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# The ñBS as a Monitor of Injection Field Reproducibility

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# DISCLAIMER

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# AGS Studies Report

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Reported by E. Gill/L. Ahrens

Subject The IPM as a monitor of injection field reproducibility

## Introduction

For normal AGS running injection time is set by the Gauss clock reaching a certain value (peaker setting). The reproducibility of the field at this time from cycle-to-cycle depends both on the reproducibility of the Gauss clock, which measures the change in field from a reference time "To" up to the peaker trigger, and on the reproducibility of the remnant field at "To" which is presently not measured. In the past a few attempts have been made to replace the "To" Gauss clock start by an absolute field measure, in particular by a signal derived from a hall probe located in an AGS magnet. As a measure of the cycle-to-cycle variability of the injection field during these tests, the beam position variation as measured by the IPM has been used. This was done without a clear understanding of how much of the observed position variation was due to field variation, how much was due to noise in the IPM, and how much was due to Linac momentum variation. The present study removed the field as a variable by replacing the Siemens power supply with a fixed (DC) supply and then repeated the measurement of pulse-to-pulse variation at the IPM. In addition, data taken under normal conditions is included for comparison; an order of magnitude reduction in jitter was observed. In other words the primary source of the position jitter seen under normal conditions is the field jitter.

## Procedure

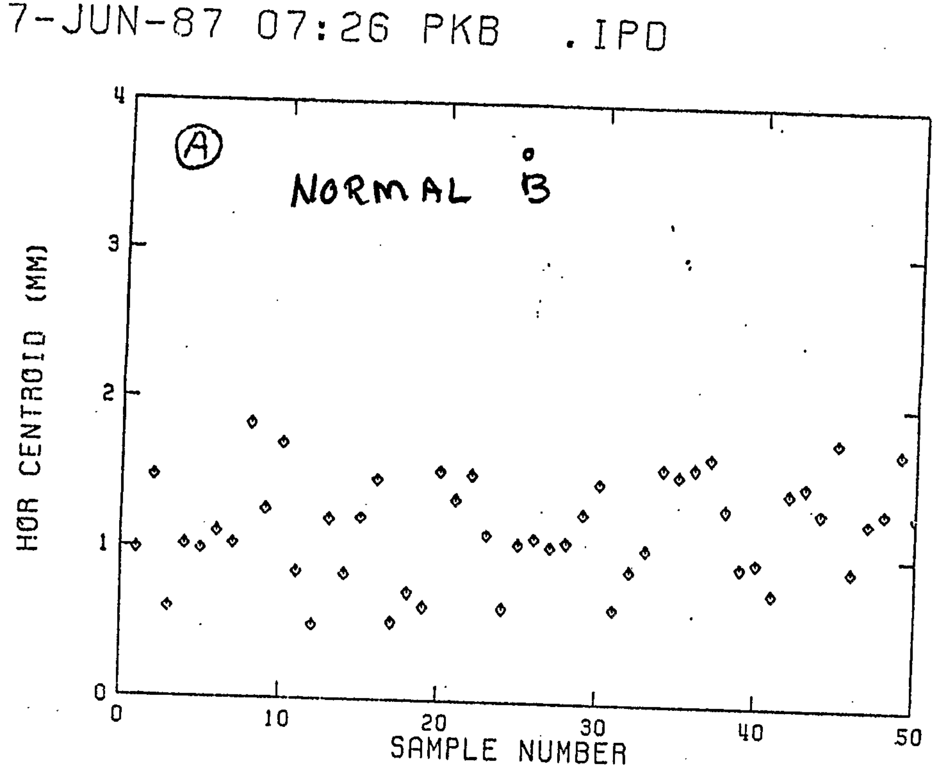
The description of how to achieve zero BDOT is given in AGS Studies No. 226 by C. Gardner. The only difference from this setup is that instead of 1/2 turn we used 40 turns of Linac beam and let the beam circulate as long as possible (Plot D).

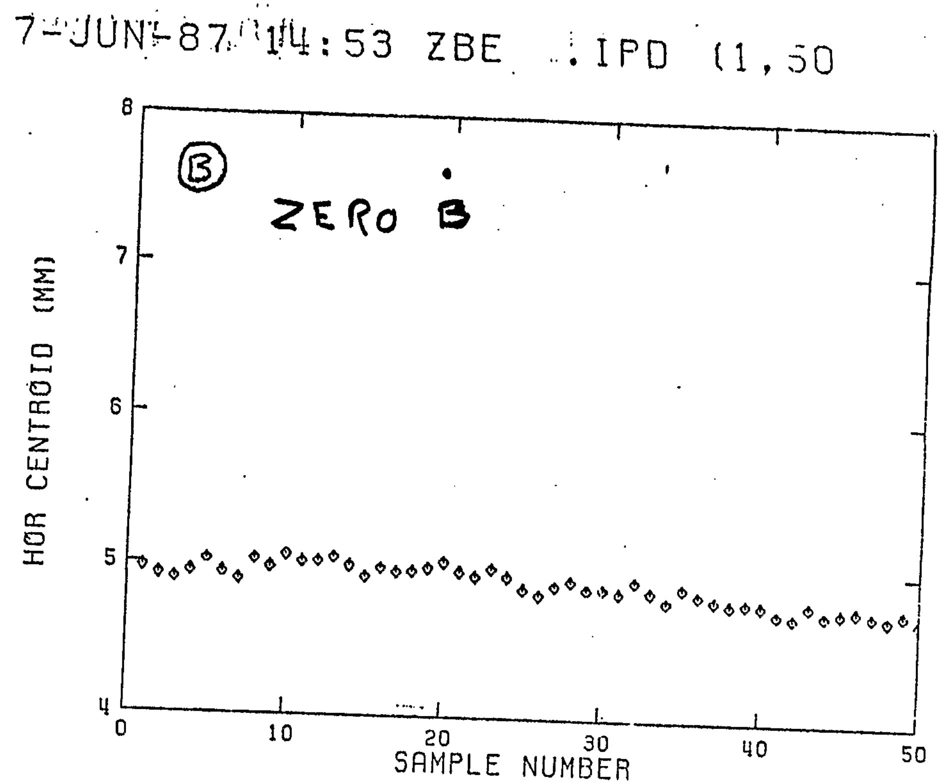
## Observation

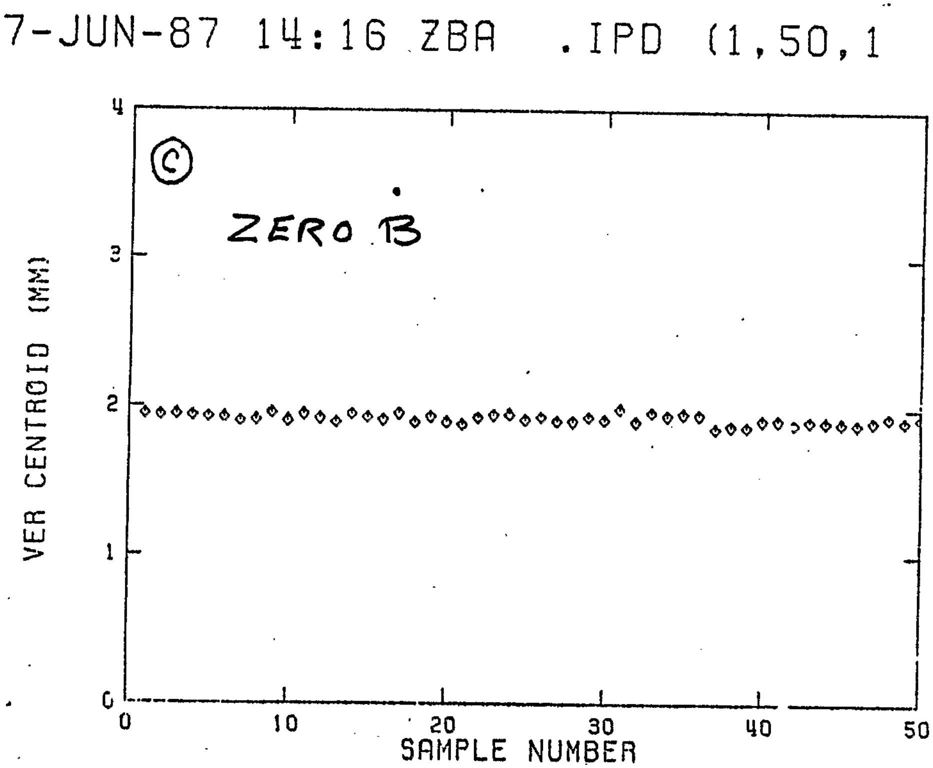
Before going over to zero BDOT we calibrated the peaker (DIFPK) versus the IPM E10 position (Plot E) .13 mm/count (DIFPK). As can be seen by Plot A, the position of beam moved with normal BDOT ± 1mm at E10, while with zero BDOT moved, less than .1mm. This data was taken over 50 pulses at 1.6 second rep rate. It repeated very well over many runs. When at zero BDOT, a function generator manufactured the backleg signal used to produce Gauss clock counts.

## Conclusion

The position variation observed at the IPM under normal conditions is indeed due to variation in the field from pulse-to-pulse. If one would like to have a more stable injected beam, one should investigate how to reduce this field variation. This study shows how stable Linac and all other timing and the IPM are. To run high intensity, one would like to have all the aperture possible and be very stable, pulse by pulse. One would also like to reduce the sensitivity of the acceleration process to the magnet cycle. To set this DC supply configuration up was not a big problem, thanks to J. Gabusi, A. Feltman, A. McGeary, and Operation personnel.


7-JUN-87 07:26 PKB .IPD
A
NORMAL B
HOR CENTROID (MM)
SAMPLE NUMBER
0
1
2
3
4
10
20
30
40
50


7-JUN-87 14:53 ZBE .IPD (1,50
B
ZERO B
HOR CENTROID (MM)
SAMPLE NUMBER
4
5
6
7
8
0
10
20
30
40
50


7-JUN-87 14:16 ZBA .IPD (1,50,1
C
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VER CENTROID (MM)
SAMPLE NUMBER
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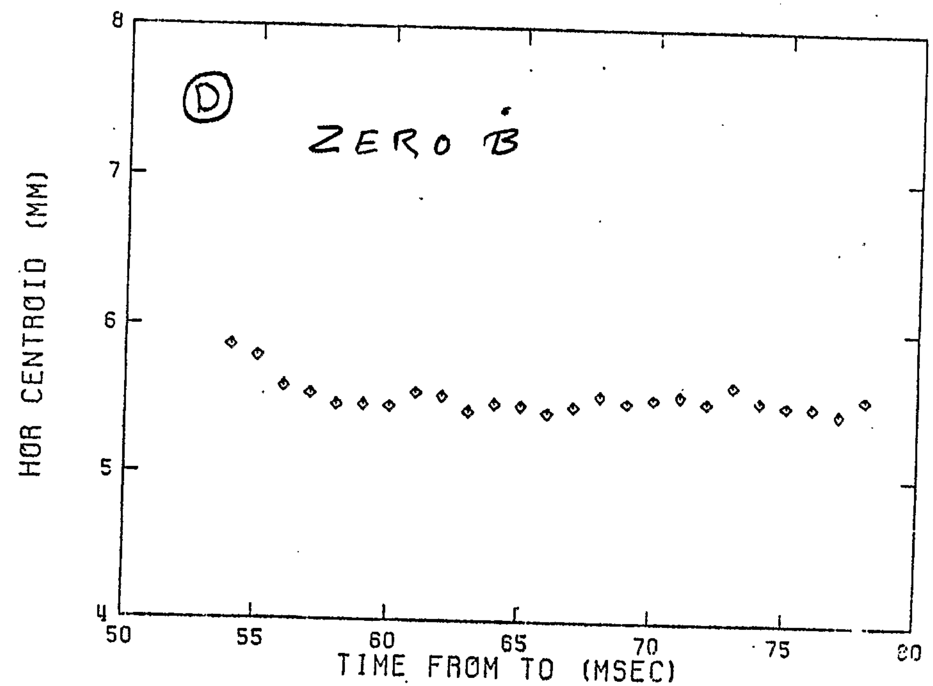
1
2
3
4
10
20
30
40
50


D
ZERO B
HOR CENTROID (MM)
TIME FROM TO (MSEC)
4
5
6
7
8
50
55
60
65
70
75

(E) NORMAL B

PEAKER(DIFPK) VS. HOR. CENTROID AT E10

CAL. .13MM/COUNT(DIFPK)