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National Laboratory

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Measure Vertical Emittance of FEB in Test Beam

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FEB Commissioning Study

Wed. May 16, 1973

Bennett, Blumberg, Gutty, Keane

Scheduled: 0001-0800 Actual: 0001-0820

Objective: Measure the vertical emittance of the bunched, high intensity FEB

Result: Success. We obtained numerous (~ 20) profiles from the array of 24 insulated plates in the test beam instrument box for each of about 15 settings of the external quadrupole UQ2. The late CBM was about $3.5 \cdot 10^{12}$ ppp and we were extracting about 20% of it. The U16 current transformer indicated that we were extracting parts of 6 bunches, although there was no clear evidence that we were extracting any one bunch completely — in contrast to previous observations that we could extract 4 complete bunches from a $1.5 \cdot 10^{12}$ internal beam.

The radial instability, previously noted at $1.5 \cdot 10^{12}$, re-appeared intermittently. The symptom is a radial inward excursion immediately after FEB, with complete loss of the beam on the inside of the ring at about 3 msec after t_{FEB} . At lower CBM we previously suspected that removal of entire beam from $\sim 50\%$ of azimuth left too little beam in machine for adequate signal for radial position servo. Tonight's result puts that explanation in question. We were able to eliminate loss by a compensating outward radius shift. The effect will therefore probably not be an operational problem. We should, however, study the radial signal after t_{FEB} and also investigate accuracy of the CBM after multi-bunch extraction.

EXTRACTED BEAM VS. H10 MAGNET POSITION

NORMALIZED TO CBM CBM $\sim 4.5 \times 10^{12}$ PPA
MAGNET POSITION IS UPSTREAM END OF SEPTUM
TO BEAM CODE AXIS
SKEW = -3 MRAD

S
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4

U16 Ins. Plate / CBM →

CLEARANCE
 $\sim 2''$

2 2.1 2.2 2.3 2.4 2.5 2.6

KEUFFEL & ESSER CO.

