Fermilab

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BOOSTER MAGNET D-48 FIELD MEASUREMENT-ADDENDUM

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It was suggested by S. Ohnuma that the measurement data of the original report be plotted as a normalized gradient compared to Figure 9-5 of the accelerator design report. Since Figure 5 of the original report reproduced so poorly an improved version is included here.

Figure 6 shows the injection body gradient data of R. Yamada for the F and D magnet and the present data for the D magnet. Figure 7 shows the same data taken later in the cycle. These data are plotted on a copy of Figure 9-5 of the accelerator design report. However since the original design did not have special "end packs" on the magnets the same data is replotted in Figures 8 and 9 as a normalized body gradient-gradient length product. Also plotted in Figure 9 is a horizontal scale with numbers 10 to 90. This scale is found by taking a momentum spread of ±.1% that is doubled by RF capture (i.e. ±.2%) with the largest beta and X_p for each magnet from a SYNCH run for the Booster and calculating the extremum of the position for each emittance 10π mm mr to 90π mm mr:

$$X = (\beta\varepsilon)^{\frac{1}{2}} + X_p \frac{\Delta p}{p} .$$

From this viewpoint an AC measurement of an F magnet would have been more interesting than that of a D magnet since the F seems to be more restricted. If the parallel lines do indeed have some relation to a useable aperture, an observed aperture less than 90π seems very reasonable.

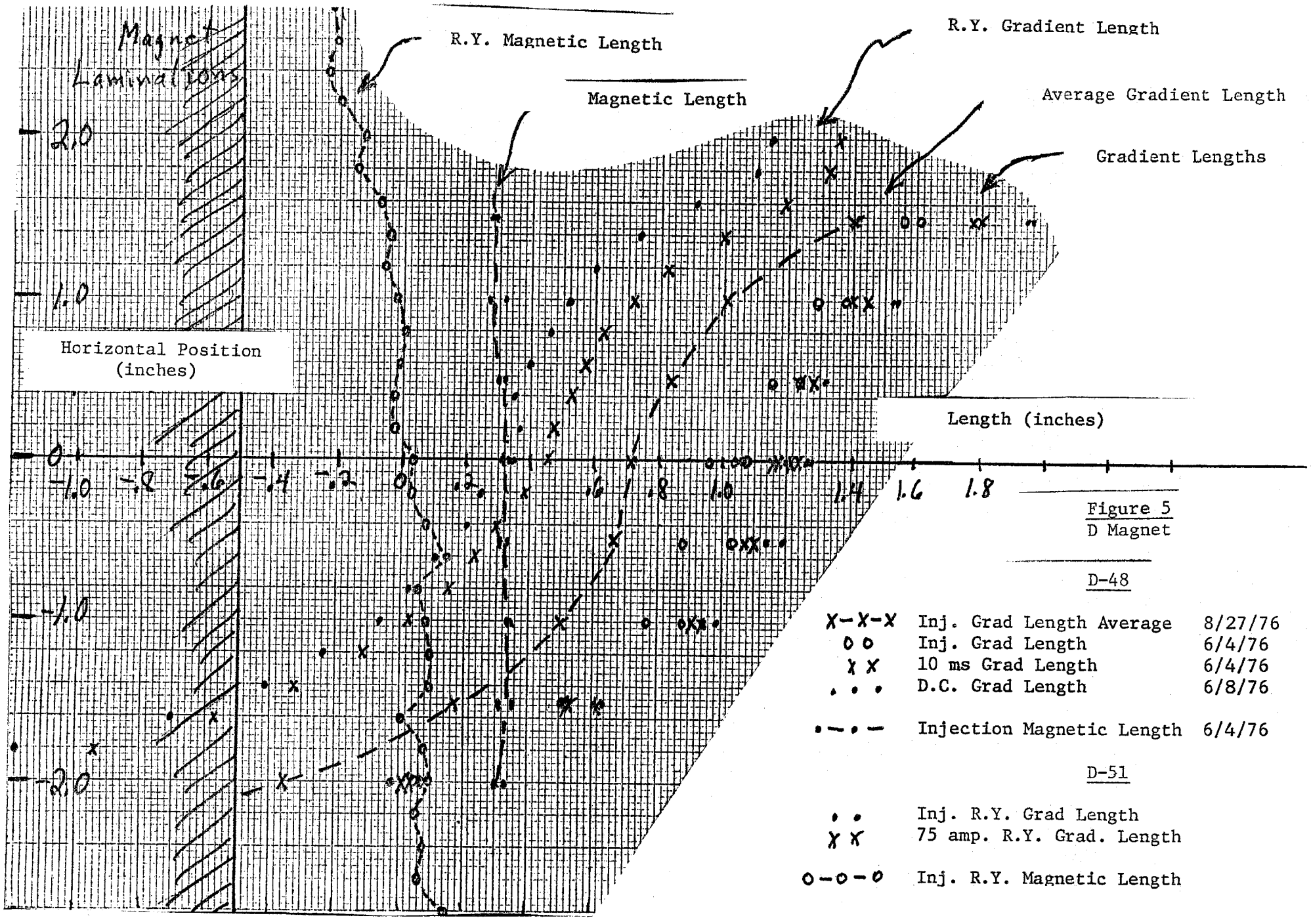

Figure 5
D Magnet

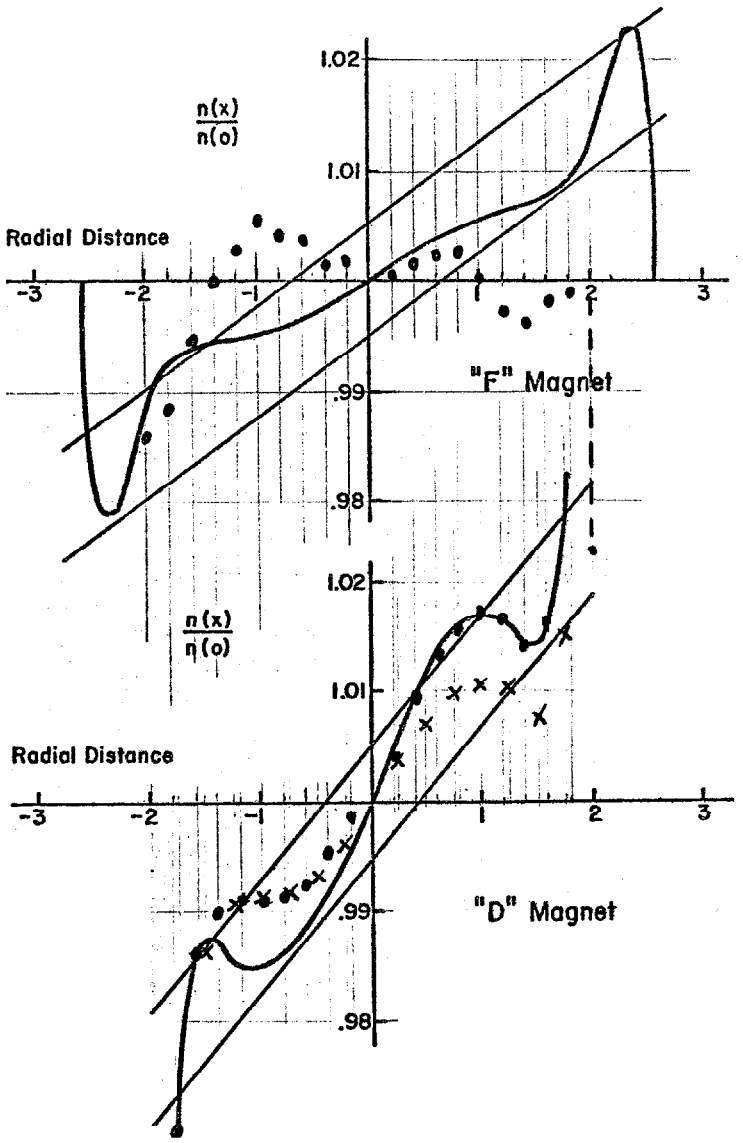

Figure 6

Injection Normalized Gradient

• • R.Y. data
X X Present data
X

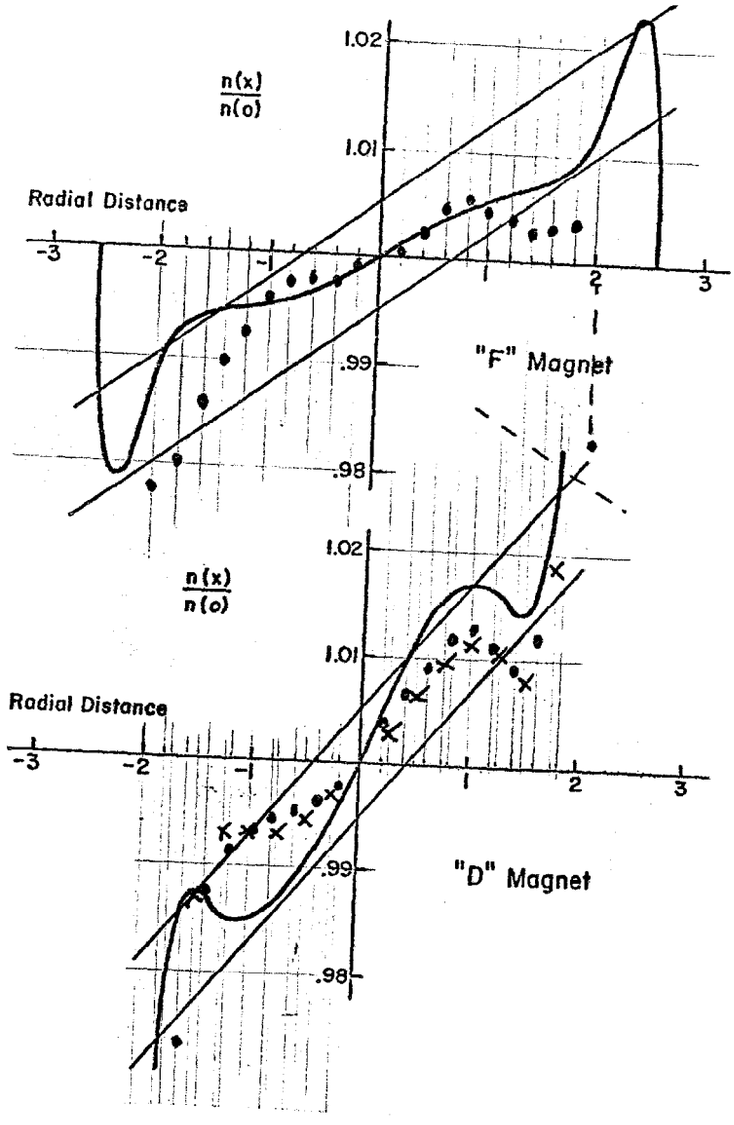

Figure 7

Normalized Gradient

• • 6 ms. R.Y. data
X X 10 ms. Present data

x

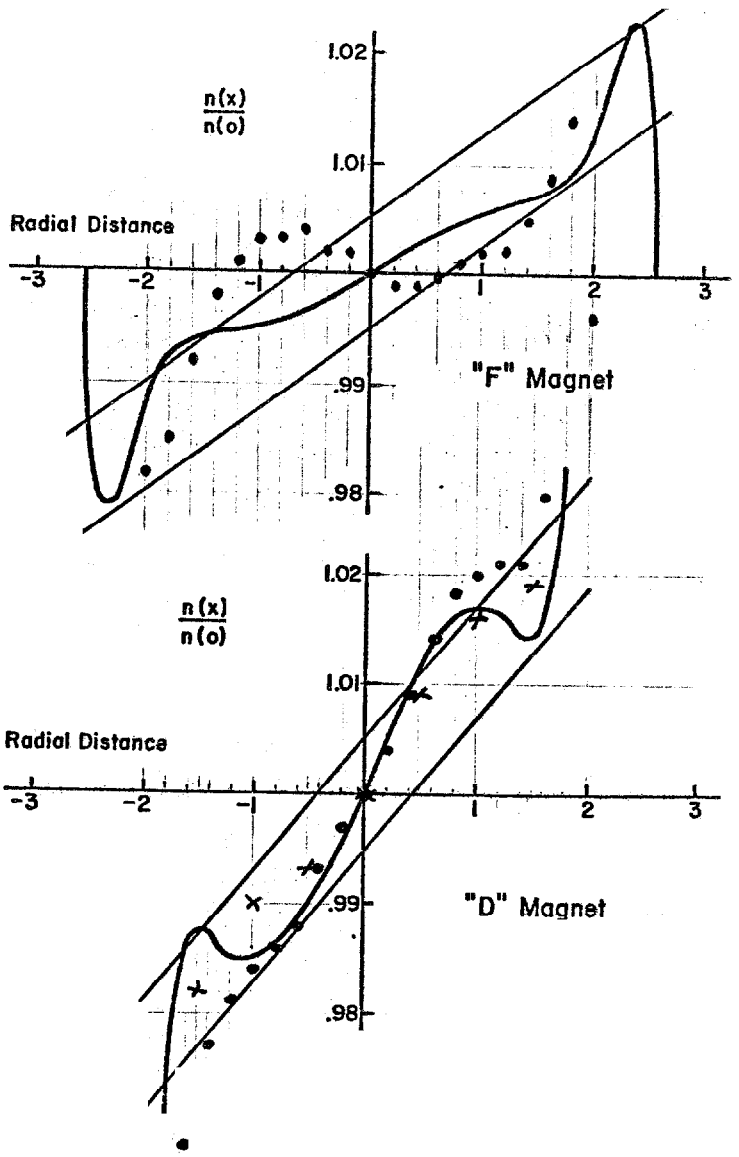

Figure 8

Injection Normalized Gradient*Gradient Length

• • R.Y. data
X X Present data

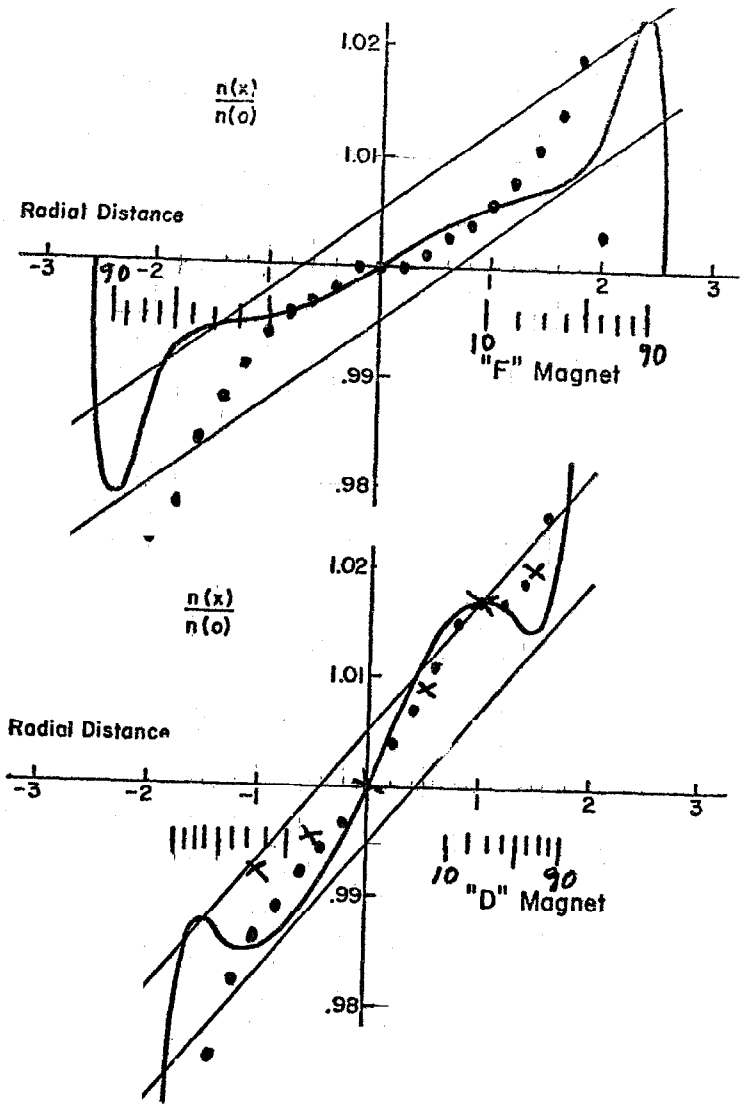

Figure 9

Normalized Gradient*Gradient Length

● ●● 6 ms. R.Y. data

XX 10 ms. Present data