

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)

Notice: This technical note has been authored by employees of Brookhaven Science Associates, LLC under Contract No.EY-76-C-02-0016 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.

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 $\approx 3 \mu\text{sec}$ 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 $3 \mu\text{s}$ 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.