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## The H5 Kicker Test

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AGS STUDIES REPORT

Date 4/21/81 Time 2100 - 2400  
4/24/81 0900 - 1230

Experimenters W. Weng, L. Ahrens, J. Gabusi, E. Gill, J. Glenn

Reported by W. Weng

Subject The H5 Kicker Test

OBSERVATIONS AND CONCLUSION

Purpose: To test the H5 kicker performance in actual operation condition and to execute fast extraction with the H5 kicker.

Summary of Equipment Preparation. Pulsing of the H5 kicker in H10 house produced a lot of noise. Major modifications on the ground connections for all the equipments in the H10 house had to be carried out to eliminate most of the interferences with each other. But the DATACON control card of the H20 electrostatic septum magnet had to be disconnected during the test.

The power supplies used for  $1/2 \lambda$  H10 bumps A and B were used for the  $3/2 \lambda$  H5 bumps A and B respectively. Because of the increase of factor of two in circuit inductance and the changed induced voltage pattern in the back-leg winding, the power supplies could not be recharged in time to give correct rep rate. Eventually the idea of  $3/2 \lambda$  local orbit bumps were abandoned for a  $1/2 \lambda$  H5 bump to facilitate the test.

Before the study, the H5 kicker was tuned again in the H10 house to achieve fast rise of current wave form in the order of 170 nsec and a clean flat top.

Procedure and Observations.a. Positioning of the Magnets

The designed central orbit of the deformed beam had been calculated and plotted in Fig. 1. The beam position at H5 s.s. is 2.7" and at H10U and H10D are 2.3" and 1.7" respectively. The edge of the H5 kicker was surveyed in at 2.06". With the good field region of the H5 kicker starts at 0.2" inside the edge of the ferrite and beam half width 0.35", the beam center point should be at  $2.06 + 0.2 + 0.35 = 2.61$ " as desired. The position of the H10 ejector was set to be 2.65" U and 2.1"D respectively.

b. Aperture Study

The actual location of the H5 kicker and the vertical aperture thereof was tested in the following way. First the beam was brought to a position of about 1.5" away from the center, then a vertical kick by F20 high-field dipole was introduced to create a vertical deformation which was recorded

by H4 PUE. There was no loss observed at H5. Then the horizontal deformation was increased and the vertical kick was reintroduced to observe the loss at H5. The results are summarized in the following table:

| H5 Bump             | 2000  | 2400  | 3100  | 3500  |
|---------------------|-------|-------|-------|-------|
| H5 current          | 700A  | 820A  | 1050A | 1200A |
| H5 orbit            | 1.5"  | 1.75" | 2.2"  | 2.5"  |
| F20 (at first loss) | >4000 | 2400  | 2400  | 2400  |
| H4 PUE              | >6mm  | 3.5mm | 3.5mm | 3.5mm |

This test clearly established the fact that the edge of the ferrite was at 2.0" and there was a vertical clearance of 3.5 mm inside the H5 aperture.

c. Horizontal Displacement Test

The H10 flag (at the upstream end of the H10 s.s.) was brought to a position barely touching the circulating beam, then the H5 kicker was triggered and the beam edge at the H10 flag was recorded to indicate 0.3" displacement. Another test was to retract the H10 flag by 0.3" and turned on the H5 kicker to observe a trace of beam barely touching the flag. Both observations indicated only 0.3" displacement instead of 0.6" as desired.

Results and Discussion: With circulating beam intensity in the AGS of  $1.5 \times 10^{12}$  ppp the extraction efficiency achieved was 50 ~ 60%. A beam image was observed on the U15 flag. The vertical position of the kicker was identified and the fast rise of the kicker wave form was confirmed by the fast longitudinal pick-up electrode signal of F20CT.

It was clear that only less than half of the deflection was observed at H10 flag. The H5 kicker has to be removed and inspected to identify the problem and cure for it.

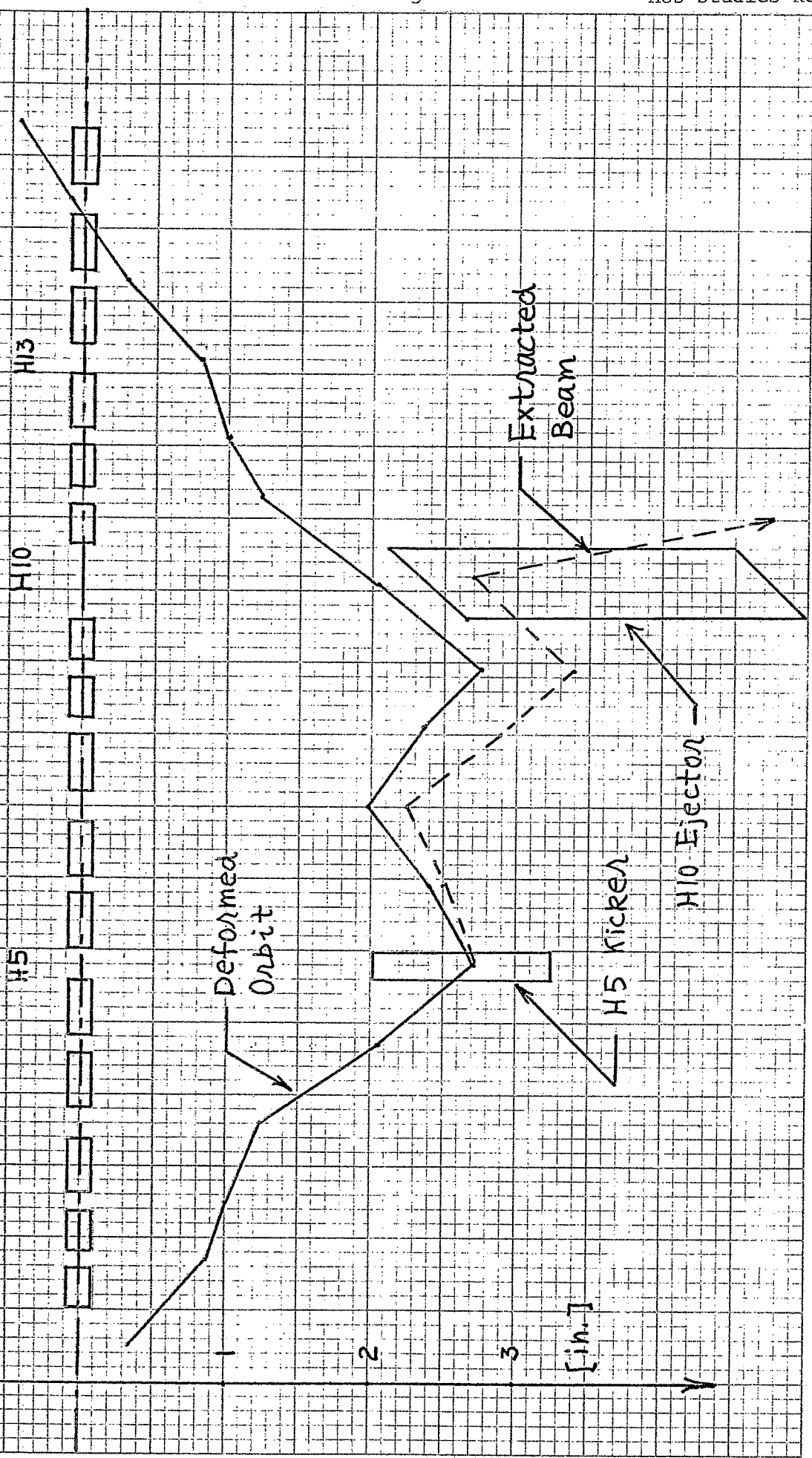


Fig. 1. H5-FEB Extraction Trajectory