

Transport of SBE Beam to the D Target

J. W. Glenn

June 1983

Collider Accelerator Department
Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

Notice: This technical note has been authored by employees of Brookhaven Science Associates, LLC under Contract No.DE-AC02-76CH00016 with the U.S. Department of Energy. The publisher by accepting the technical note for publication acknowledges that the United States Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce the published form of this technical note, or allow others to do so, for United States Government purposes.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

AGS STUDIES REPORTDate June 8-9, 1983Time 1700 - 0800Experimenters J.W. Glenn and J. RyanReported by J.W. GlennSubject Transport of the SBE Beam to the D TargetOBSERVATIONS AND CONCLUSIONIntroduction

Beam was extracted to the slow beam line at 24 GeV/c in Single Bunch Extraction (SBE) mode and transported to the D target. Transport efficiency vs intensity and losses were measured. Optical modeling is consistent with the observations and indicated that the full beam can be transported within the present beam line constraints.

Performance Observations

An initial estimate of an optical setup for the D line was tried without great success as the nonlinearity of field in some magnets was not considered. After lengthy tuning of a low intensity SBE beam, transmission was measured at several intensities (Figure 1). The decrease in transmission with intensity is consistent with beam size increasing with intensity. Two "COUT" printouts were generated at different stages in the tuning. A plot of efficiency vs losses (Figure 2) roughly indicates that the SEC's respond equally to beam intensity and the loss monitors read 1/3 low. The absolute calibration of these SEC's is in doubt as the first one indicated 12% extraction efficiency and only one bunch (8.3%) was extracted. The remaining 11 bunches were seen in the U line.

Beam sizes were observed on the available flags. Upstream, the sizes correlate well with sizes predicted by a later run of Ryan's beam transport modeling program, JFR (Figure 3). Also, an IPM profile from G. Smith agrees well with the emittance assumed for this model. Downstream, the measured sizes are significantly smaller than predicted, also the spot on the D215 flag shows a sharp edge on the east side. The aperture causing this cutting of the beam is not apparent. The tilts observed on the flags of the beam spots agree well with those predicted by the model from sextupole moments in the thick Lambertson magnets.

Beam losses are plotted (Figure 4) on the same distance scale as Figure 3. Long and point loss monitors correlate well. The lines are sketched to guide the eye. Beam losses along the line show peaks at the first wall and near the polarimeter in the D cave. Also, they also may indicate losses in the 21° bend area that are well shielded by the magnetic iron. These losses occur in regions where there has been aperturing indicated by the beam model and the observed sizes have become smaller than predicted.

Conclusions

Subsequent adjustment of the computer model produced a beam envelope smaller than the expected apertures (Figure 5). The matching of size at the IPM and upstream indicate a realistic emittance for the model. Misunderstanding of the orientation of the extracted beams emittance can be compensated for with the first four quads. Thus, this solution provides a strong indication that there exists a solution to "cleanly" transporting the beam. At high intensity the beam envelope should be about 10% bigger than Figure 5 shows, but would still fit the aperture.

mh

BY _____ DATE _____ SUBJECT _____ SHEET No. _____ OF _____
 CHKD. BY _____ DATE _____ DEPT. OR PROJECT _____ JOB No. _____

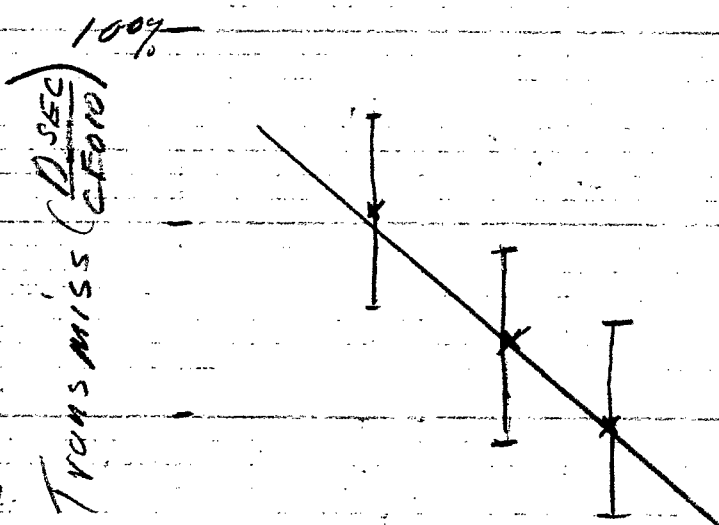


Fig. 1
 Transport efficiency
 vs Internal Beam
 Intensity

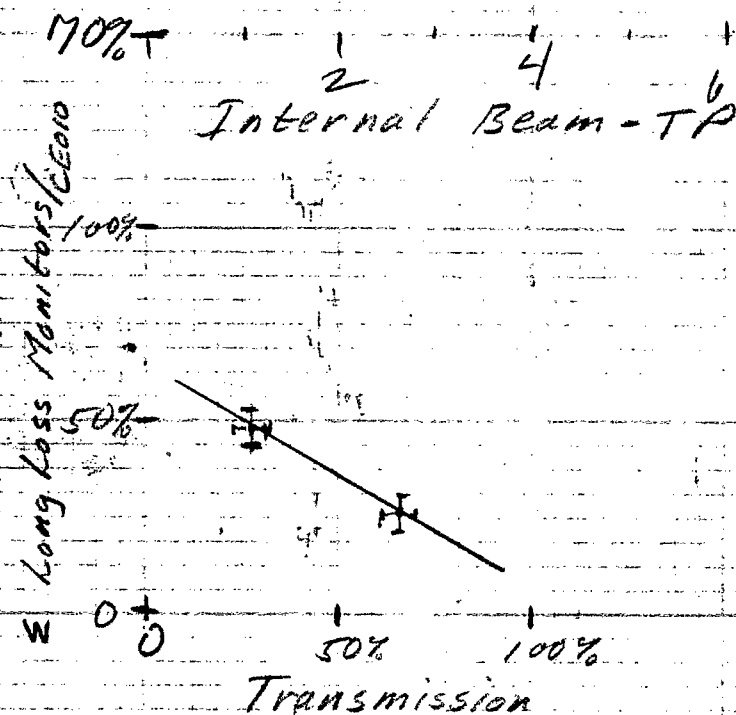
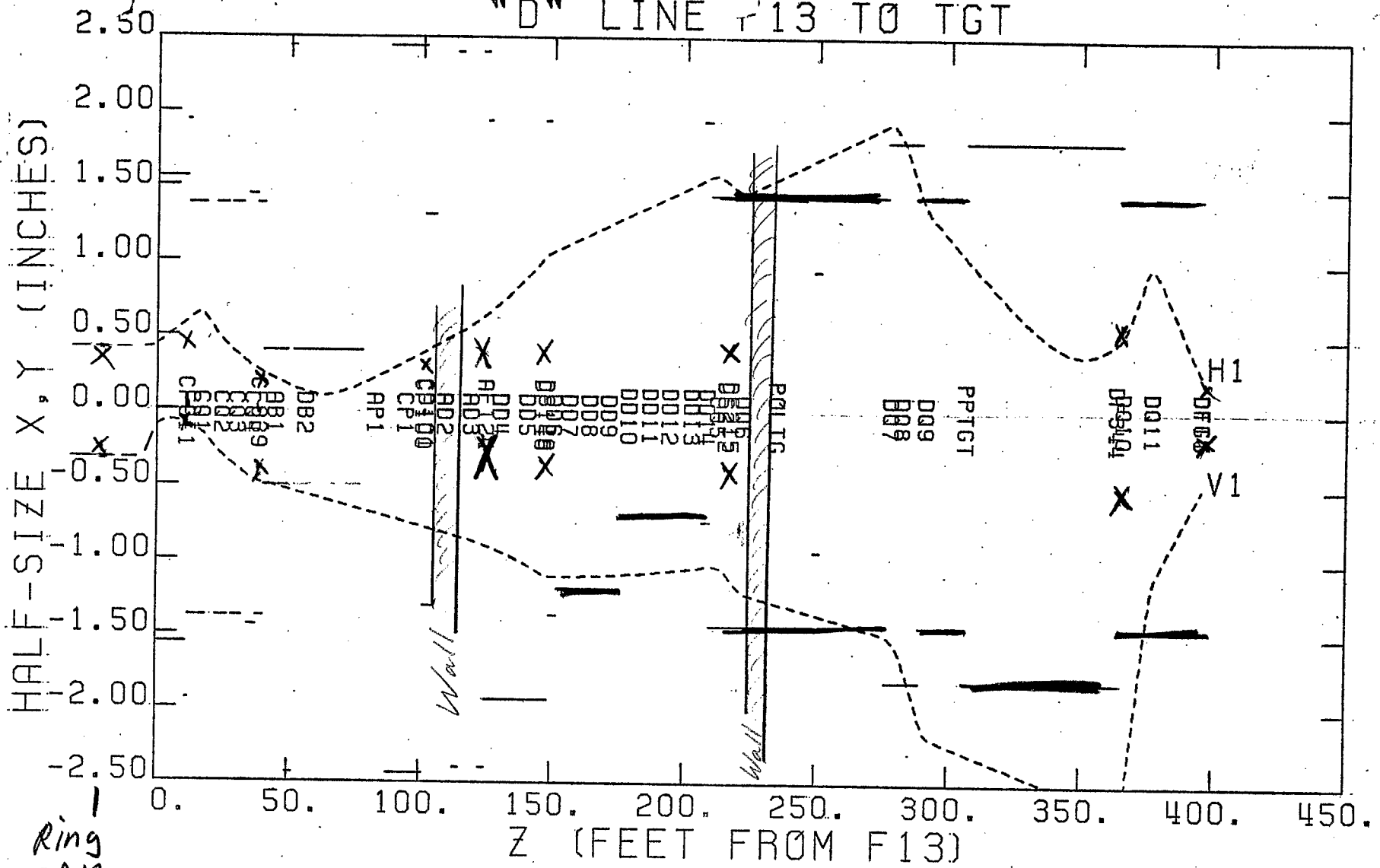


Fig. 2
 Sum of Long loss
 Monitors times
 arbitrary constant
 and normalized to
 Extracted Beam
 vs Transmission
 Efficiency

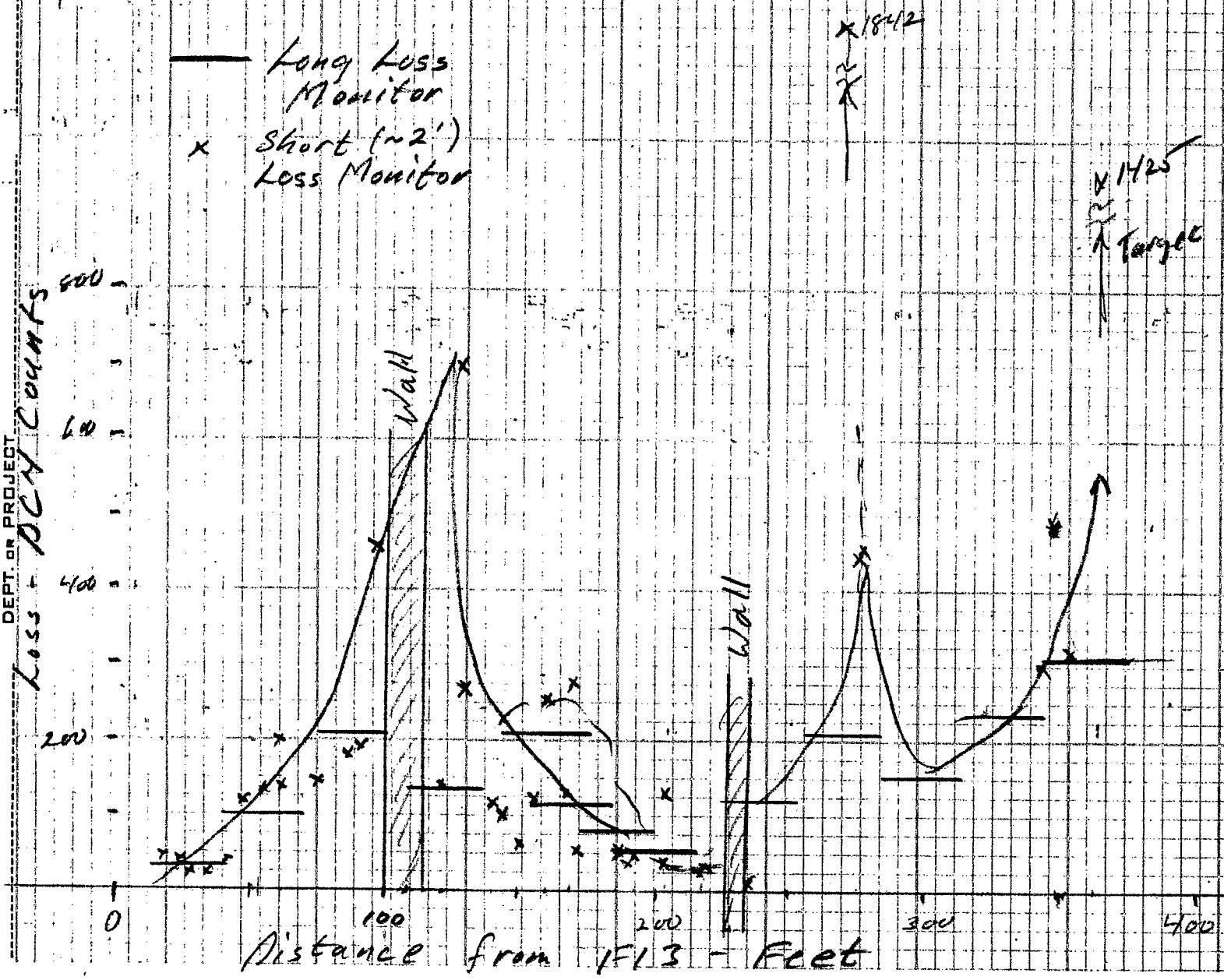
"D" LINE F13 TO TGT



Ring
IPM

Fig 3 - Observed (x) and calculated Beam Sizes in the Transport to D Target

Fig 4 Beam Loss along the Transport to D Target.



"D" LINE F13 TO TGT

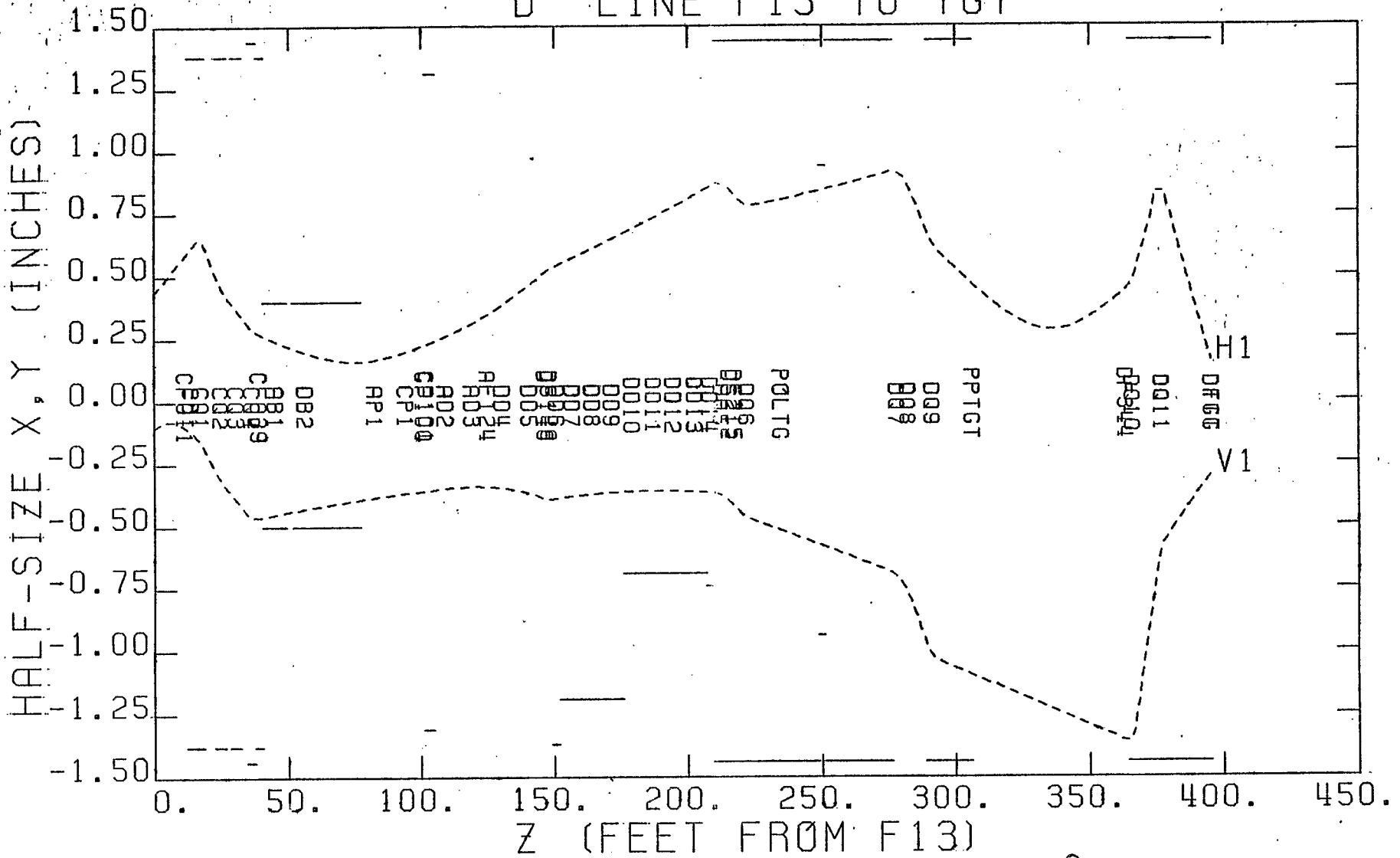


Fig. 5 Modeled "Clean" Transport of SBE Beam to D Target.