



Brookhaven  
National Laboratory

BNL-103921-2014-TECH

AGS.SN41;BNL-103921-2014-IR

## Measure FEB Extraction Efficiency, Calibrate Transformers

J. Balsamo

October 1973

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.AT(30-1)-16 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.

Blumberg  
NO. 41

FEB BEAM COMMISSIONING STUDY. WED. OCT. 3, THURS. OCT. 4, 1973

Balsamo, Bennett, Blumberg, Glasmann, Guthy, Keane, Williams

SCHEDULED 1800 (10/3) → 0800 (10/4). ACTUAL: 1900 → 0800

OBJECTIVES: CALIBRATE INSULATED PLATES, CURRENT TRANSFORMERS

AND PICK-UP ELECTRODE SUMS VS. POLY FOIL AT LOW AND HIGH INTENSITY. MEASURE EXTRACTION EFFICIENCY. MEASURE HALO AT U273.

1. SET UP "USUAL" FULL EXTR. AT  $P_{FEB} = 28.7$  GeV/c (GAUSS CLOCK SET) AND  $CBM \sim 1.5 \cdot 10^{12}$ . NOTED  $\frac{1}{2}$ " BEAM POSITION FLUCTUATIONS AT U15. THESE CORRELATED WITH SPOT MOVEMENT AT H10 INTERNAL FLAG. HENCE H10 EJECT. MAGNET IS NOT CAUSE. PROBLEM IS RADIAL FLUCTUATION OF 2 mm OF CIRCULATING BEAM, WHICH CORRELATES WITH CHANGES IN CBM OF ABOUT 50%. WE COULD NOT STABILIZE RADIUS BY GAIN CHANGE IN RADIAL SERVO LOOP OR USE OF BIPOLAR PUE.
2. WENT TO  $CBM = 6.3 \cdot 10^{12}$  p/p. RADIAL AND VERTICAL SPOT SIZE INCREASE MARKEDLY. VERTICAL SIZE AT H10 FLAG →  $\frac{3}{4}$ " FROM USUAL  $\sim \frac{1}{4}$ " AND SHOWS VERTICAL COLLIMATION, PROBABLY FROM .687" E10 APERTURE. WITH OUTER EDGE OF BEAM AS CLOSE AS POSSIBLE TO E10 SEPTUM, WE DO NOT HAVE ENOUGH KICK AT C15 KICKER (EVEN WITH INCREASE OF C15 BANK VOLTAGE FROM 30 KV TO 36 KV) TO EXTRACT BUNCHES CLEANLY, AS EVIDENCED BY HIS PUE SIGNAL AND U165 CURR. TRANS. PICTURE. EXTRACTION EFFICIENCY = 51% BY POLY FOIL. ALSO EXPOSED ARRAY OF POLY RODS FOR "HALO" INTENSITY AT  $\frac{7}{16}$ " FROM SPOT CENTER IS  $\sim 3 \cdot 10^{-4}$  OF CENTER INTENSITY. HALO DECREASES BY FACTOR OF 7 GOING FROM 1" TO 5.5" FROM CENTER. CENTER FOIL COUNT ALSO GIVES  $\sim 51\%$  EXTRACTION. AUTO RADIOGRAPH OF FOIL SHOWS  $\sim \frac{1}{2}$ " DIAMETER SPOT, WHEREAS ON U273 FLAG IT LOOKED  $\sim 2" \times 1"$ . IP'S, PUE'S AND CT'S ALSO CALIBRATED IN ABOVE RUNS. AGS RADIUS STABLE TO  $\sim 22m$  AT HIGH <sup>intensity</sup> <sub>intensity</sub>
3. WENT BACK TO  $CBM \sim 1.5 \cdot 10^{12}$ . EXPOSED POLY FOIL. EXTR. EFF. = 45%. LOW VALUE POSSIBLY CAUSED BY RADIAL JITTER NOTED ABOVE. EXTERNAL DETECTORS ALSO CALIBRATED AT THIS LOW INTENSITY
4. CHECKED PERFORMANCE OF US VERTICAL COLLIMATOR. IT LIMITS VERTICAL SIZE OF U273 SPOT AS CALCULATED. (NOTED THAT US COLLIMATOR WAS OPEN TO ONLY  $\frac{3}{8}$ " GAP IN ABOVE RUNS. THIS MAY ALSO EXPLAIN LOW EFFICIENCY.)
5. CHECKED MOMENTUM RECOMBINATION AT U273. INCREASED  $4\frac{1}{4}^\circ$  BEND BY 1% AND NOTED  $\sim \frac{1}{8}$ " MOVEMENT TO INSIDE AT U273 (3000" AWAY). SO WE ARE NEAR ACHROMAT. SPOT AT U165 MOVED  $\sim 1"$ .
6. ALL POWER SUPPLIES STAYED ON FOR 13 HOURS WITHOUT FAULT. RECORD!