BNL-104107-2014-TECH
AGS.SN231;BNL-104107-2014-IR

HEBT Steering

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January 1987

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U.S. Department of Energy
USDOE Office of Science (SC)

DISCLAIMER

7/17/87

Number 231

AGS Studies Report

Date(s) 21 January 1987, 3 February 1987 Time(s) 0001-0800

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Subject HEBT Steering

Observations and Conclusion

Since the conversion of the AGS to H^- injection, it has been an emperical necessity to steer the HEBT beam horizontally as much as 2cm beam left of center line at SEM11 for optimum injection. This has resulted in some loss of beam in that region and local residual radiation levels as high as 30 R/hr (HEBT vacuum chamber adjacent to the A19SS). Parasitic attempts to correct the steering were incompatible with efficient circulating beam in the AGS.

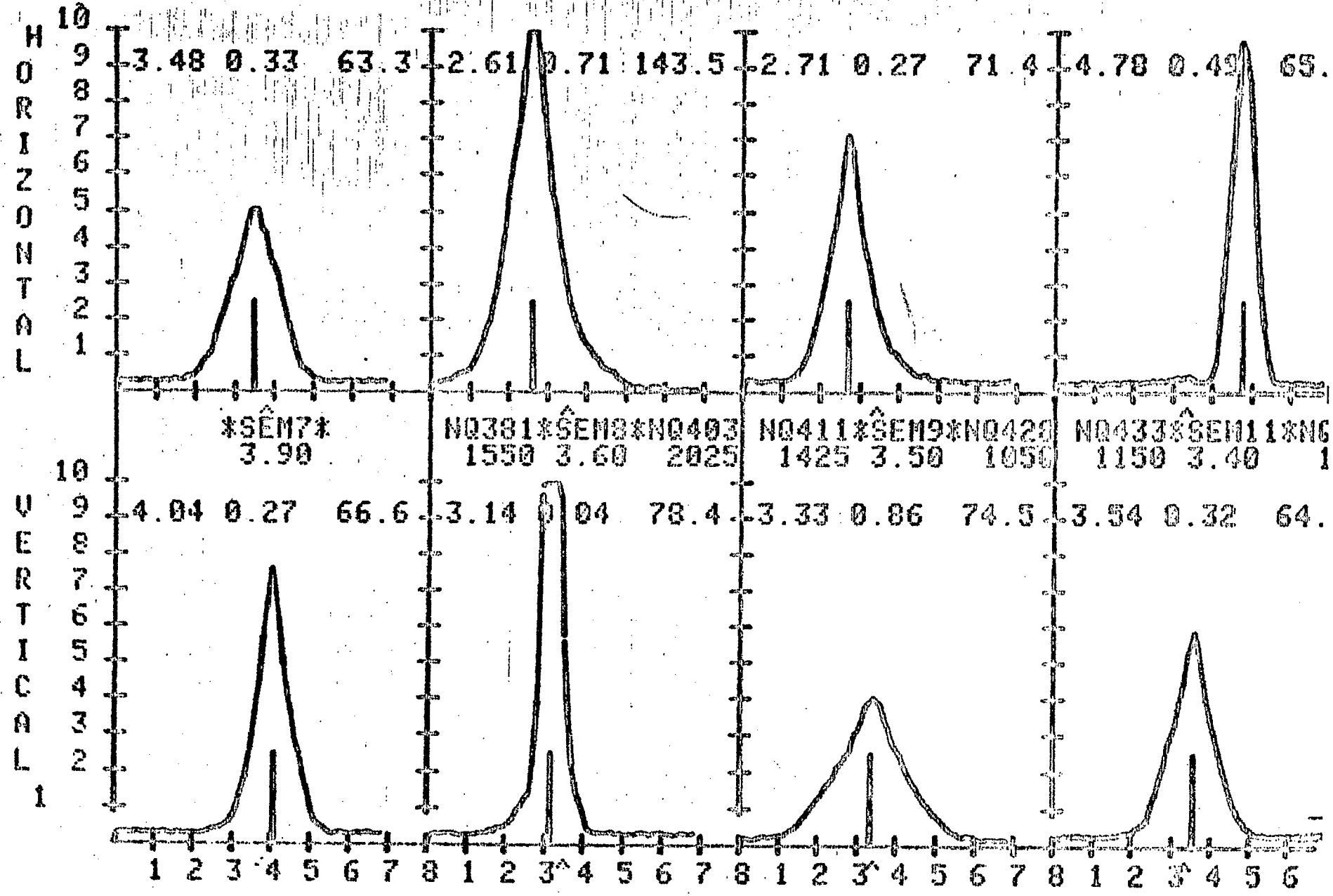
During two dedicated studies periods, this problem was examined in detail. Using the ring loss monitor system (RLRM program), which is quite sensitive to losses in the HEBT region near the AGS ring, and the H^- stripping foil stripped e^- monitor, the beam losses and transport efficiencies were documented. The second study effort included results of the A2Ø SEM beam position measurement.

Initially, one had to isolate the contribution to the injection region RLRM loss of the incoming HEBT beam and that of any spiralling beam in the AGS. This was accomplished by powering a high field vertical bump located in the IlØSS normally used during the extraction process.

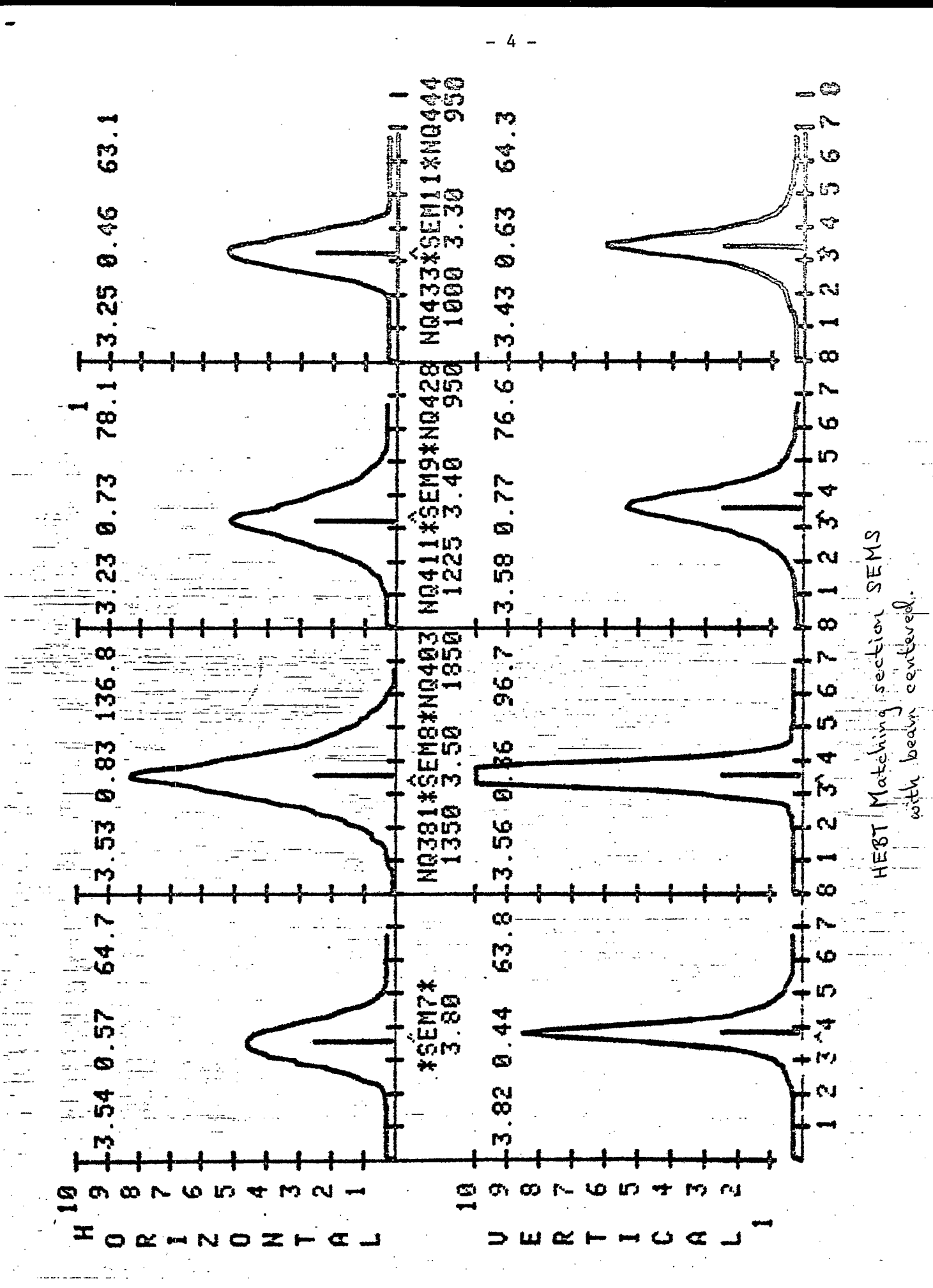
The initial position of the HEBT beam was then measured using the HEBT SEMS program to be approximately 1.6 cm beam left of center line at SEM11. This was later shown to correspond to a similar 1.6 cm horizontal shift at the A2Ø SEM. Reducing the field in ND422 (last major horizontal dipole in HEBT) just to the point where the injection region RLRM loss went to zero, resulted in approximately a 40% reduction in the stripped e^- signal. However, the HEBT beam at SEM11 was now within 0.3 cm of center line. After iteration of the two horizontal trim

dipoles (ND431, ND437) after ND422, the stripped e^- signal was returned to the nominal value.

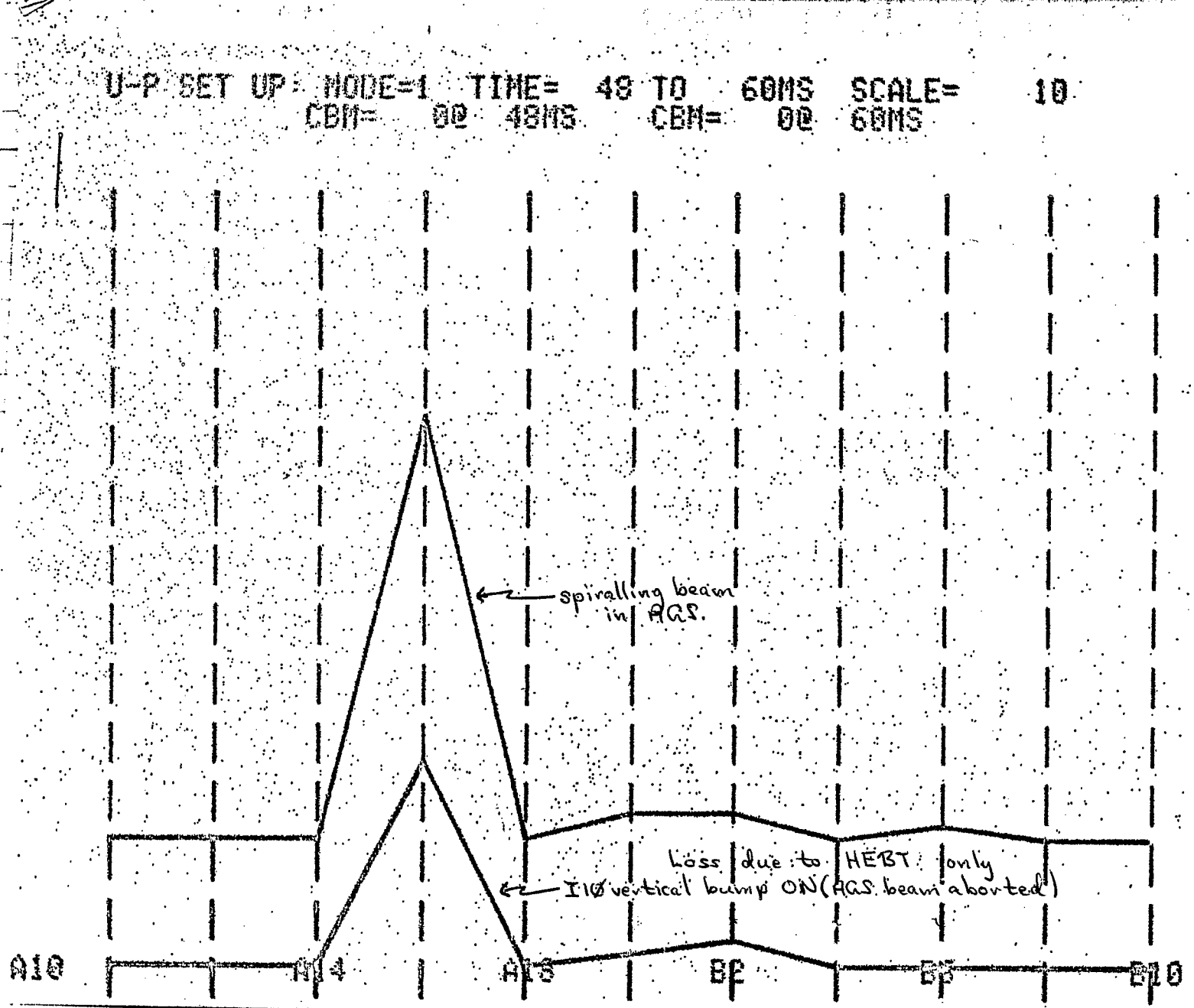
Several questions remain to be considered. First, there does not exist an accurate calibration of the stripped e^- monitor, so it cannot be used in a calculation of HEBT transport efficiency. The alignments of SEM11 and the A2Ø are probably not a concern as they were carefully surveyed when installed during the H^- conversion and have not been moved since. When the I1Ø vertical bump was turned off, the spiralling beam (as measured by the L2Ø current transformer) was only ~ 75% of that from before the HEBT steering change. It should be noted that there was essentially no effort to improve the spiralling beam efficiency and will be investigated in a later study.



HEBT Matching section SEMS
as empirically determined for HEP.



HEBT Matching section SEMS
with beam centered.


U-P SET UP: MODE=1 TIME= 48 TO 60MS SCALE= 10
CBM= 00 48MS CBM= 00 60MS
spiralling beam in AGS.
Loss due to HEBT only
I10 vertical bump ON (AGS beam aborted)
A10
A14
A18
BF
BF
B10

RLRM plot