

## Tune and Chromaticity Correction

L. Ahrens

November 1985

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. DE-AC02-76CH00016 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.

AGS Studies Report

Date(s) November 17, 1985 Time(s) 1200-1700  
Experimenter(s) L. Ahrens and W. van Asselt  
Reported by W. van Asselt  
Subject Tune and Chromaticity Correction

Observations and Conclusion

At three points in the cycle we have measured tunes as a function of radius for the following cases:

- a. bare machine
- b. programs in the horizontal and vertical quad strings as suggested in Studies Report No. 182
- c. with the quads and the horizontal sextupoles programmed to reduce the horizontal chromaticity

In all cases the skew quads were powered in such a way that coupling between the two transverse planes was at a minimum. At the highest momentum point, the 60 A available was inadequate.

Coherent oscillations were excited by the tune meter kickers. The tune was measured by filtering of PUE signals in the MCR and feeding these signals into a gated frequency counter (we tuned the filter such that we measured the lower side band frequency of the coherent oscillation).

The results are summarized in Tables 1, 2 and 3. The tunes given are for zero radius as indicated by the PUE system.

Table 4 gives the value of the currents in the different strings at the three measuring points.

Table 1  
(@ 35,000 GC)

	Bare Machine a	Quads b	Quads + Sext c
$\nu_H$	8.70	8.662	8.692
$\nu_V$	8.752	8.795	8.782
$\xi_H$	-2.34	-2.34	-1.15
$\xi_V$	-0.24	-0.24	-0.78

Table 2  
(@ 45,000 GC)

	Bare Machine a	Quads b	Quads + Sext c
$\nu_H$	8.688	8.650	8.696
$\nu_V$	8.746	8.799	8.779
$\xi_H$	-2.61	-2.54	-0.49
$\xi_V$	+0.06	+0.05	-0.78

Table 3  
(@ 55,000 GC)

	Bare Machine a	Quads b	Quads + Sext c
$v_H$	8.648	8.577	8.627
$v_V$	8.714	8.815	8.785
$\xi_H$	-3.36	-3.37	-1.17
$\xi_V$	+0.94	+1.01	-0.12

Table 4

	35,000 GC	45,000 GC	55,000 GC
$I_H$ Quad (A)	15	20	42
$I_V$ Quad (A)	25	43	100
$I_{Sext}$ (A)	130	280	390
$I_{Skews}$ (A)	37.5	50	60

### Conclusions

The results for the bare machine are in agreement with previous measurements (see Studies Report No. 182).

We are able to control the chromaticity to values of about 1 throughout the cycle in both planes by using the horizontal sextupole string only.

The quads have been programmed in such a way that the vertical tune was approximately 8.78 throughout the cycle. The program for the horizontal quad string does not seem optimal yet, because we are crossing  $\nu_H = 8-2/3$  between 45,000 and 55,000 Gauss Counts, while the intention was to hold the tune above the  $8-2/3$  line.

mvh