BNL-103980-2014-TECH

AGS.SN102;BNL-103980-2014-IR

Injection Matching and Dilution Studies

J. L. LeMaire

October 1977

Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

DISCLAIMER

AGS STUDIES REPORT NUMBER 102

Date 10/20/77 Time 0400-0800 Experimenters J-L LeMaire, E. Raka

Subject Injection Matching and Dilution Studies

OBSERVATIONS AND CONCLUSION

Object: To investigate the source of injection errors in the vertical plane when less than a single turn is injected. To test a matching program with a medium intensity spiraling beam.

Procedure: A five-turn spiraling beam of $\approx 4 \times 10^{12}$ was obtained (this was actually of poor quality, i.e. short survival time and little flattop, for unknown reasons). Then reduction of linac pulse width to ≈ 3 μsec for the half-turn studies. Finally, a return to many turn injection to give 8×10^{12} for matching studies (still poor spiraling time).

Observations and Results: Two simple programs controlling the last two vertical steering magnets were employed to attempt to minimize the vertical injection errors present in the 3 μs injected beam. To first order the angle or position of the beam as it left the inflector could be controlled independently. Again, it was not possible to obtain a significant reduction in the coherent amplitude. About 1 cm pp was the best one could do, or about the same as before.

An attempt was made to measure the H and V tunes at $\approx 4 \times 10^{12}$ but the poor quality of the beam gave erratic results. However $\nu_H \approx 8.76$, $\nu_V \approx 8.86$ right after injection.

At 8×10^{12} a matching program described in AGS 77-9 was used to minimize the losses against the inflector in the horizontal plane and then in the vertical plane. The results were encouraging since the spiraling beam intensity was increased by 5% in a reproducible manner.

Quadrupoles Q18, Q19, Q20, Q21 were used but other combinations should be tried.

Conclusions: Further matching studies using the program HOPI should be undertaken.

In order to further investigate the injection error problem it is planned to provide computer acquisition of the PUE data so that it can be thoroughly analyzed.