

## Correction of Chromatic Effects in the $\beta$ -functions in RHIC

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BNL

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The attached graph records the connection of the variation of  $\beta_x$  with momentum for the CBA accelerator. The approach used here may be of interest for the connection of similar effects in RHIC.

In the example shown, only  $\beta_x$  is corrected using 3 families of septupoles. A 4th family is included to control the ~~vertical~~ 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  $\beta_x$  around the ring:

2 families are put in the arc where  $\beta_x$  has its largest value and varies around the ring with a period of 2 cells.

In the other arc, where  $\beta_x$  has not changed a lot from its  $\beta_x/p=0$  value, there is one family which is set at the  $k_2$  required by 2-family chromaticity correction.

~~is~~

In this example, a 4th family, near QD, is set ~~as~~ just as the ~~3rd~~ 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 in 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 value needed for 2-family correction of the chromaticity. Note it was assumed that  $\Delta b_2(2) = -\Delta b_2(1)$ , and  $\Delta b_2(3) = \Delta b_2(4) = 0$ .

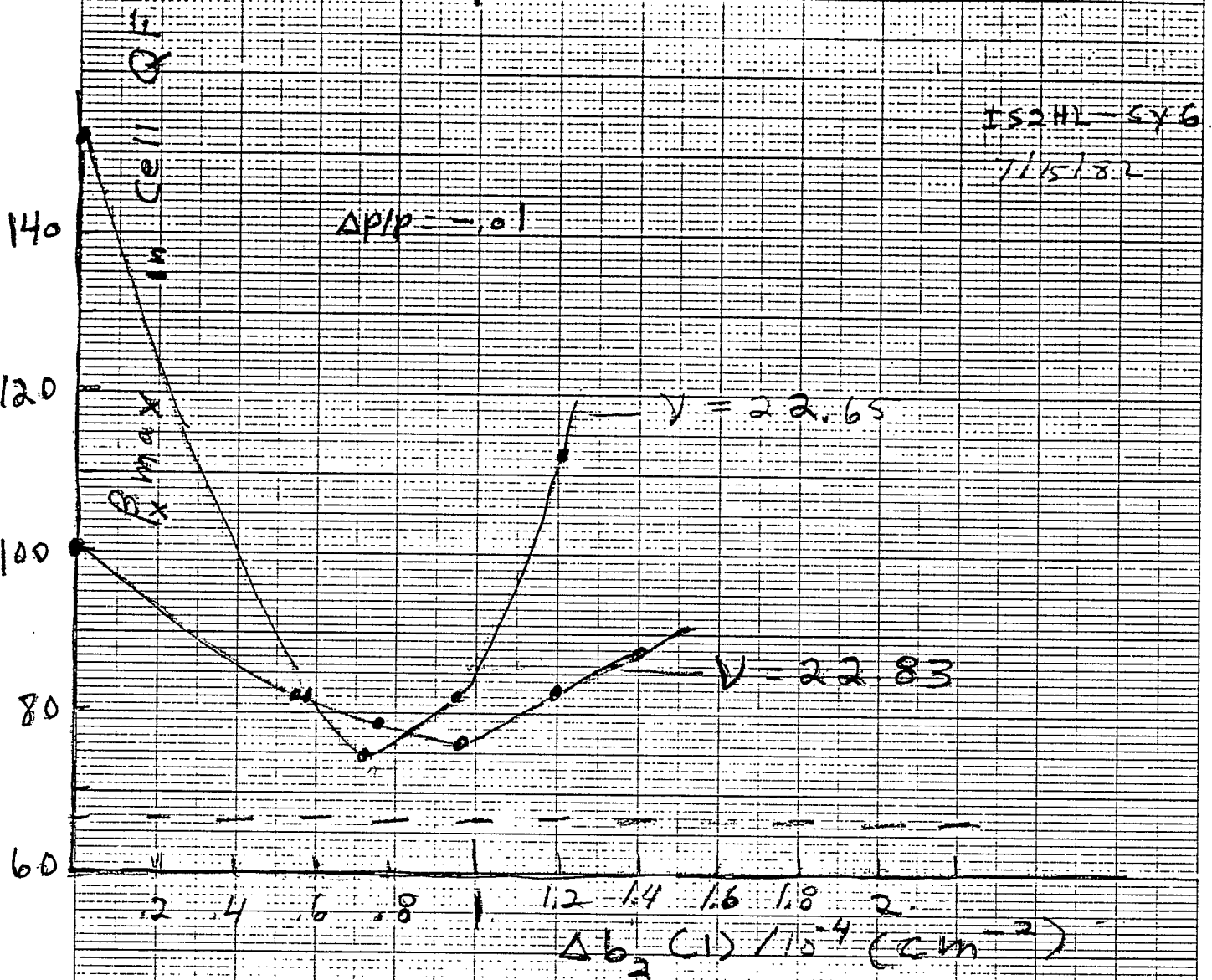
With just the one parameter remaining, the  $\beta_x(p)$  variation is reduced to about 1.9% or  $\Delta p/p = .01$

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

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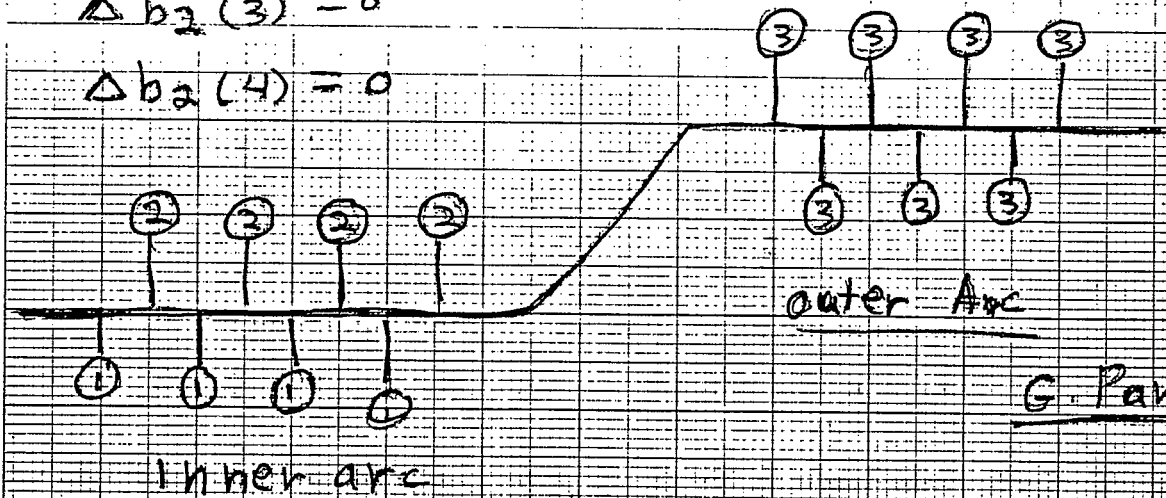
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$$\Delta b_2(2) = -\Delta b_2(1)$$

$$\Delta b_2(3) = 0$$

$$\Delta b_2(4) = 0$$



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