SINGLE PASS COLLIDER MEMO

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TITLE: Preliminary Study of the Positions of Elements in LTR

In the process of developing a model to understand LTR, the question came up, "How realistic is the data in the latest LTR deck?" In particular, "Are the positions of LTR elements the same as in the model?"

To answer these questions a print-out (filename, "Lebout Output", dated 07/14/83) was obtained from Bill Dozhier at the Precision Alignment Office which contains the LTR quad and bend magnet specifications actually used for final alignment. The format includes tooling ball data, plus coordinates, 'X' 'Y' 'Z' in the SBO grid, defining the mechanical centers of the magnets. (Note: the magnets 'VB53', 'QD45' and those in between are not included in 'Lebout Output' and were hand prepared by [unclear] King). Since these positions were verified (within specified tolerances) by surveying equipment, this information forms the basis of an independent data set with which the LTR deck can be compared. Once the quad and bend positions have been established, the X and Y soft corrector positions can be determined using measurements relative to specific quads. These measurements were provided by Precision Alignment and presented by T. Fieguth on 07/18/83.

The task of comparing the grid 'XYZ' coordinates to the Transport 'S' longitudinal coordinates was handled in the following manner. A computer program was written to calculate the linear distances between grid coordinates and tabulated the net distance along these segments to give the trajectory length (S) to the center of each quad and bend. These calculated S values were then compared with the values in the Transport deck and data base to locate discrepancies. Although this method does not take into account the effective trajectory length inside the bend magnets, it is not a major concern according to Phil Morton, who demonstrated that the linear distance from the pole faces to the vertex (for small bend angles as we have in LTR) is so close to the effective path length that the difference can be ignored (See Figure 1 below).

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DETERMINATION OF PATH LENGTH BETWEEN ELEMENTS

FIGURE 1

One other problem remains, and this one can not be disregarded. The mechanical center of a bend magnet is not at the vertex. The displacement between these two points can vary by several millimeters. What's more, the relative orientation of these points changes with different magnets so that adding a uniform correction factor will not work. Lengthy investigation and study of individual drawings will be required to produce correction factors.

In spite of these drawbacks, this "quick and dirty" approach yields some useful results. The quad centers and vertices are one in the same, which introduces no error. A systematic error of approximately -0.55 millimeters in S was found for every bend. This represents the minimum uncertainty of the 'S' values as determined by the computer.

Two runs were made; one of alignment data vs. LTR deck and the other of alignment data vs. data base. The results follow:

- 1) The LTR deck and data base show four noticeable discrepancies.

In each case the alignment data vs. LTR deck results agree while the alignment data vs. data base do not. The data base values have been corrected by the amounts shown below.

QD53B 12.1 mm

QD39 -27.5 mm

QD17B -27.4 mm

B5 15.3 mm

- 2) The alignment data indicates that QD49 is located 37 mm upstream of the LTR deck position. Also, alignment data shows QF47 being 34 mm upstream of the LTR deck position.

3) All other quad/bend positions agree.

In conclusion, the LTR deck appears to represent quad and bend locations reasonable well, with the exception of QD49 and QF47. A modified LTR deck, with QD49 and QF47 in their new positions, along with the correct X and Y corrector positions now exists and resides in Mark Woodley's account. Access to the computer program used here may be found on VM account name, "GEH", filename, "S-TOS FORTRAN A1."