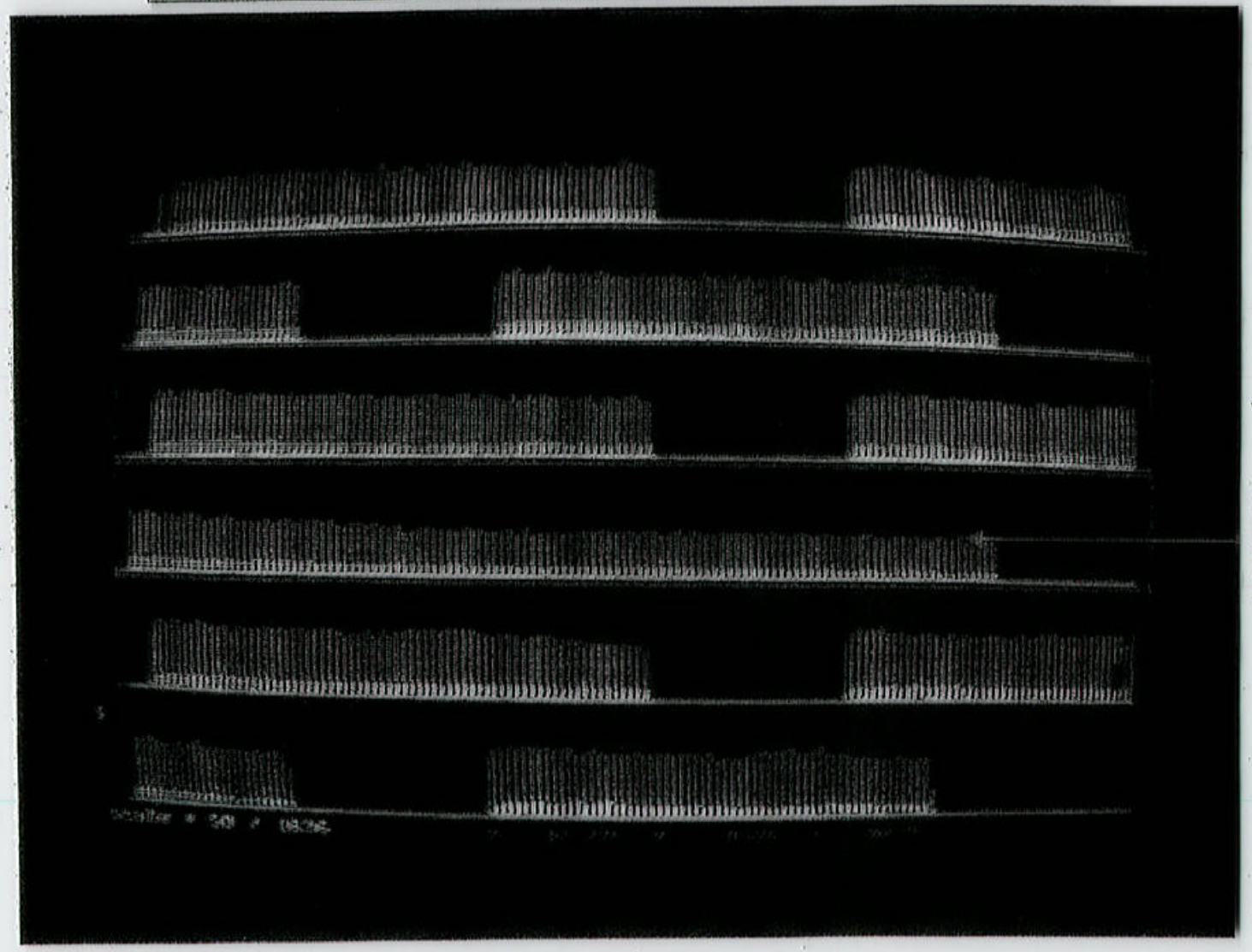




Low Energy Ring - Pumping Chamber

Luminosity versus Bunch Number

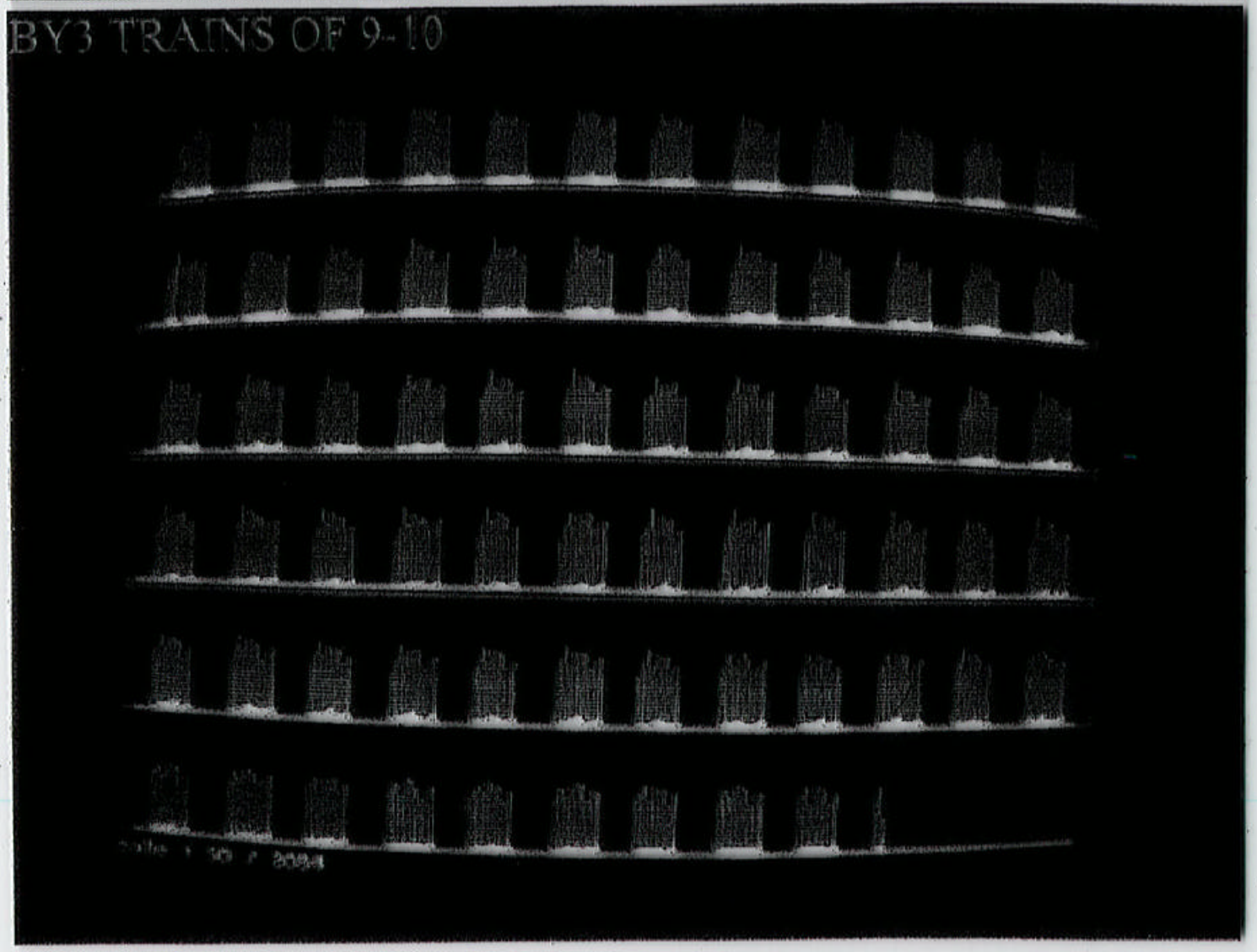
Pattern: by-4 with 8-1 additional big gaps (Oct. 2000)

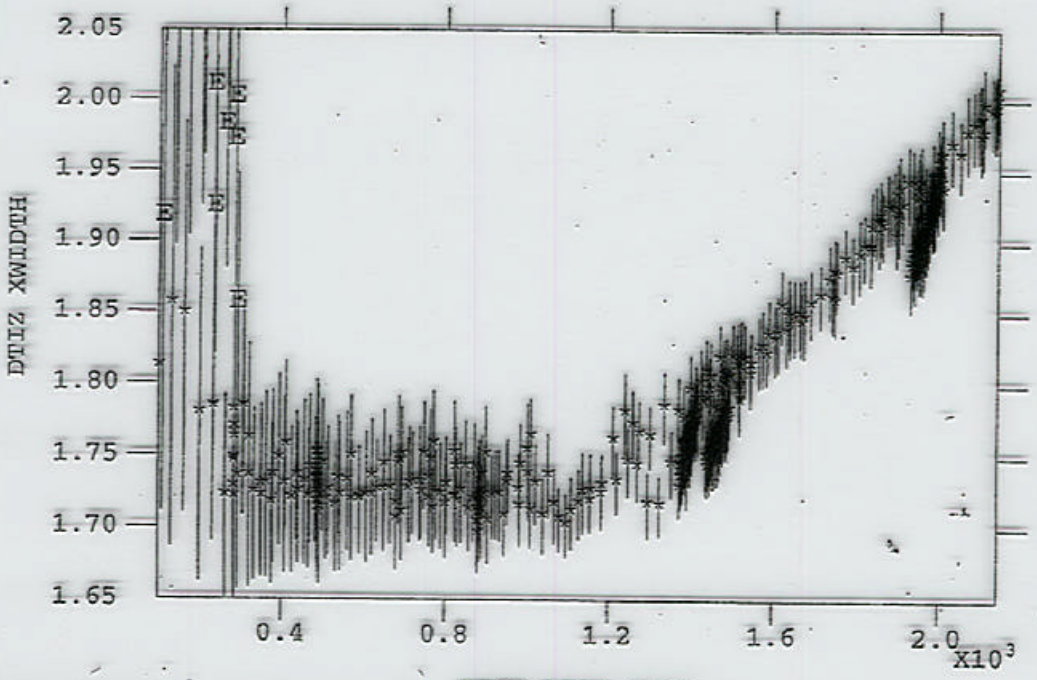


60%

Pattern with Highest Luminosity: $3.1 \cdot 10^{33}\ cm^{-2}s^{-1}$

Pattern: by-3, 10 bunches, 6 free (micro gaps)

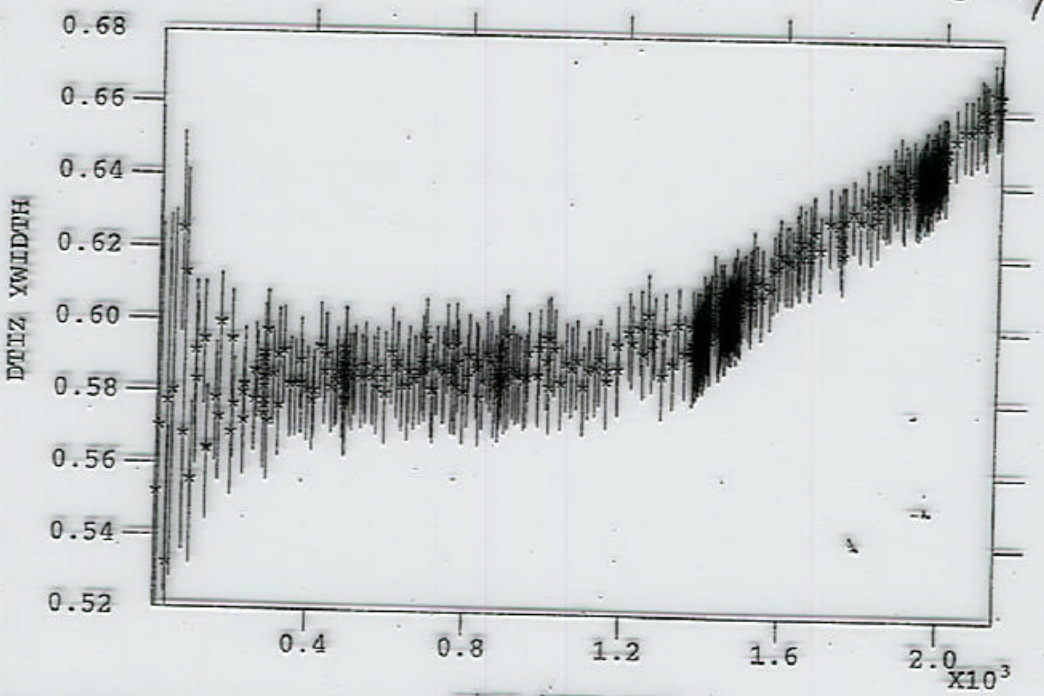




LB60:DCCT:SUMY
STEP VARIABLE = TIME STEPS = 512 DELAY = 5.000

31-OCT-00 08:51:12

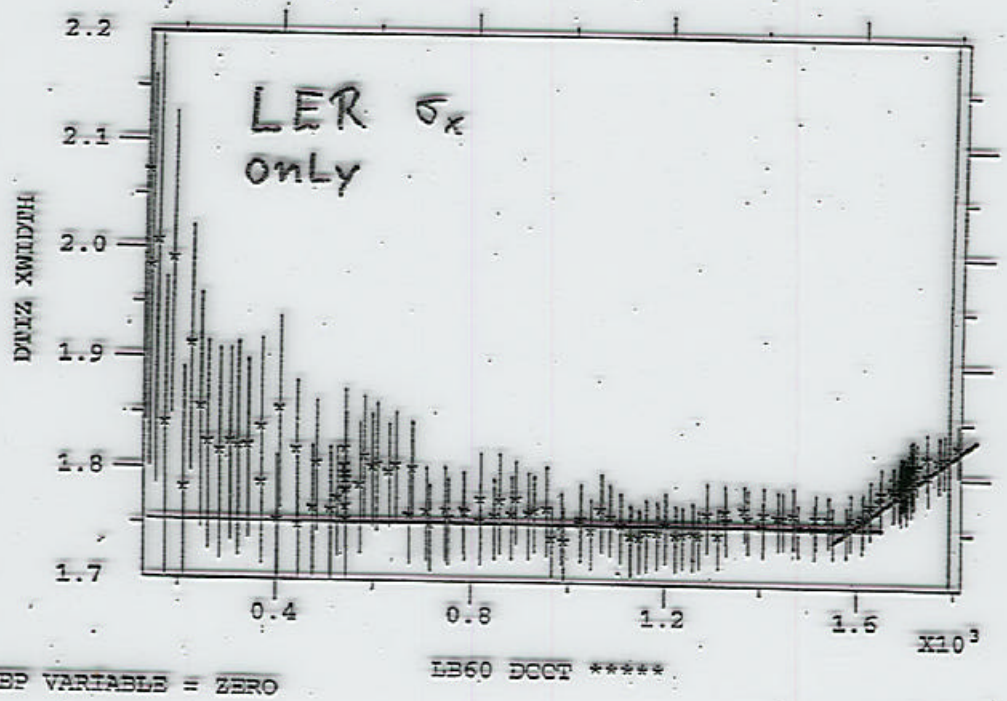
1660 bun
x2
e⁺ only



LB60:DCCT:SUMY
STEP VARIABLE = TIME STEPS = 512 DELAY = 5.000

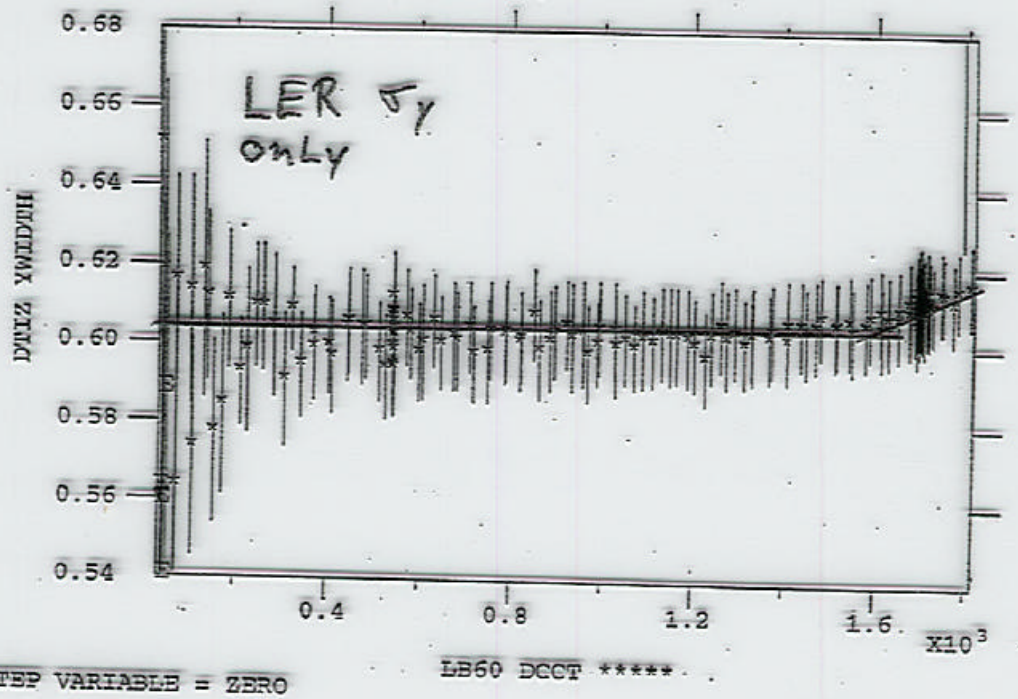
31-OCT-00 08:44:41

By 3 832 bunches



STEP VARIABLE = ZERO

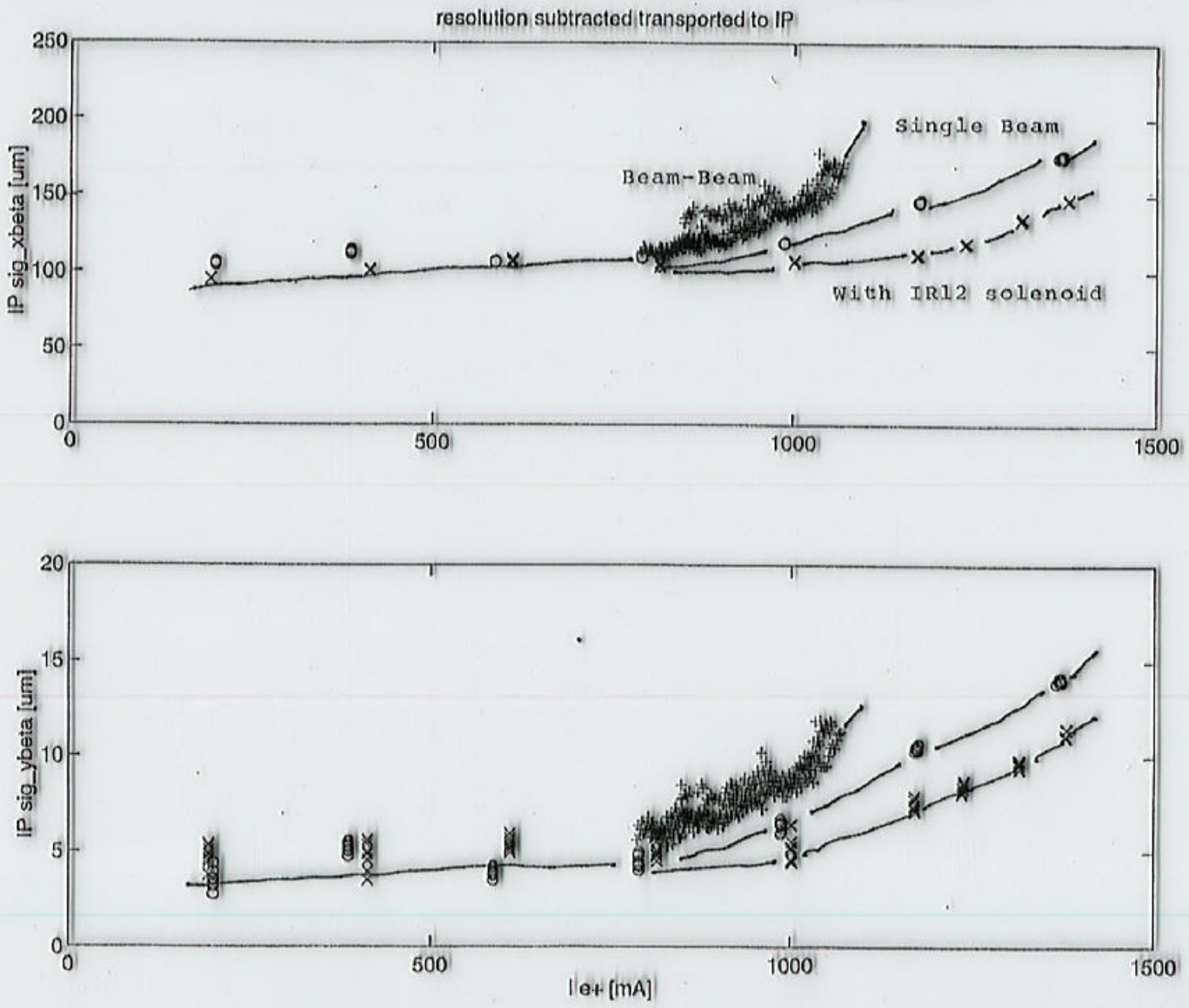
~~16-NOV~~-00 08:50:01
31-Oct



STEP VARIABLE = ZERO

~~16-NOV~~-00 09:27:45
31-Oct

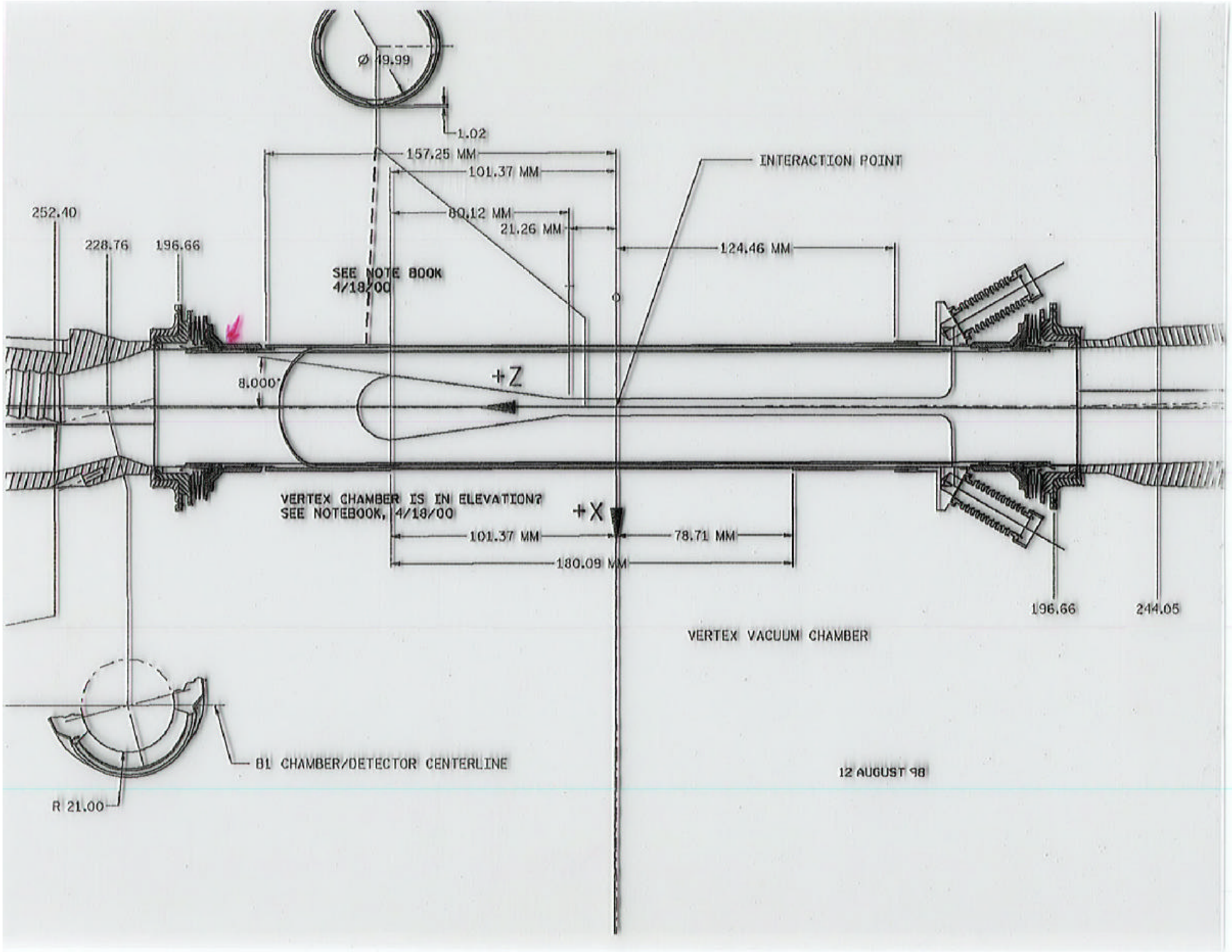
LER e+ Beam Enlargement Versus Current

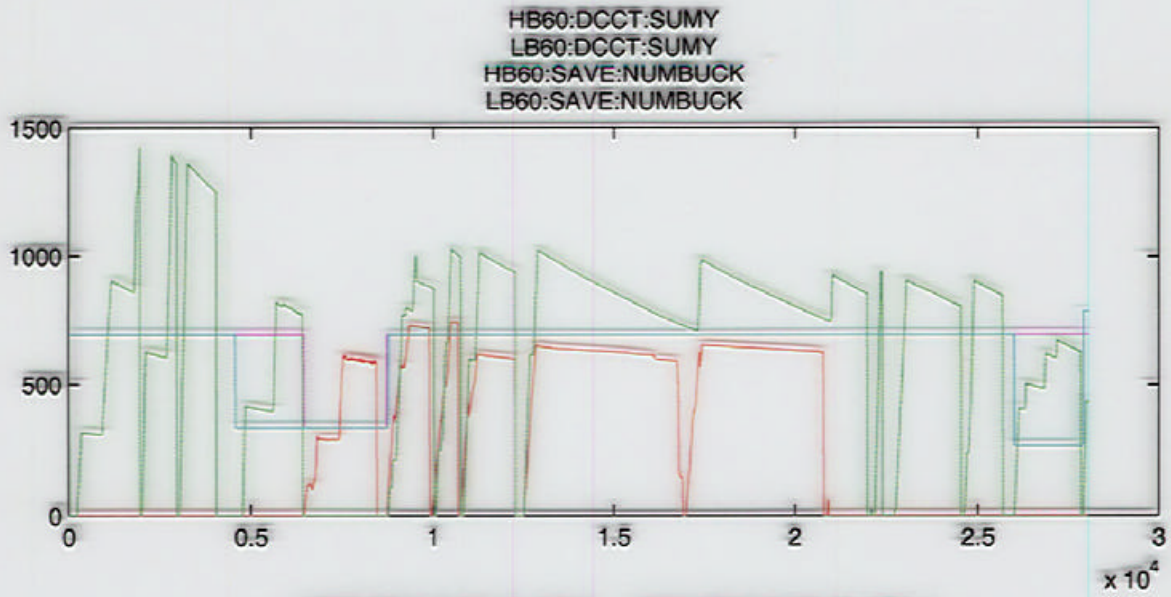


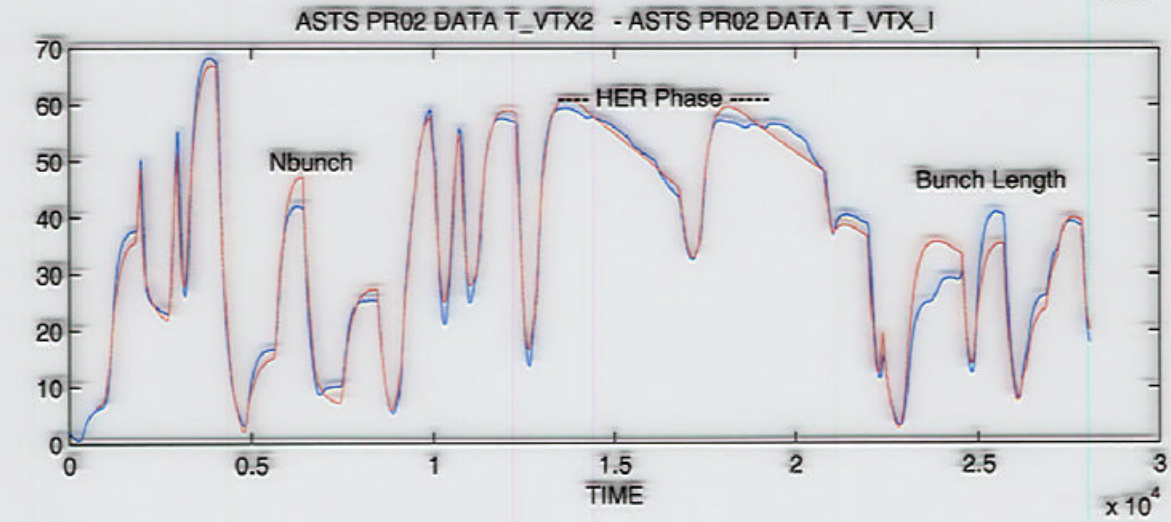
U:\r\rogers\pub\PEP_II\ma_od\ms_108.jpg

MS_108

05/27/98


Ø 19.99
1.02
157.25 MM
101.37 MM
80.12 MM
21.26 MM
124.46 MM
INTERACTION POINT
252.40
228.76
196.66
SEE NOTE BOOK
4/18/00
8.000
+Z
+X
VERTEX CHAMBER IS IN ELEVATION?
SEE NOTEBOOK, 4/18/00
101.37 MM
78.71 MM
180.09 MM
196.66
244.05
VERTEX VACUUM CHAMBER
B1 CHAMBER/DETECTOR CENTERLINE
R 21.00
12 AUGUST 98






```
H1=9.26e-003  (0.10)
L1=2.09e-002  (0.39)
M1=2.26e-002  (0.34)
N1=1.79e-002  (0.61)
a1=-1.09e-003  (-0.01)
ts= 249 sec
rms=2.76e+000
```

file:T001031_1.MAT 31-OCT-2000 12:24:24.18 crr fig 1

PEP-II MD 30-31 Oct 2000

IR (Vertex Chamber) Thermocouples

Stan Ecklund
report 3
1 December 2000

Part I. Current Dependence

Goal: Determine response of thermocouples to each beam current and product of currents.

Fit the data to:

$$T = T_0 + H I_- + L I_+ + M I_-^2 / N_b + N I_+^2 / N_b + a I_- I_+ / N_b$$

varying the coefficients T_0, H, L, M, N, a.

Part II. Frequency

Goal: Determine resonant frequencies of HOM heating.

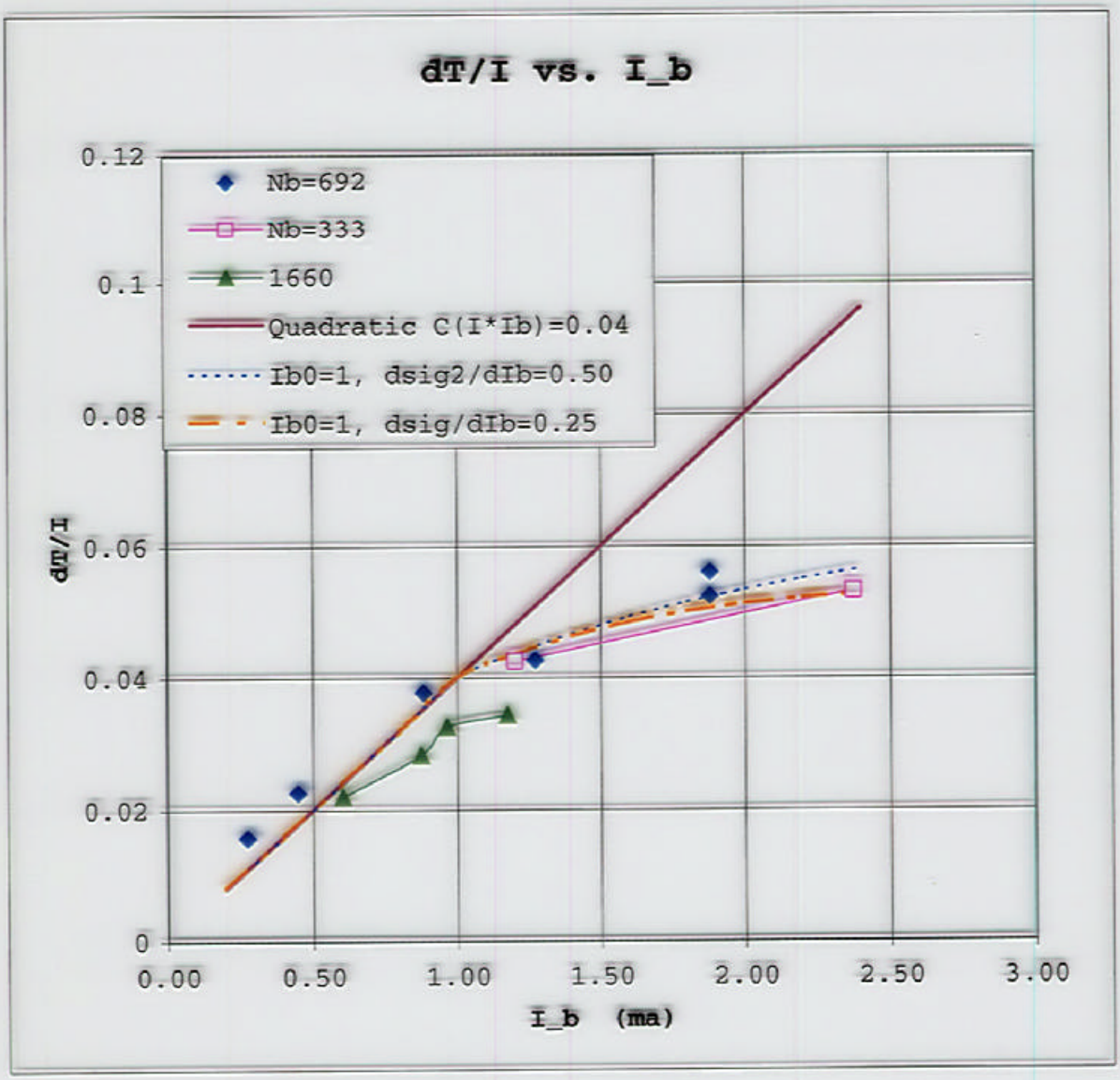
Part III. Orbit Dependence

Goal: Determine if orbit affects heating.

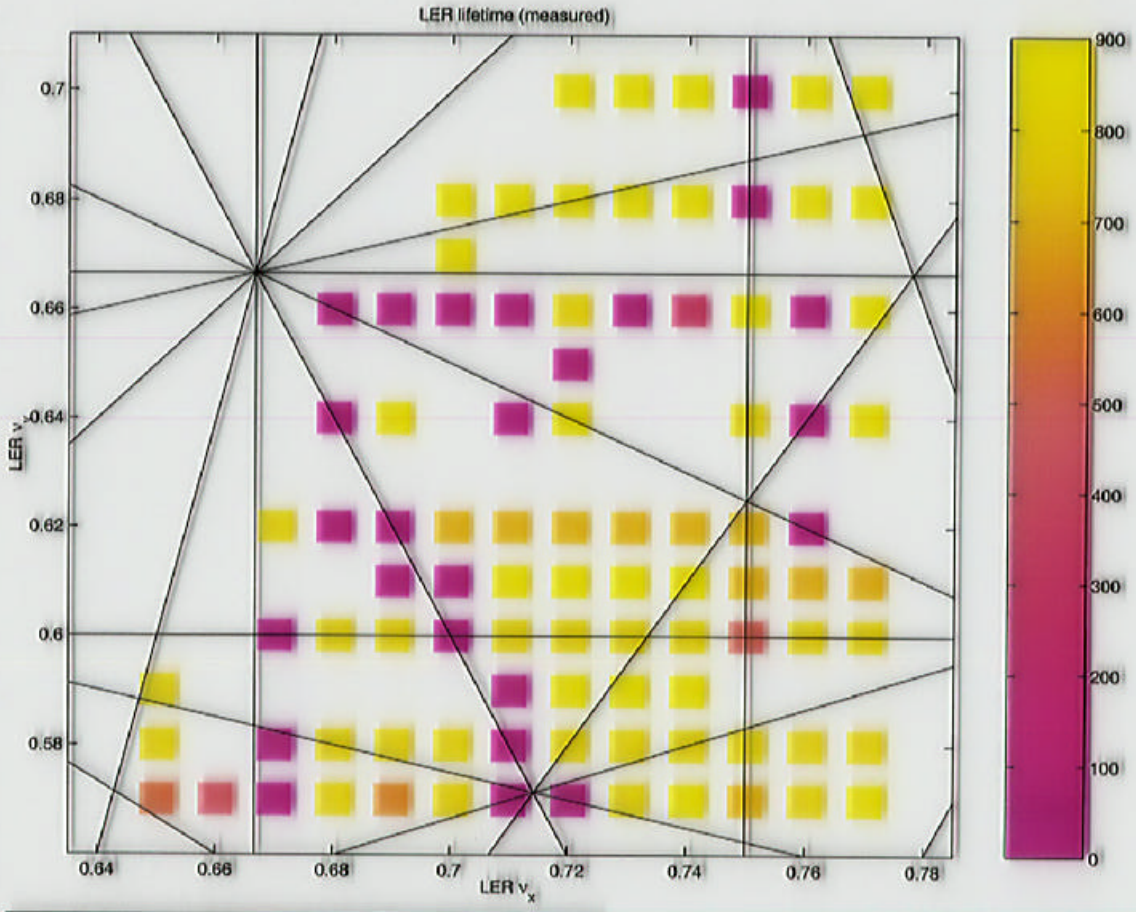
Part IV. Bunch Length Dependence

Goal: Determine temperature sensitivity to bunch length by varying RF voltage.

$$\sigma_z \sim V_{rf}^{-1/2}$$

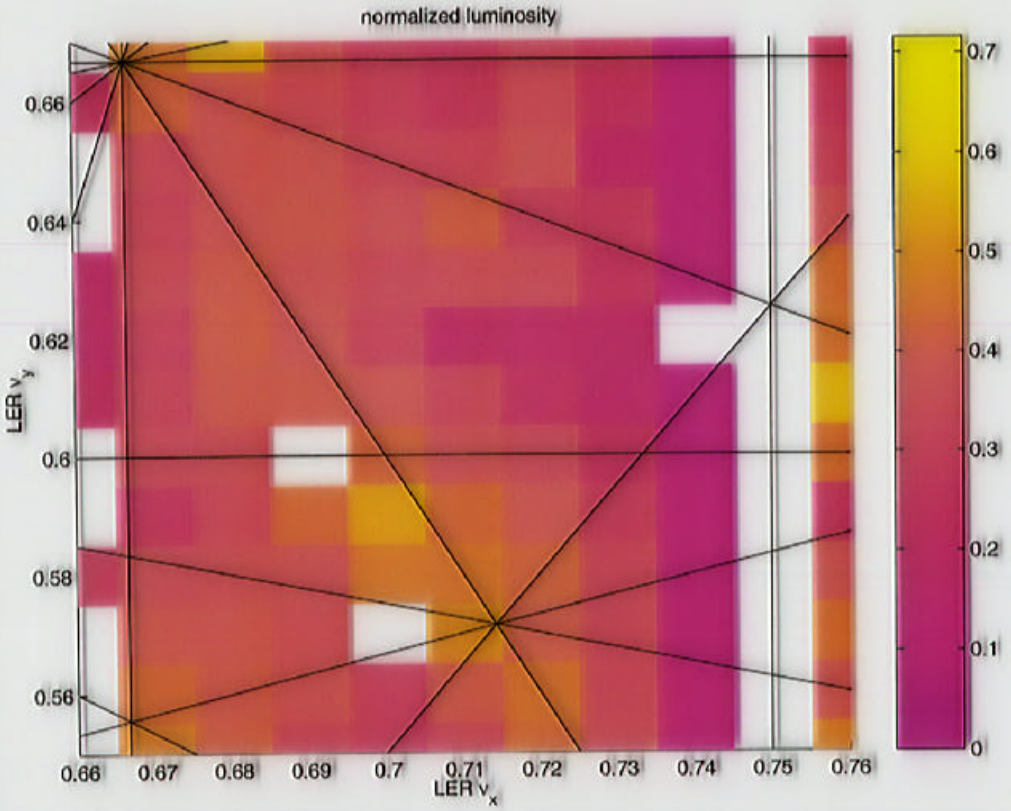

dT/I vs. I_b
Nb=692
Nb=333
1660
Quadratic C(I*Ib)=0.04
Ib0=1, dsig2/dIb=0.50
Ib0=1, dsig/dIb=0.25
dT/I
0.12
0.1
0.08
0.06
0.04
0.02
0
0.00
0.50
1.00
1.50
2.00
2.50
3.00
I_b (ma)

.7/.6 (lifetime, single beam, practice[a])

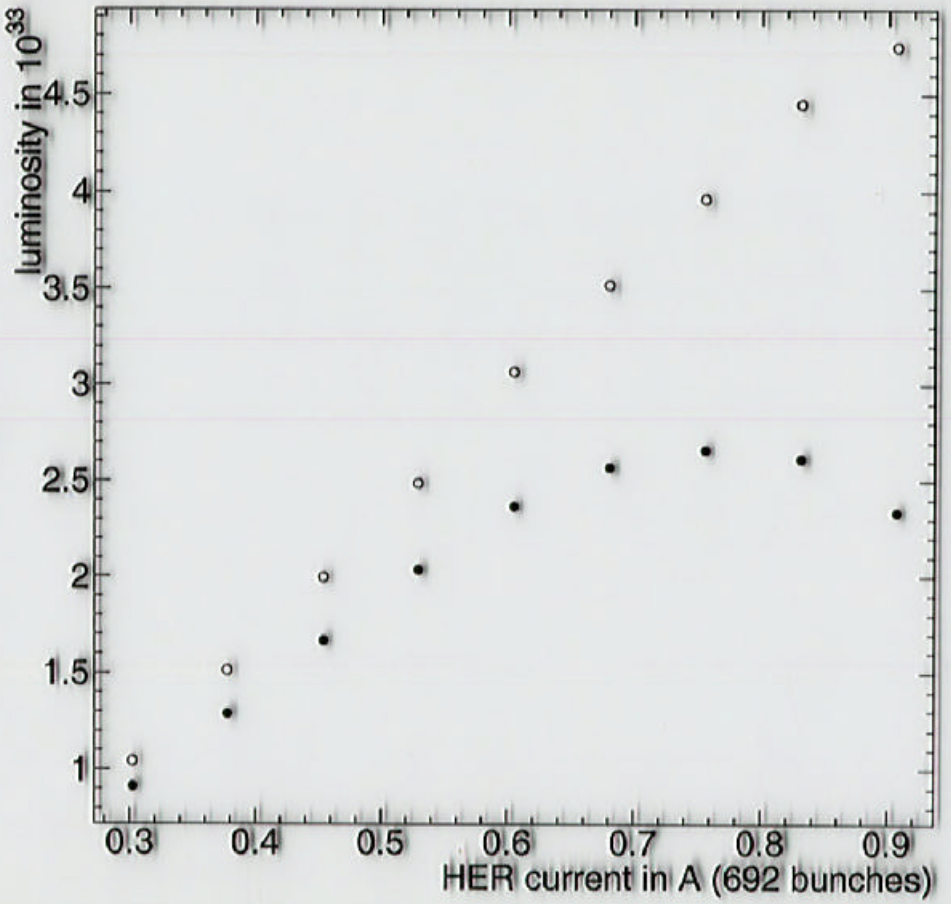


[a]data taken by M. Sullivan

LER at .7/.6 (luminosity, simulation)



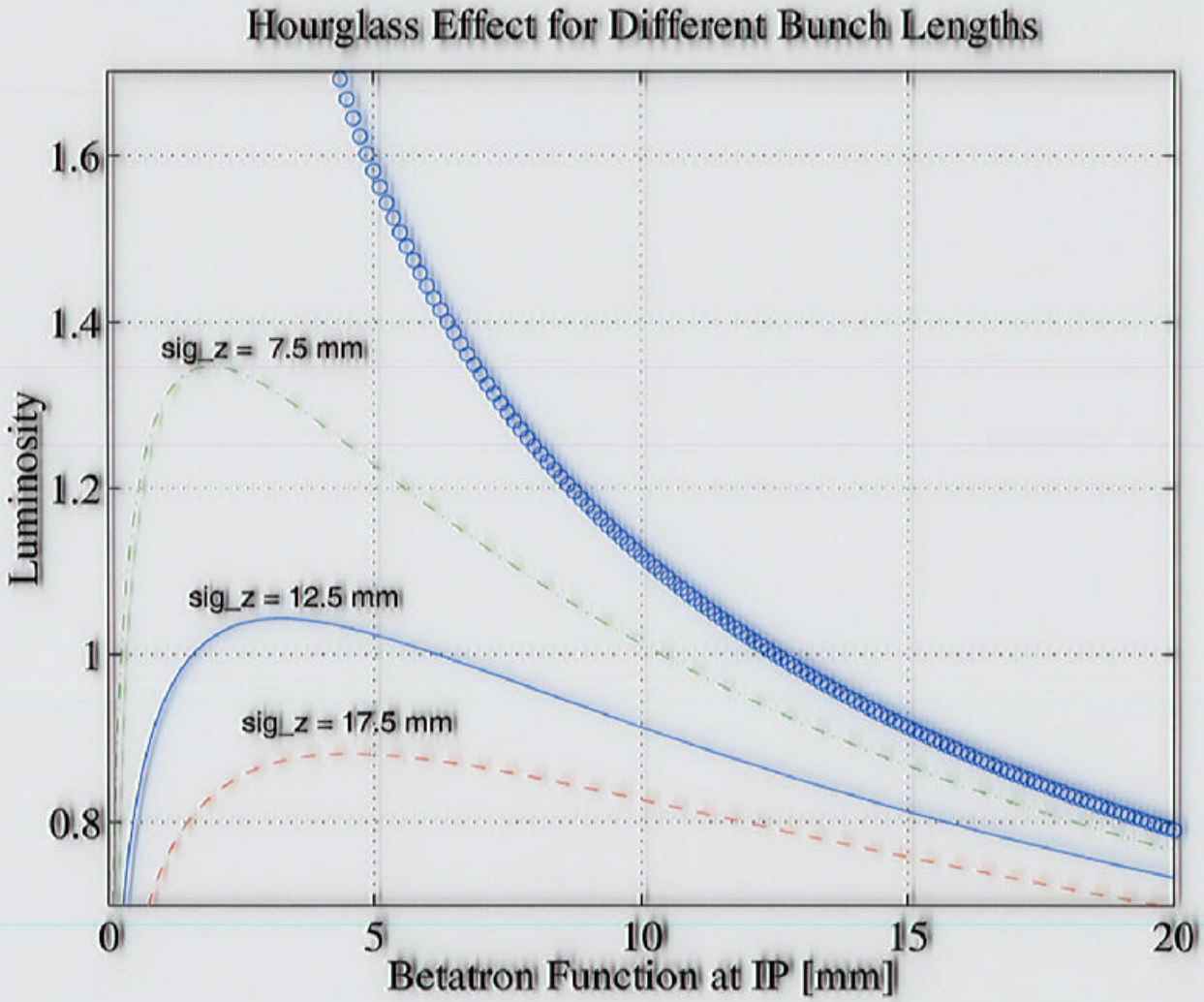
lower $\beta_x^* = 35\,\mathrm{cm}$ (simulation)



current ratio is 2:1

- $\beta_x^* = 50\,\mathrm{cm}$
- $\beta_x^* = 35\,\mathrm{cm}$

Hourglass Effects vs β_y for different σ_z



$$\sigma^*_{0y,\div} = \sqrt{\varepsilon_{0y,\div}\,\beta^*_{y,\div}}$$

$$\xi_{0y,\div} = \frac{r_0 N_- \beta^*_{y,\div}}{2\pi\gamma_\div \sigma^*_{0y,-}\left(\sigma^*_{0x,-} + \sigma^*_{0y,-}\right)}$$

$$\mathcal{L}_0 = \frac{N_\div N_- f_c}{2\pi\sqrt{\left(\sigma^{*2}_{0x,\div} + \sigma^{*2}_{0x,-}\right)\left(\sigma^{*2}_{0y,\div} + \sigma^{*2}_{0y,-}\right)}}$$

Issues for $3x10^{34}$ Luminosity

- *HER current to 1.5 A (more RF)*
- *LER current to 4 A (more RF)*
- *Lower betay* (~6 mm)*
  - *(move IP quads inward)*
- *Crossing angle (2 x 3 mrad)*
- *Stronger bunch-by-bunch feedbacks*
- *Shorter bunches (lower α or third harmonic cavities)*

Even Higher Luminosity?

- To get to 3×10^{34}, we need to lower β_y^* down to 5 mm

  ⇒ Hourglass effect is very large for a 10 mm HER bunch so we need to lower HER bunch length down to 6 mm

  ⇒ LER bunch length can already be made short with the added RF stations

  ⇒ Add one more RF station to each ring giving the LER a total of 5 stations and the HER a total of 7.

- Getting β_y^* down to 5 mm will mean very large β_y max values in the near IP quadrupoles.

- Propose changing the IR B1 magnets by replacing the last 20 cm of bending field with quadrupole field.

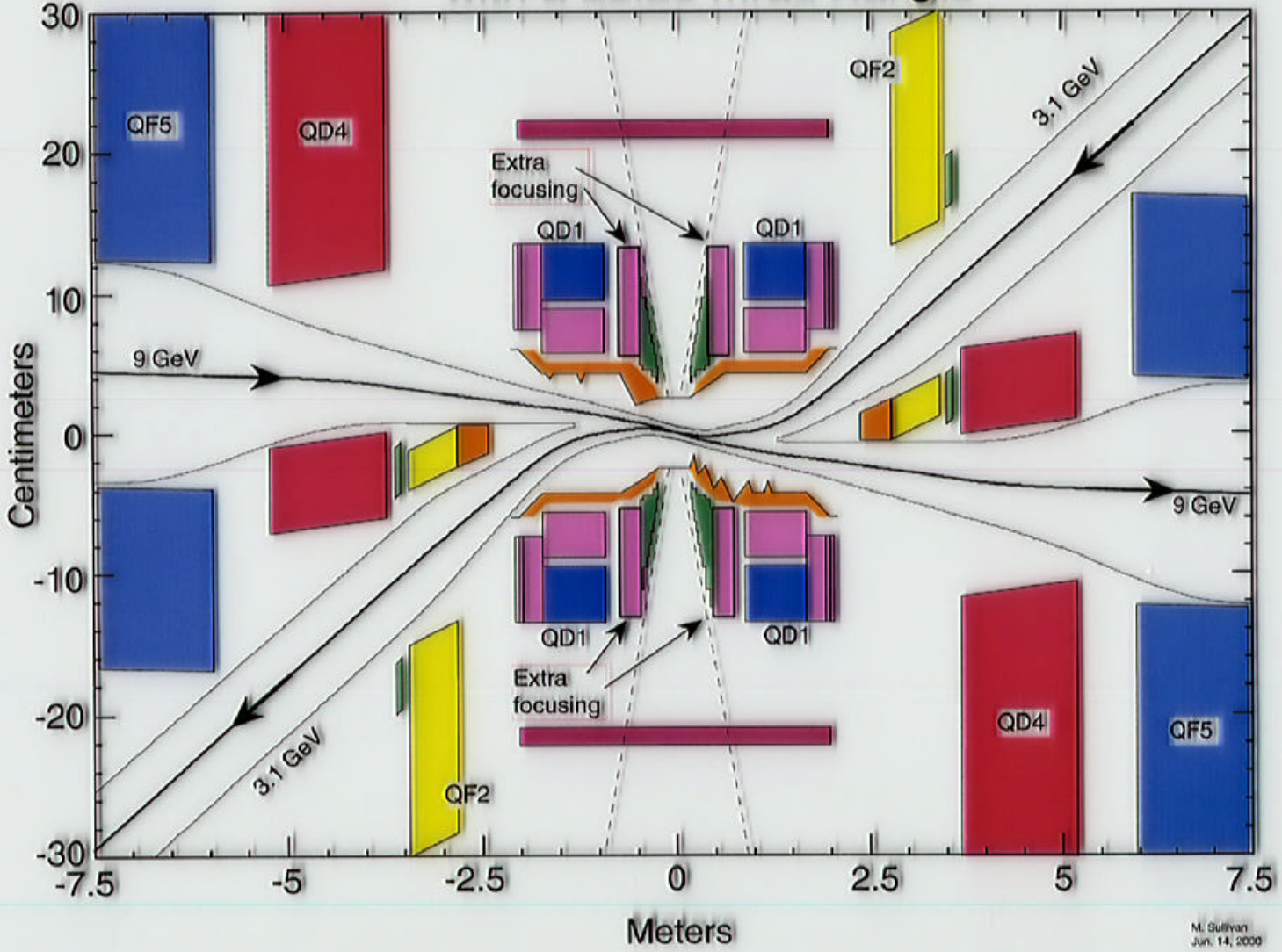
  ⇒ This introduces a crossing angle of ±3.25 mrad at the IP.

  ⇒ The crossing angle separates the beams enough at 31.5 cm from the IP to allow filling every single RF bucket or 3320 bunches. This keeps the bunch current down and allows for more total current

  ⇒ The extra focusing lowers the by max values by 20% in the LER and 15% in the HER.

  ⇒ Removing some of the B1 bending field reduces the synchrotron radiation power generated in these magnets.

Possible 3×10^{34} Interaction Region with a ±3.25 mrad Xangle



PEP-II Summary

- The PEP-II run with BaBar went very well. The luminosity ended at 103% of the design and the best integrated luminosity per day was 129% of design.
- There is a definite plan in place to raise the luminosity to 1E34. Big issues are building the RF stations, the electron cloud e+ blowup, and Be chamber heating.
- A luminosity approaching 3E34 is being studied with several possible avenues. Several feasibility studies underway.