



Fermilab

\bar{p} Note #411

LONGITUDINAL PALCEMENTS AT DO

D. Finley

10/19/84

Finley
#411

October 19, 1984

To: P. Koehler

From: B. Finley

Subject: Longitudinal Placements at DO

The DO experimental hall is to be centered at:

$Z = -10.313$ inches in the Main Ring coordinate system.

The DO detector is to be centered in the experimental hall.

This is based on several sources of information. All numbers are in inches in the Main Ring coordinate system unless noted otherwise.

1. TM-1032 "The Revised Great Doubler Shift" by T. Collins and S. Ohnuma. This TM has all Tevatron zeroes located at -10.308 inches, and is THE REFERENCE for the Tevatron.
2. 12/6/83 H. Edwards meeting with RF people. These notes give the locations of the RF cavities at FO and thus determine the p-pbar crossing point. These notes have TeV FO at -10.3 inches and the p-pbar crossing point at -9.425 inches. Thus, the p-pbar crossing point is 0.875 inch downstream of TeV FO.
3. K. Koepke print 2214-MD-187011 (3-28-83). This is what BO is based on. It has TeV BO located at -10.313 inches. The design intention is to center the collision hall, the detector, and the lattice at TeV BO.
4. September 1984 "Design Report Tevatron I Project". This report is based on a SYNCH run with low beta at BO only. This SYNCH knows nothing about RF. Section 9.2.1 says the arrangement of low beta quads has the result that the "maximum luminosity point is 0.9 inch downstream of Tevatron BO". Thus, the RF and the low beta quads agree that the best place is 0.875 to 0.9 inches downstream of TeV zero, when only BO low beta is on.

5. D. Johnson ran a SYNCH (under duress) which is dated 11 Oct 83 and has low beta at both BO and DO. Figure 1 is based on that SYNCH run. The X axis is in meters from the end of the G4 low beta quad on the 49 side. The minima indicated for BO and DO reflect the best location based on optics only. Converting to Main Ring coordinates and centering the lattice at $Z = -10.313$ inches, one obtains:

TeV O	-10.313 inches
Best DO optics	-9.447 inches
Best BO optics	-8.266 inches

Thus, with both low betas on, the calculation indicates that the best place at DO is 0.856 inch downstream of TeV DO, and the best place at BO is 2.047 inches downstream of TeV BO.

A cursory glance at the figure should demonstrate that an inch means less than 0.1 percent change in maximum luminosity. If the lattice design changes for a very good reason, some things may change. However, I have no reason to suspect that items addressed in this note will significantly change.

A simple hand calculation to check the SYNCH run gives a parabolic dependence:

1 inch	is 0.064 %
2 inches	is 0.257 %
4 inches	is 1.022 %

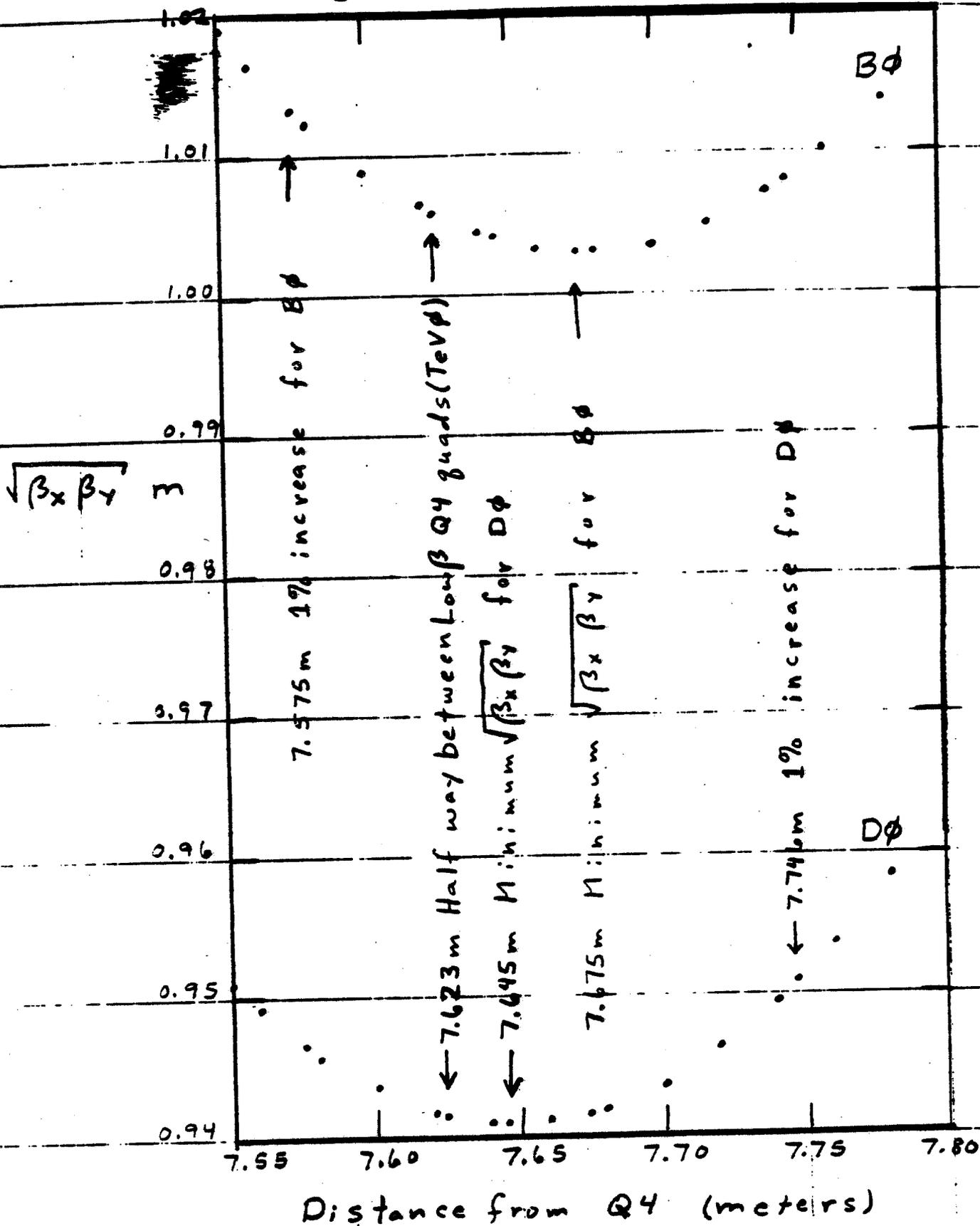
The figure shows 1 % points at about 0.1 meter, which agrees with the hand calculation.

Thus (on paper, at least), the effect of the lattice differences on the maximum luminosity points should be less than important. The important point to keep in mind is the location of CDF relative to the DO detector. The figure shows that the ideal locations differ by a little more than an inch when both low betas are on. The actual locations of the RF cavities, CDF, BO lattice, DO detector and DO lattice will differ from their ideal values ... hopefully it will be no worse than the order of an inch. Adjustments to the RF should be able to compromise between BO and DO to give a best overall luminosity for both detectors -- if luminosity can be reliably measured that accurately.

Distribution

D. Edwards
H. Edwards
D. Johnson - Operations
D. Johnson - Tev I
S. Pruss

$B\phi$ and $D\phi$ $\sqrt{\beta_x \beta_y}$



From D.E. Johnson SYNCH 11 OCT 83.