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CORRECTION OF FIRST ORDER SYSTEMATIC COMPONENT IN SSC DIPOLES

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ABSTRACT

The limit on the first order systematic skew multipole component in the SSC dipoles was improved by correcting the tune shifts with the cell quads. As a result the tolerance on the systematic a_1 can be increased to $a_1 \leq 0.6 \times 10^{-2} m^{-1}$.

INTRODUCTION

Limits on the allowable systematic a_1 in the SSC dipoles have been reexamined from the coupling constant criterion (which requires that the coupling constant be less than 0.005) for the 90 degree lattice (Garren/Johnson L90). The procedure for determining the tolerances are the same as in Reference 1, i.e. the limits on the systematic skew multipoles are determined from the demand that the coupling constant (Reference 1) be less than 0.005. The tune shifts resulting from the introduction of the systematic error were corrected by the regular cell quads and the coupling reevaluated.

ANALYSIS AND RESULTS

In this study, the tunes of the 90 degree standard lattice (Reference 2) were adjusted to 96.265 in x, and 95.285 in y. As previously (Reference 1), the integer tune split was necessary to reduce the effects of coupling. The lattice was studied with TEAPOT (Reference 3) without random multipole errors in the dipoles. The coupling constant and tune shifts at zero amplitude were computed for systematic a_1.

Table 1. summarizes the result. The upper limit on the systematic a_1 is determined by the criteria that the coupling constant (Reference 1) be less than 0.005. The tune shift criteria used in previous studies is not relevant in this case, since the tune shifts were corrected after the systemmatic error has been introduced. The following table shows the value of the coupling constant before and after correcting for the tune shift and the percentage change in the magnet strength as a function of a_1, which lies well within the allowable power supply limits.

$a_1(m^{-1})$	C_b	C_a	δk (%)
0.20×10^{-2}	0.0021	0.0015	0.02
0.25×10^{-2}	0.0050	0.0018	0.03
0.35×10^{-2}	0.0150	0.0026	0.06
0.40×10^{-2}	0.0224	0.0030	0.09
0.45×10^{-2}	0.0313	0.0035	0.10
0.50×10^{-2}	0.0419	0.0039	0.15
0.60×10^{-2}	0.0644	0.0049	0.28

Table 1. Coupling constant before (C_b) and after (C_a) correction for the tune shift due to a_1 and percentage change of the quad strengths

CONCLUSIONS

Limits on the first order systematic skew multipole error in the SSC dipoles have been reexamined for the 90 degree standard lattice. The limit is $a_1 \leq 0.6 \times 10^{-2} m^{-1}$, or, expressed in units used by the magnet errors group (parts per 10^4 at $1cm$) is 0.6, compared with 0.09 in the previous study (Reference 1).

REFERENCES

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