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Correction of Chromatic Effects in the ß-functions in RHIC

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Correction of Chromatic Effects in the β-functions in RHIC

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The attached graph records the correction of the variation of β_x with momentum for the CBA accelerator. The approach used here may be of interest for the correction of similar effects in RHIC.

In the example shown, only β_x is corrected using 3 families of sextupoles. A 4th family is included to control the vertical chromaticity, but no attempt is made to correct $\beta_y(p)$.

The 3 families to correct $\beta_x(p)$ are chosen in a simple way, according to the variation of β_x around the ring. 2 families are put in the arc where β_x has its largest value and varies around the ring with a period of 2 cells. In the other arc, when β_x has not changed a lot from its $\Delta p/p = 0$ value, there is one family which is set at the b_2 required by 2-family chromaticity correction.

In this example, a 4th family, near QD, is set just as the third family was set. In principle, this

fourth family could be replaced by 3 families to control $\beta_y(p)$, and these 3 families would be chosen is same manner used for the 3 families to control $\beta_x(p)$

In the example shown, $\Delta b_2(K)$, $K = 1$ to 4, gives the change in b_2 from the values needed for 2-family correction of the chromaticity. Note it was assumed that $\Delta b_2(2) = -\Delta b_2(1)$, and $\Delta b_2(3) = \Delta b_2(4) = 0$. With just the one parameter remaining, the $\beta_x(p)$ variation is reduced to about 1% or $\Delta p/p = .01$

These results indicate that 6 families of sextupoles might do the job for RHIC, and 8 families would do even better.

4 Sextupole Families Correction