

## Happex Optics – Past Actual and Future Options

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This document contains Optim output for the optics used for the summer 2004 HAPPEX run at 3026 MeV and proposed optics for the two energies to be run in 2005, 2751 and 3270 MeV. On pages 2-5 there are three figures, one for each energy, in the order 3026, 2751 and 3270 MeV. At the end I extend the horizontal scale for beam envelope and raster, including the effect of the new sweep magnet at 12 T-m on the beam envelope and raster to the dump. These pages have only two plots and vertical scales have changed from those used earlier in the document.

Scale on trajectory (raster) plots is cm

Scale on phase plots is fractions of  $2\pi$ , so 0-0.5 is 180 degrees

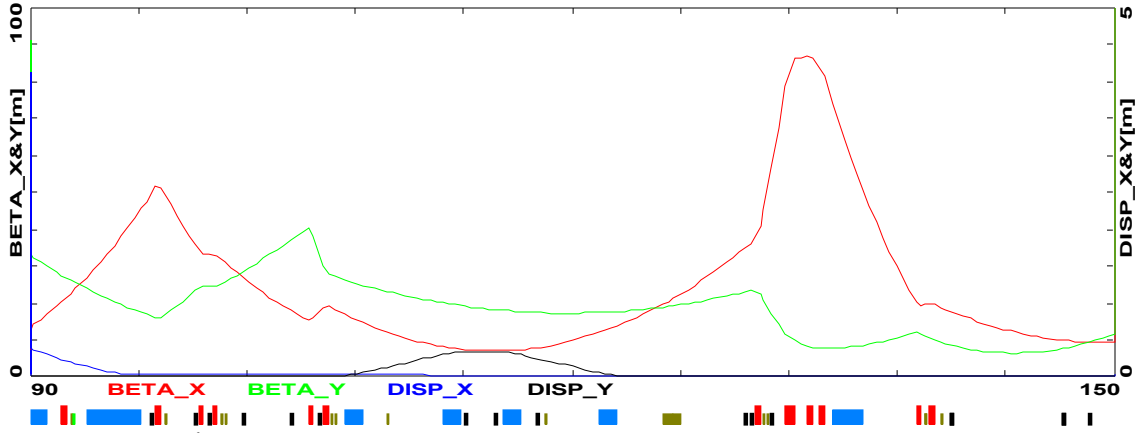
All of the optics use Moller quad settings derived from the original, three magnet solutions supplied to me by Eugene Chudakov. In other words, quads need not be changed to make a Moller measurement. I term these “combined optics”.

Remember when you look at the raster size that this is the result of the positive kick, hence the half size.

Note also that these assume design beam parameters coming out of the transport recombiner, which never happens. From allsave, it appears that on June 12, 2004, I used BPAM to match the beam to this design optics first at the start of the hall A arc (harp 1C09) and then in the Compton chicane (probably BPM1P03). The end of the line was then downloaded from the file used here and was not changed during the run.

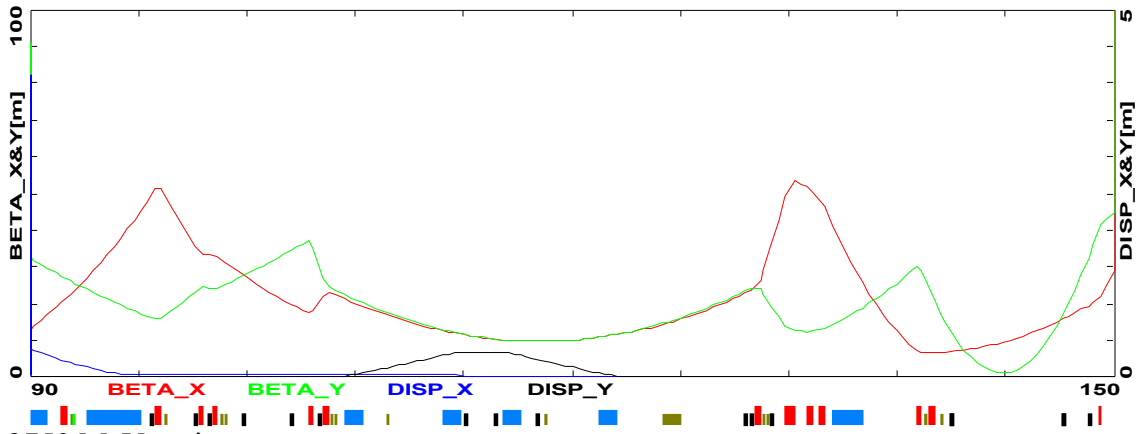
Design goals for new optics were: small beam in Compton; raster at least 7 mm square; betatron phase difference between last two BPMs comparable to that used in 2004; big spot at physics target. The first three were satisfied, the last wasn't. I used combined optics for all of these because I couldn't come up with a solution which better met all four goals when I relaxed this constraint.

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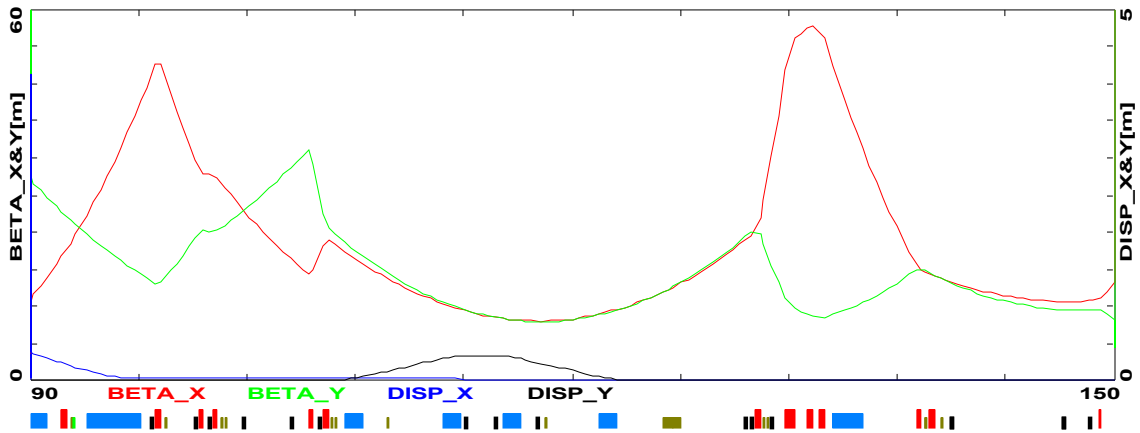
3026 MeV optics

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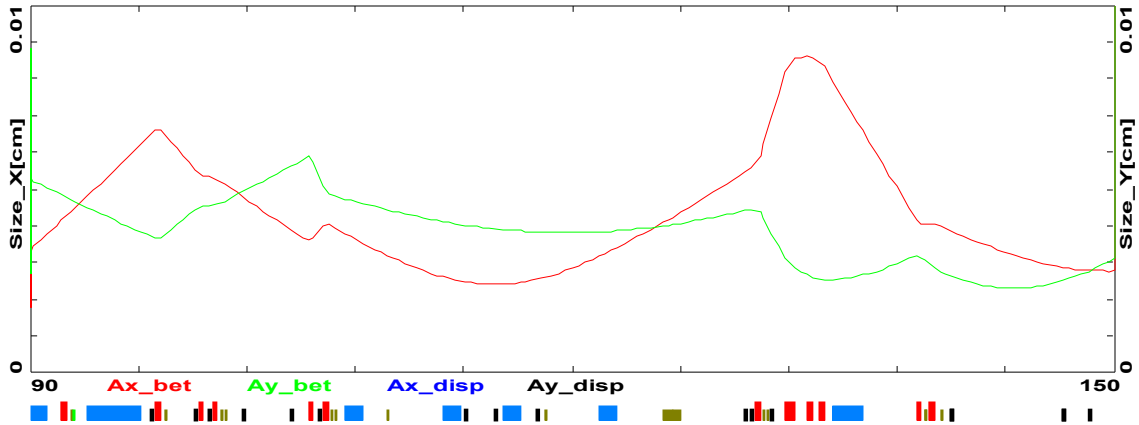


2750 MeV optics

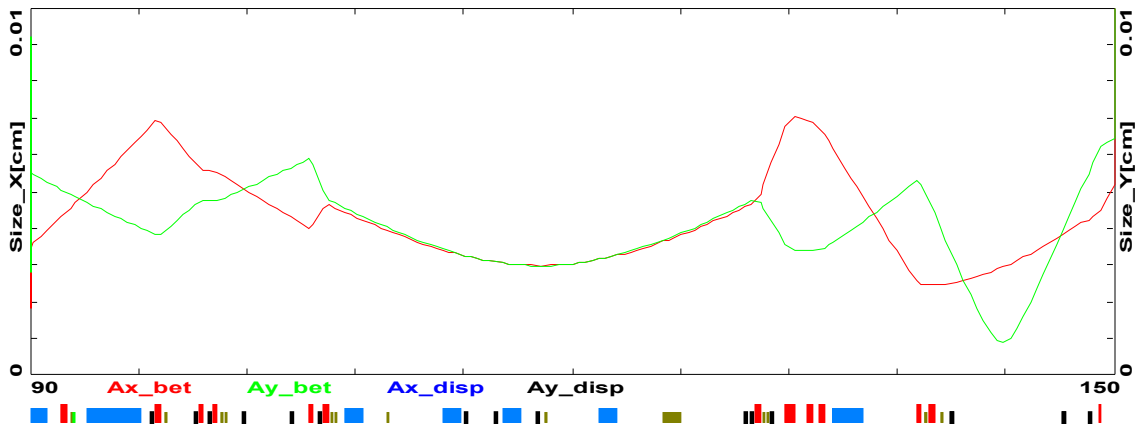
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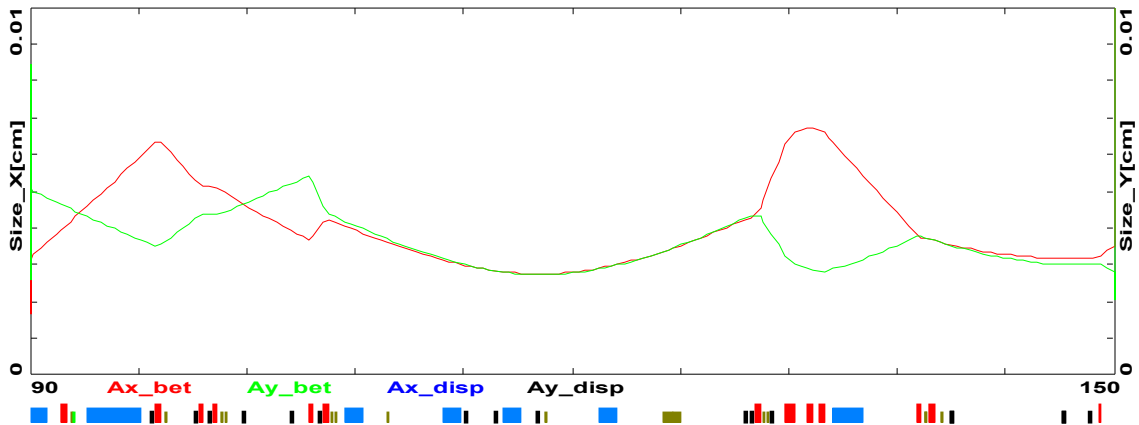
3270 MeV optics



beam envelope 3026 MeV, 100 microns vertical scale

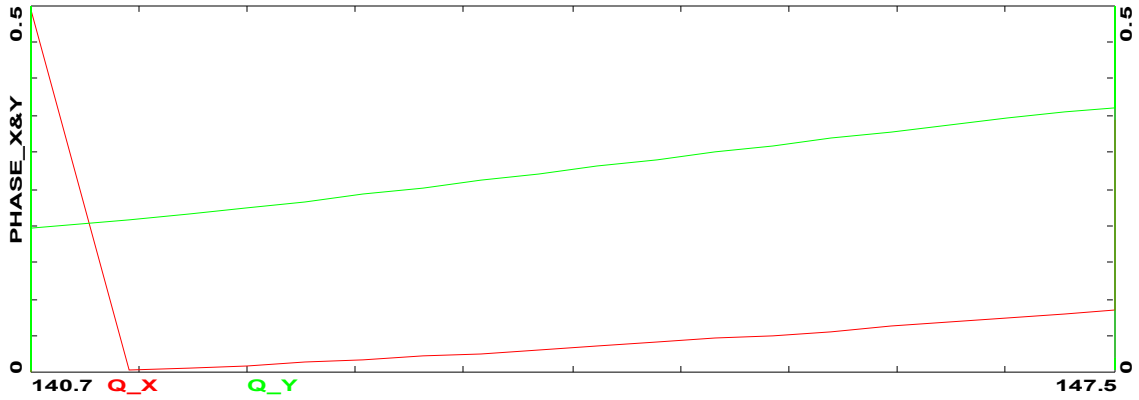


2750 MeV beam envelope



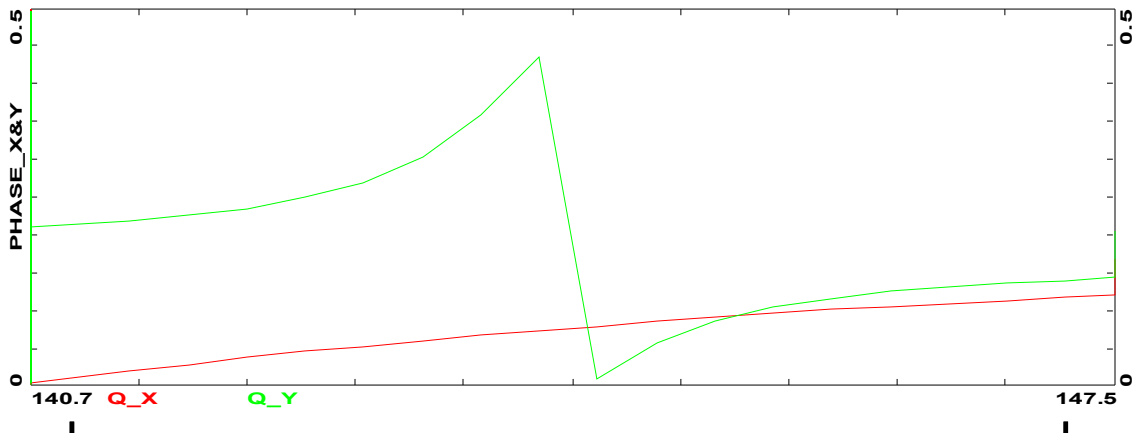
3270 MeV beam envelope

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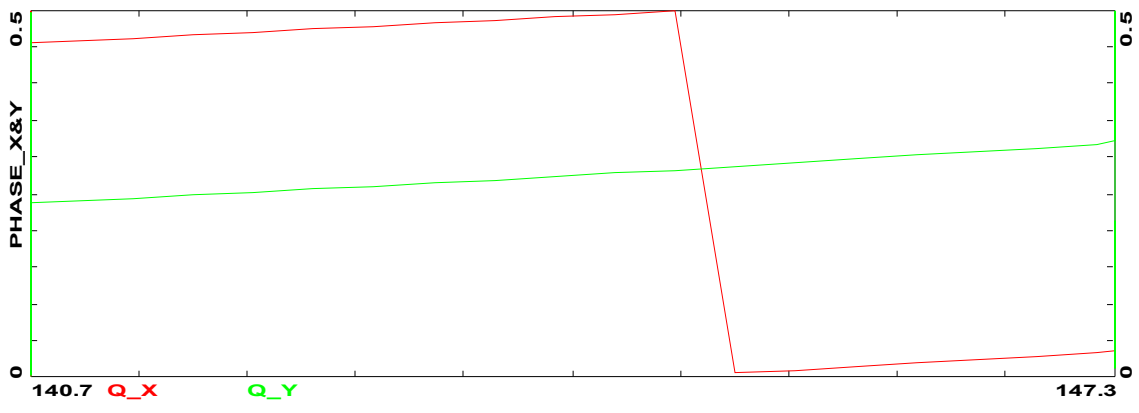
3026 MeV optics phase advance between last two BPMs. BPM locations indicated by vertical ticks below "7" in 140.7 and "1" in 147.5. Vertical scale 0-180 degrees.

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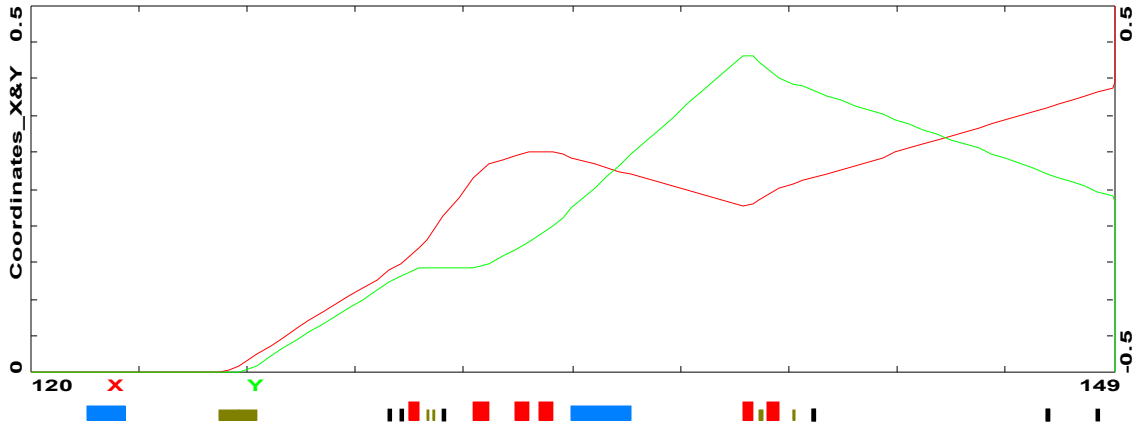
2751 MeV phase advances

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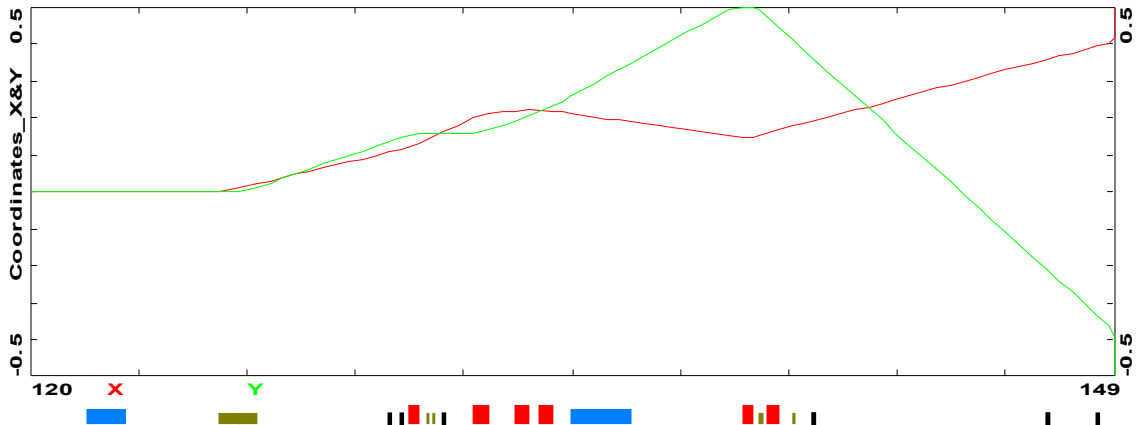
3270 MeV phase advances. Both about 14 degrees. Will this suffice? Both here are within 10% of the value of horizontal phase advance in the upper graph, the optics used in 2004, so I assume so unless told otherwise.

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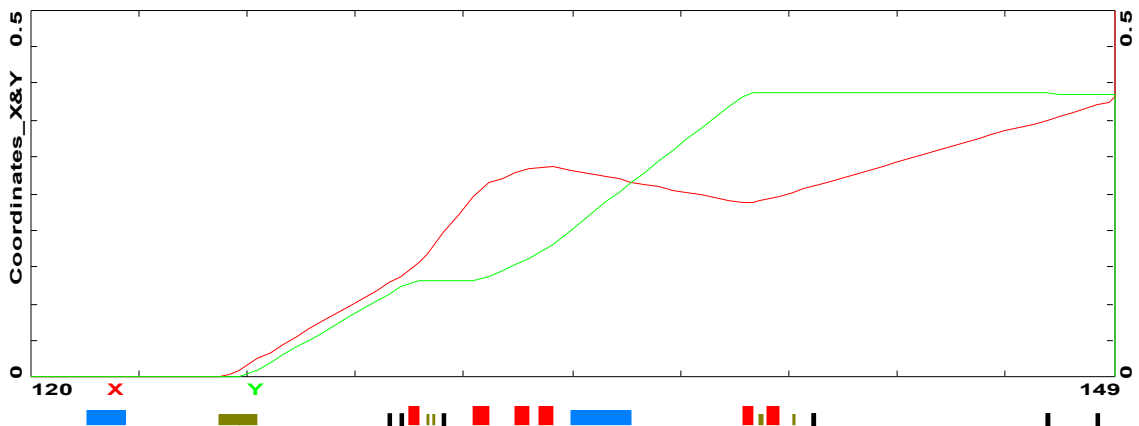
3026 MeV raster with both coils maxed out. Note change in horizontal scale starting and end points. End point changed to eliminate effect of new sweep magnet on plots below. 0.5 cm full scale vertical.

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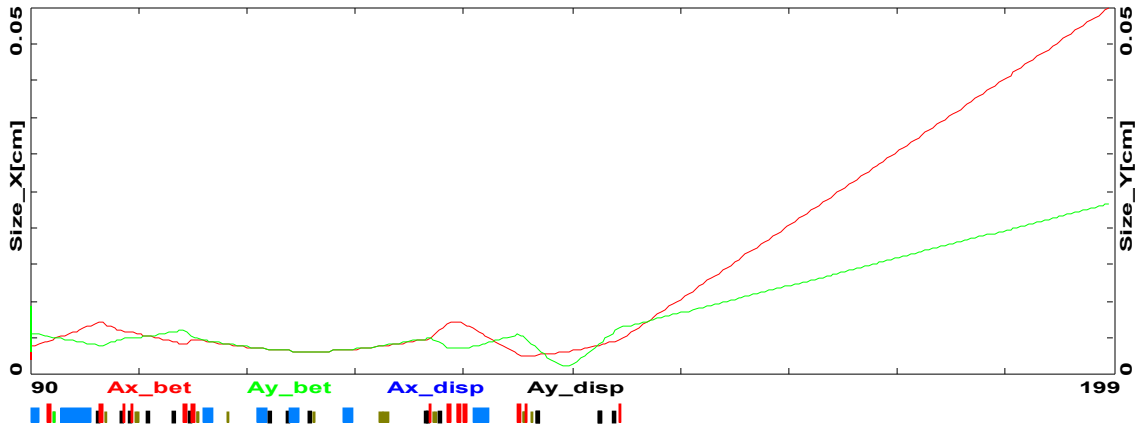
2751 MeV raster. X coil at 69% of max, Y coil at max. Note that vertical scale is now -0.5 to 0.5 cm

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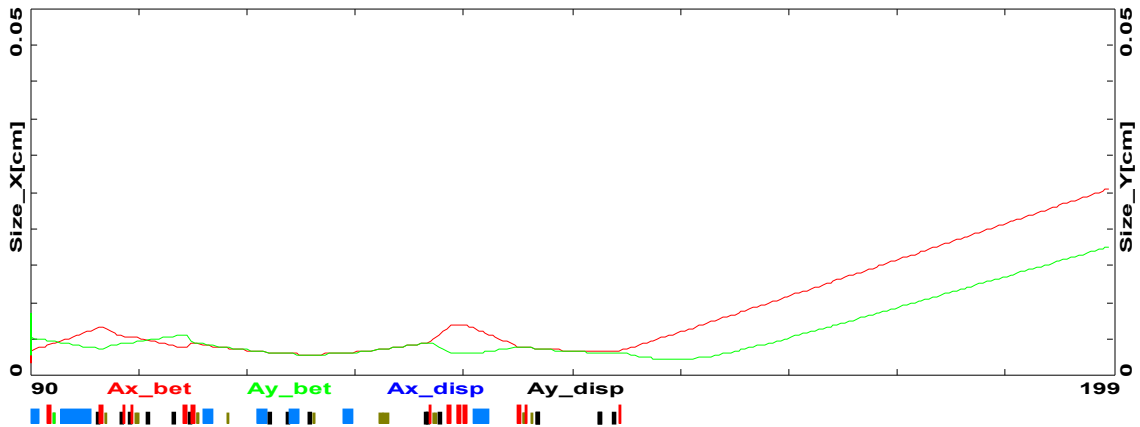
3270 MeV raster, both coils maxed out. Vertical scale again 0-0.5 cm.

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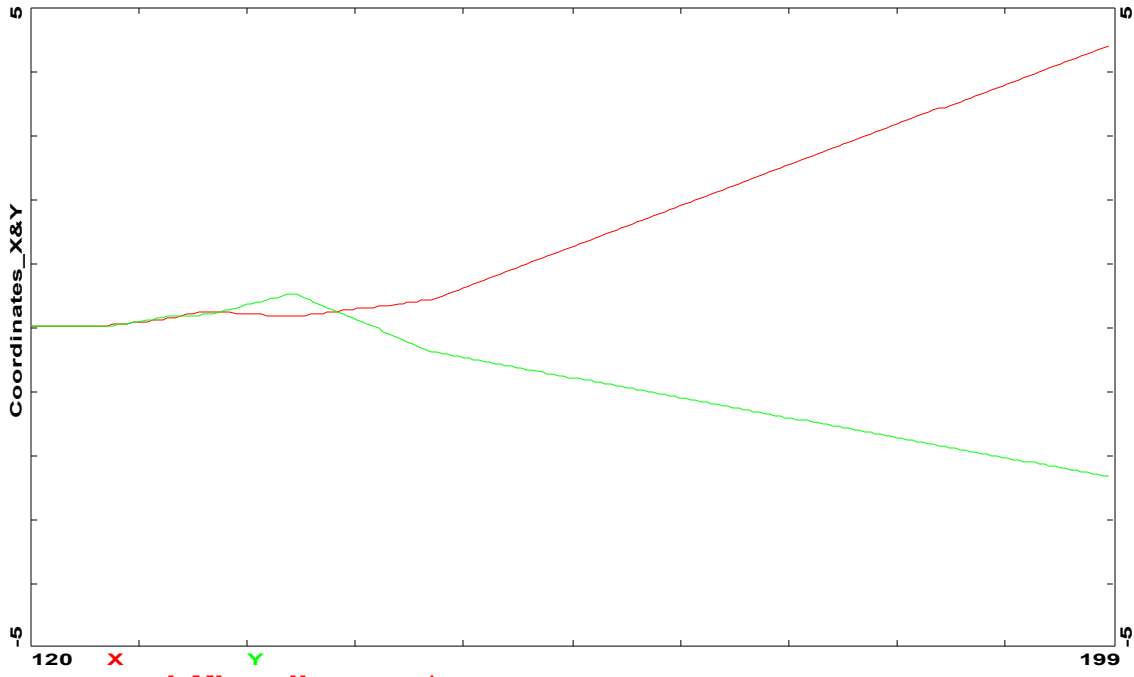


2751 beam envelope all the way to dump, with sweep magnet at 12 T-m. Vertical scale 0.5mm

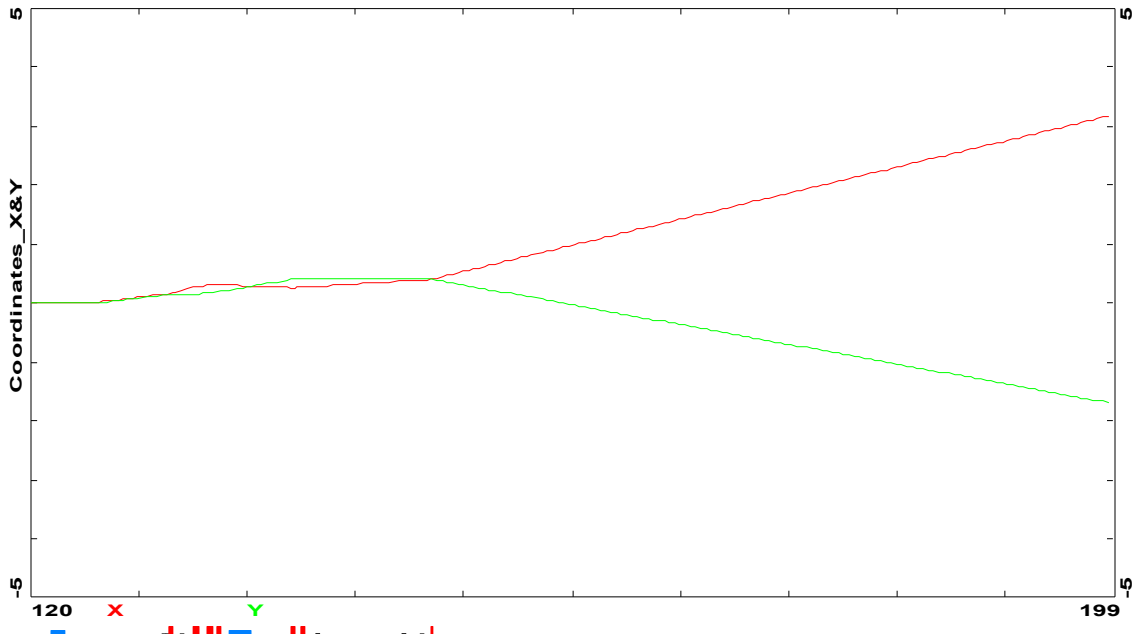
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3270 MeV beam envelope all the way to the dump. Sweep magnet and scale as above



2751 MeV raster all the way to the dump, including sweep magnet at 12 T-m. Vertical scale now -5 to 5 cm. Diffuser flange ID ~10 cm perhaps 15 m from dump face



3270 MeV raster all the way to the dump.