CORRECTION MEETING NOTES 11/4/85

Jack Peterson

Attendees: Bintinger, Chao, Dragt, Elioff, Garren, Harrison, Johnson, Limon (chair), Peggs, Peterson, Schachinger, Shrauner, Stork, Talman, Taylor, and Tigner.

The following table of strengths and numbers of correction elements in the SSC was developed:

Corrector Multipole	Reason	Corrector Frequency	Corrector $B_n(1\ cm)L$	(NI)n AT/pole[11]
dipole horiz	c.o.[1]	1 per Q_F	4.0 T-m	8.0×10^4 A-T
dipole vert	c.o.[1]	1 per Q_D	4.0	8.0×10^4
quad norm	$\Delta\beta/\beta$[2], tuning[3], and tracking[4]	2 per cell	.07+.21+.03 = 0.31	7.7×10^3
quad norm	$\beta,\beta'_{x,y}$ meas.	4 per reefer	0.31	7.7×10^3
quad skew	$\Delta\beta/\beta$[2]	10 per ring	0.60	1.5×10^4
sext. norm	2x nat'l chrom[5]	1 SF per cell 1 SD per cell	(F) .07 (D) .11	2.9×10^3 4.6×10^3
sext. skew	$4\sigma(a_2)$ in dipole[6]	10 per ring	0.54	2.3×10^4
oct. norm	$4\sigma(b_3)$ in dipole and Landau[7]	10 per ring	0.30	2.4×10^4
oct. skew	$4\sigma(a_3)$ in dipole[8]	10 per ring	0.60	4.7×10^4
deca. norm	$4\sigma(b_4)$ in dipole[9]	10 per ring	0.51	8.0×10^4
deca. skew	$4\sigma(a_4)$ in dipole[10]	10 per ring	0.12	1.9×10^4

Notes:

1. to correct closed orbit deviations caused by 4σ errors in quad position, quad rotation, and BPM position. (SSC-48 Rev.)
2. (Talman) For a dipole b_1 of 1 unit (10^{-4} B_0 at 1 cm), $\Delta\beta/\beta=10^{-3}\sqrt{N_d}$, where N_d is the number of dipoles between correctors. For 10 correction

points the quad strength at 1 cm radius is:

$$B_1L = 4\sigma(b_1)B_0L_D\sqrt{Nd} = 4 \times .7 \times 10^{-4} \times 6.5T\ 16.6\ m\sqrt{4000/10} = 0.60\ T\text{-}m$$

For one corrector per half cell $B_1L = 0.068$ T-m.

3. For $\Delta\nu = \pm 1$ per arc with 60° cells, $\Delta\nu/\nu = 1.10\ \Delta(B'L)/(B'L)_Q$, giving

   $\Delta B'L = 136T/m \times 5m/(1.10 \times 30) = 20.6$ T

   or $\Delta B_1L = 20.6 \times .01 = .21$ T-m at 1 cm.

4. Tracking error assumed to be ±1/2% of cell quads.

   $\Delta B_1L = 5 \times 10^{-3}\ 680T\ 10^{-2}m = 0.034$ T-m

5. From SSC-N-53.
6. For $\sigma(a_2) = 0.62 \times 10^{-4}$ (SSC-7),

   $\Delta B_2L = 4 \times 0.62 \times 10^{-4}\ 6.5T\ 16.6m\sqrt{4000/10} = 0.54$ T-m
7. For $\sigma(b_3) = 0.35 \times 10^{-4}$ (SSC-7) and/or Landau betatron frequency spread of 0.025 at 1 TeV.
8. For $\sigma(a_3) = 0.69 \times 10^{-4}$ (SSC-7)
9. For $\sigma(b_4) = 0.59 \times 10^{-4}$ (SSC-7)
10. For $\sigma(a_4) = 0.14 \times 10^{-4}$ (SSC-7)
11. Ampere-turns per pole for thin $\cos(n+1)\theta$ coil with length of 2.0 m and coil radius of 2.5 cm.

The β, β' measurements can use four consecutive quads in a 60-degree lattice. Another arrangement would be necessary in a 90-degree lattice. E. Forest's results with 90-degree lattice with non-interleaved sextupoles are interesting but incomplete. For the time being we assume a 60-degree lattice.

To correct the sextupole fields due to persistent currents and to saturation effects we assume driven, series-connected, bore-tube correctors.

The bore-tube sextupoles could be connected so as to make the chromaticity corrections also, but achieving the required positional accuracy could be difficult. For strength comparison, the integral field at 1 cm over a half-cell for a 2 "unit" sextupole at 20 TeV is 0.11 T-m, which is equal to the strength of the chromaticity sextupole corrector at the D-quads listed in the table.

The spool picture that has developed is that in every spool there is at the end next to the quadrupole a nested set of dipole (either horizontal or vertical), normal quad, and normal sextupole windings about 2 meters in length. The other end can be used for a variety of functions: cryogenic leads, in-line vacuum valves, vacuum barrier, single or nested set of skew quad, skew sextupole, normal octupole, skew octupole, normal decapole, and/or skew decapole windings--or other special hardware.

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