HAPPEx optics 7/21/05 10am

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I've been working on HAPPEx optics since last Saturday, mostly with BPAM. Design optics is in file /a/opsdata/optics/optim/hallA_art_happex_2751.opt. This is also in the model server, art++. There are various "r" revised files in the same directory. This morning in response to concerns about transfer function from modulation coils at the front of the line to the last two BPMs I created a new file, hallA_art_happex_2751r6.opt, with input parameters taken from BPAM run in elog 1281663, 7/19/05 1711. I chose these input parameters rather than the ones in elog 1281675 because they're consistent with the emittance measured at 51 MeV in elog 1281592 that morning. I then changed all the quads that had been altered from design via BPAM though Monday evening and with manual intervention Tuesday swing.

I found that the horizontal beta function was blown starting about halfway down the arc except at the few places I was looking: 1C20, 1H00 and the target. Three quad changes were needed in the model to restore a more reasonable horizontal beta function while preserving the raster capabiliy, small horizontal size in Compton chicane and acceptable beam size at the target. The values in the machine at 1000 this morning for MQA 1C08, 1H01 and 1H04 are preserved as comment lines in the Optim file r6.

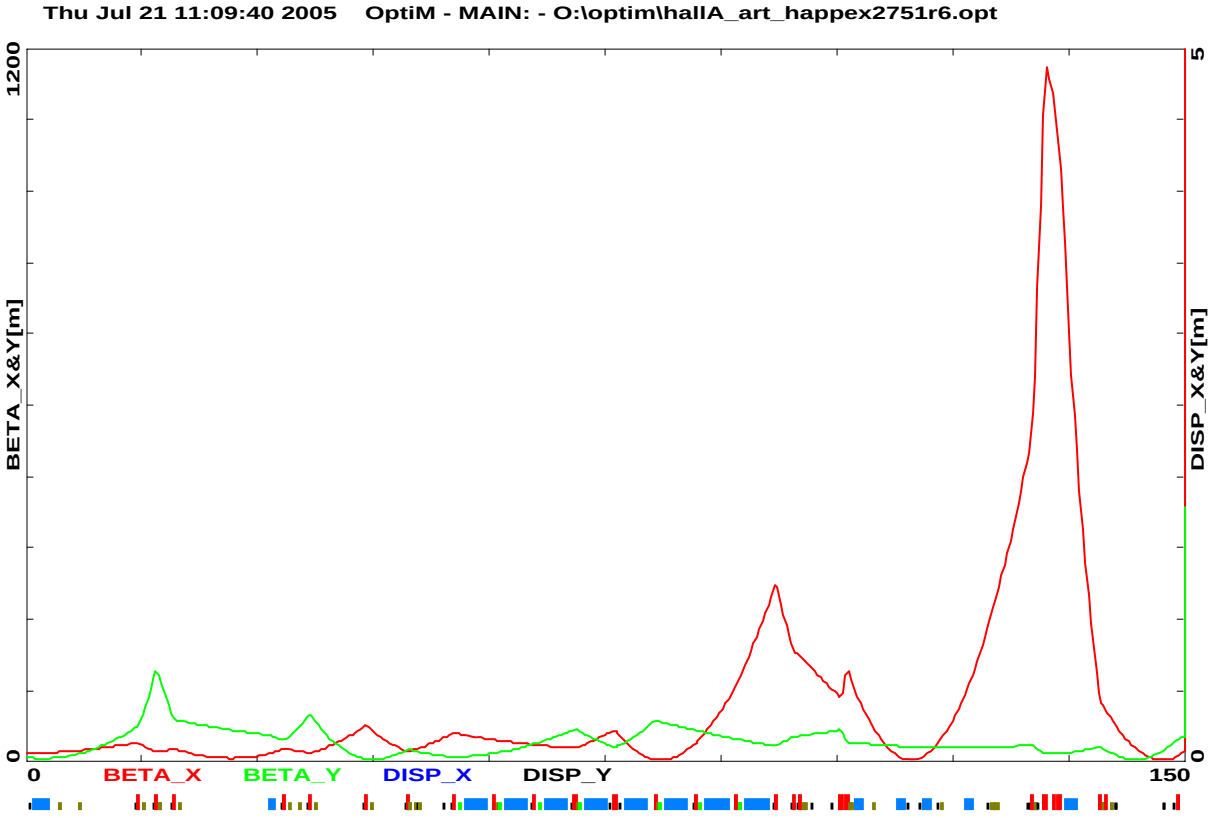

Figure 1. Beta functions with "measured" input parameters and quads in machine at 1000 on 7/21/05. Note vertical scal, 1200m. Horizontal axis ends at sweepter magnet. Beta increase much more after the sweeper

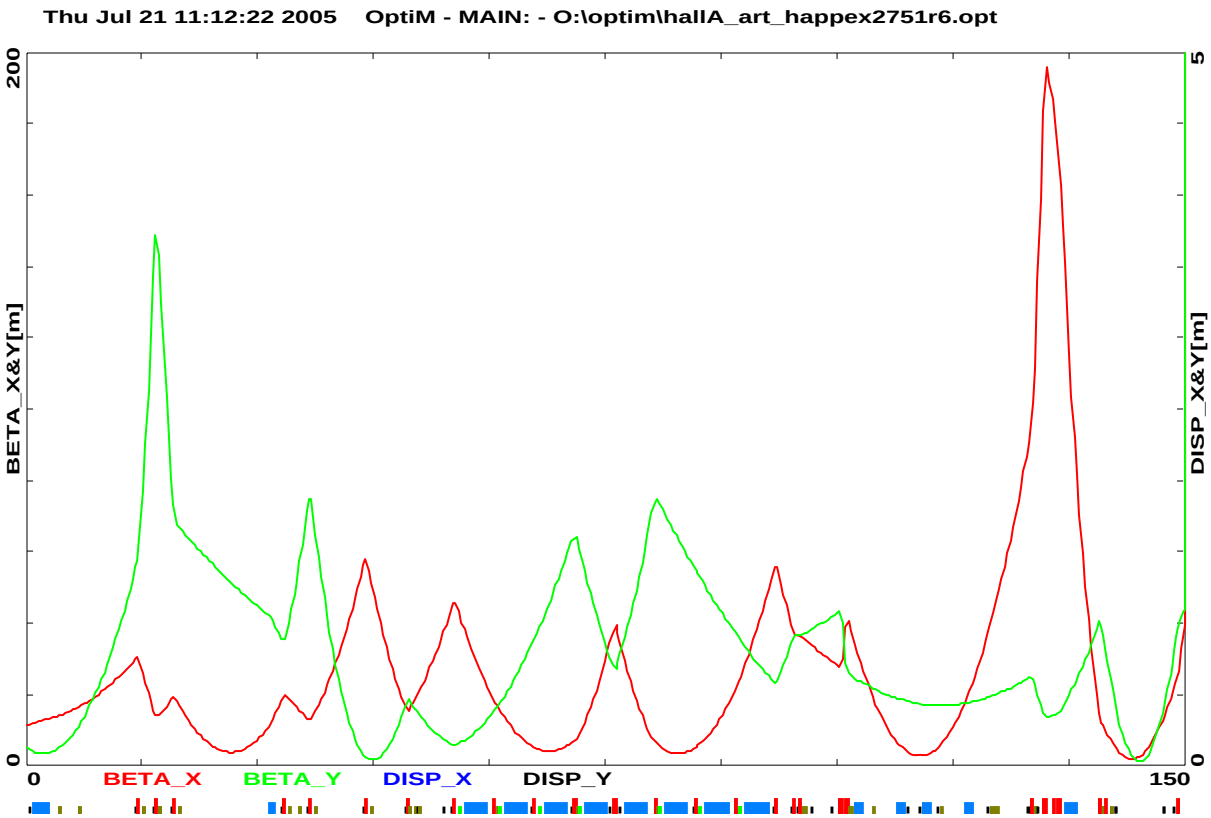

Figure 2. Beta functions after changing MQA 1C08, 1H01 and 1H04. Vertical axis 200m

MQA 1C08 changed from 9609 to 13959

MQA 1H01 changed from -18350 to -16700

MQA 1H04 changed from -26400 to -25350

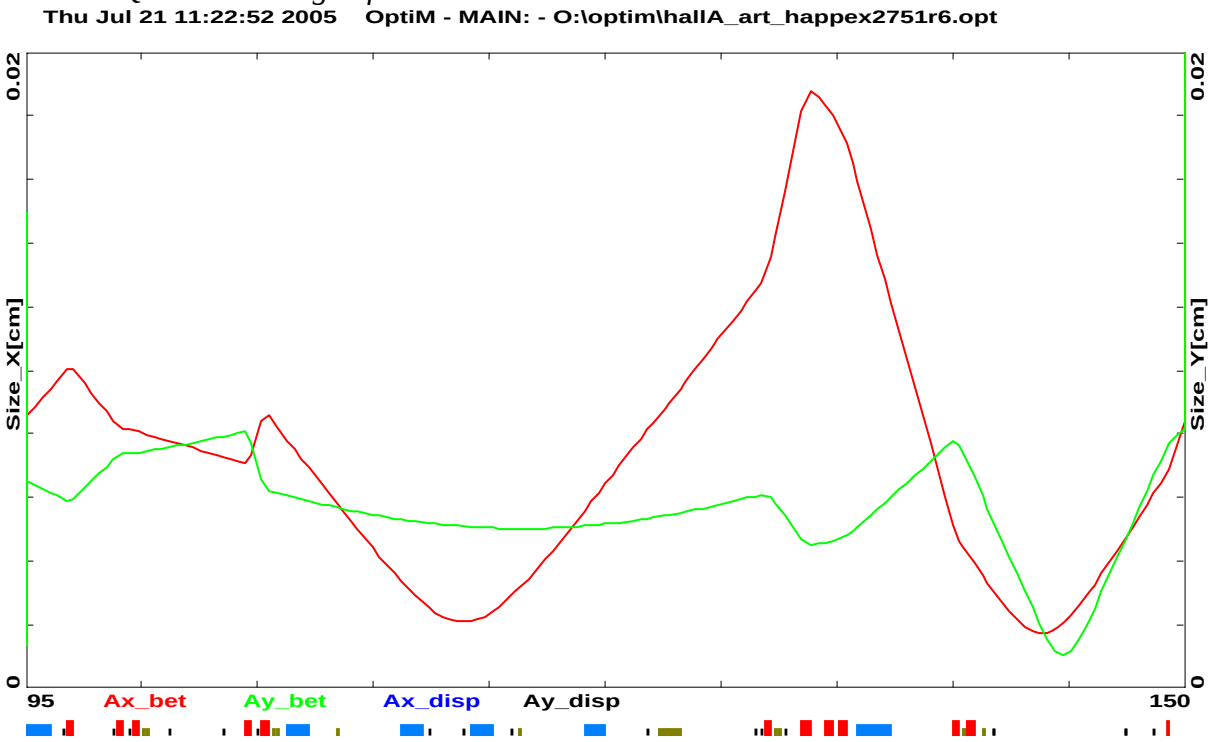

Figure 3. Beam envelopes at end of line, 200 microns vertical scale

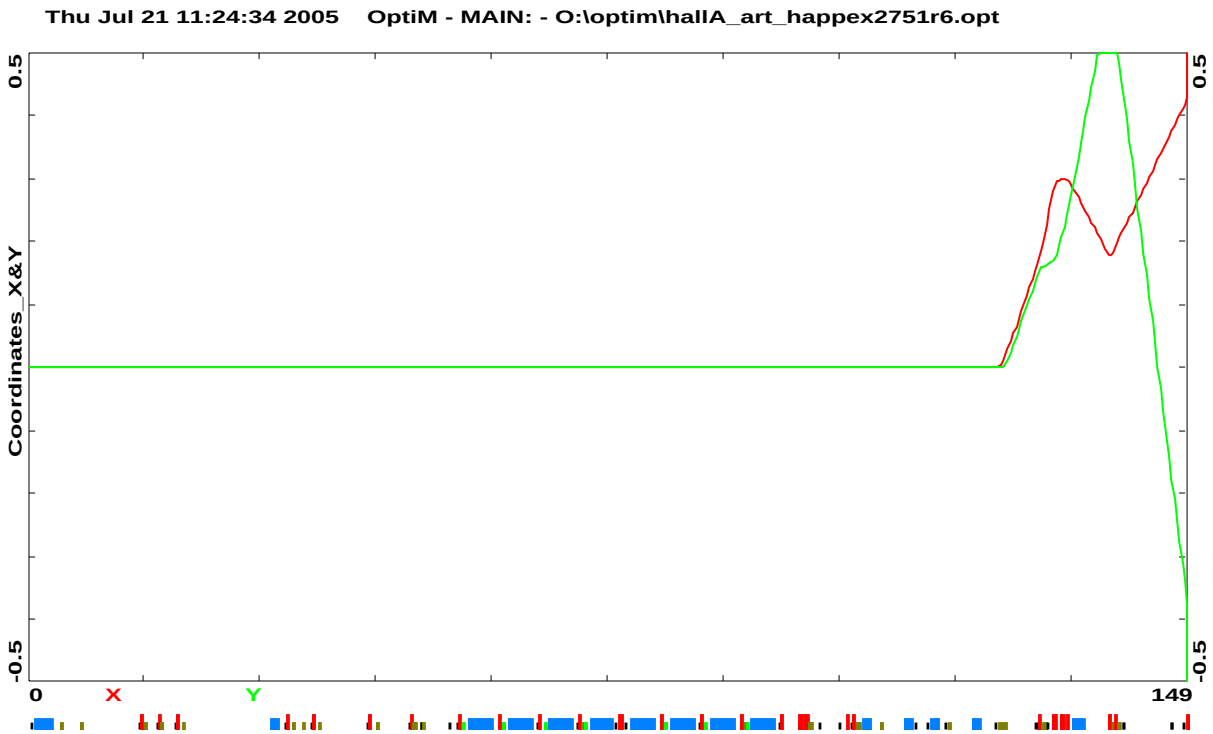

Figure 4. Response to max raster (40A) at target. Vertical scale in cm, i.e. +- 5 mm

The next seven figures will show the response of the Accelerator correctors near the modulation correctors to +328 G-cm, 1A in an AT corrector. The following set of seven figures will blow up the horizontal axis to show only the region about the last two BPMs and target.

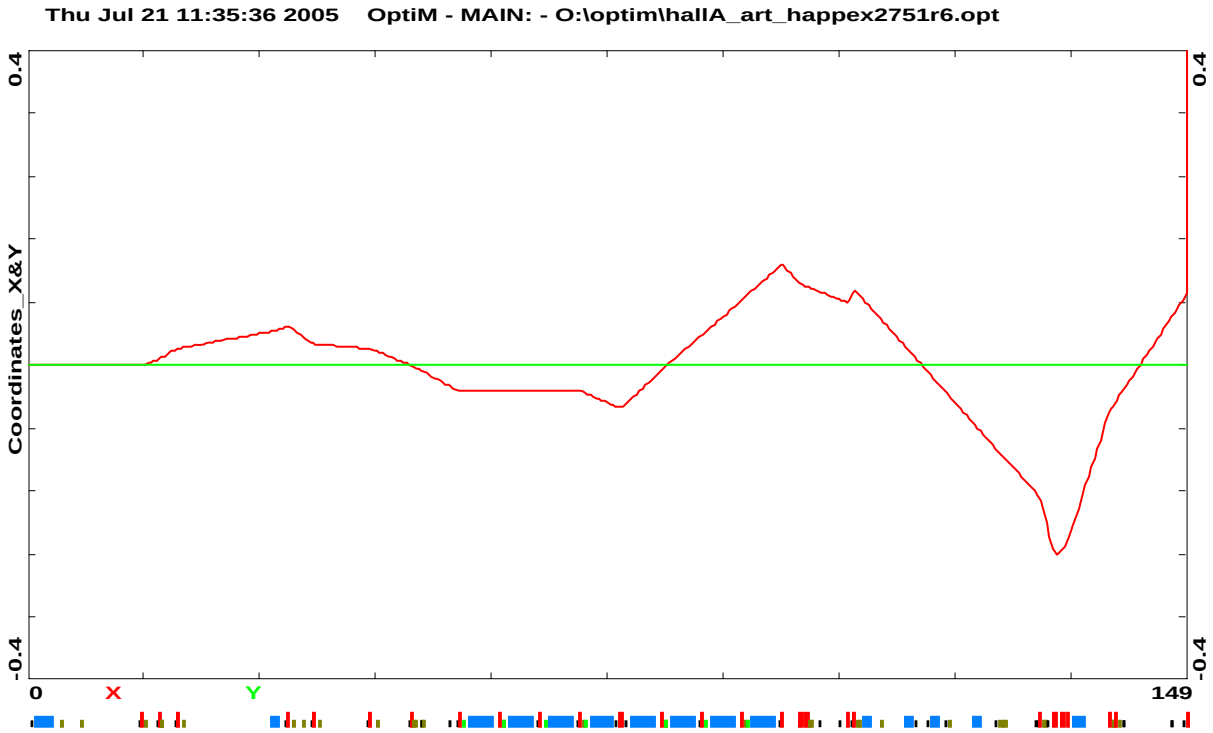

Figure 5. MBC1C01H 328 G-cm Vertical scale in cm (+- 4 mm)

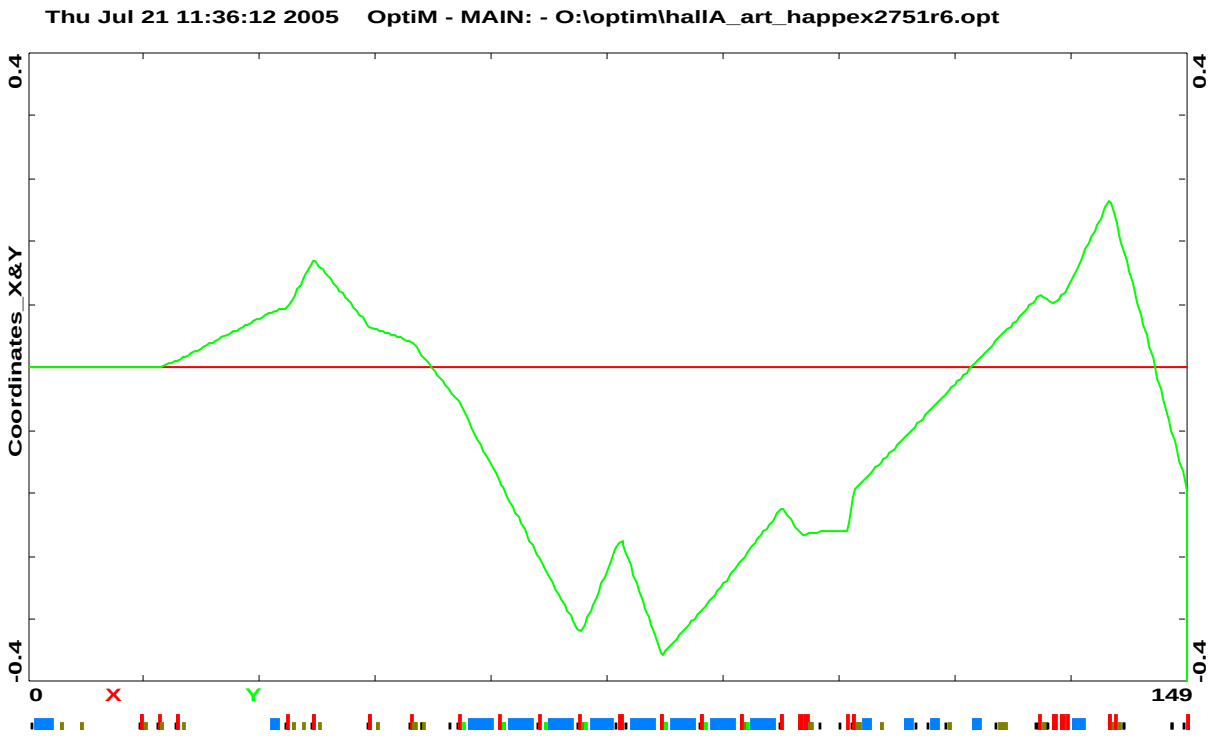

Figure 6 MBC1C02V 328 G-cm Vertical scale in cm (+- 4 mm)

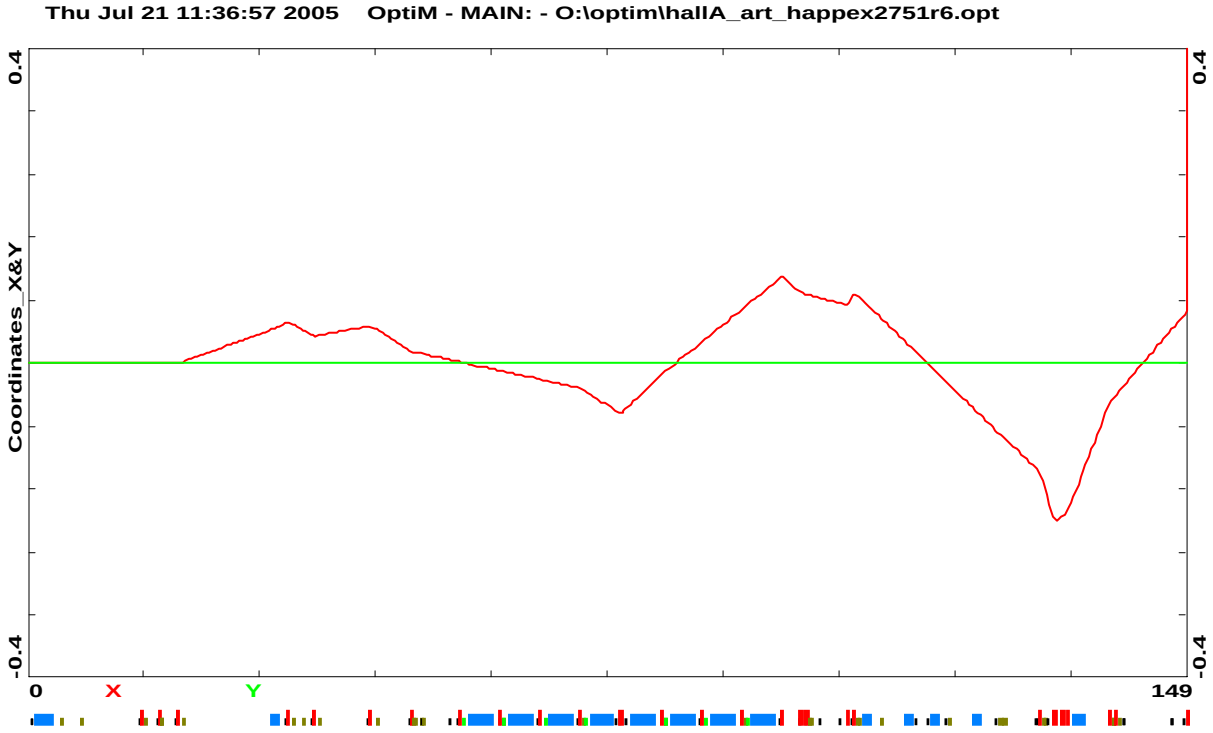

figure 7 MBC1C03H 328 G-cm Vertical scale in cm (+- 4 mm)

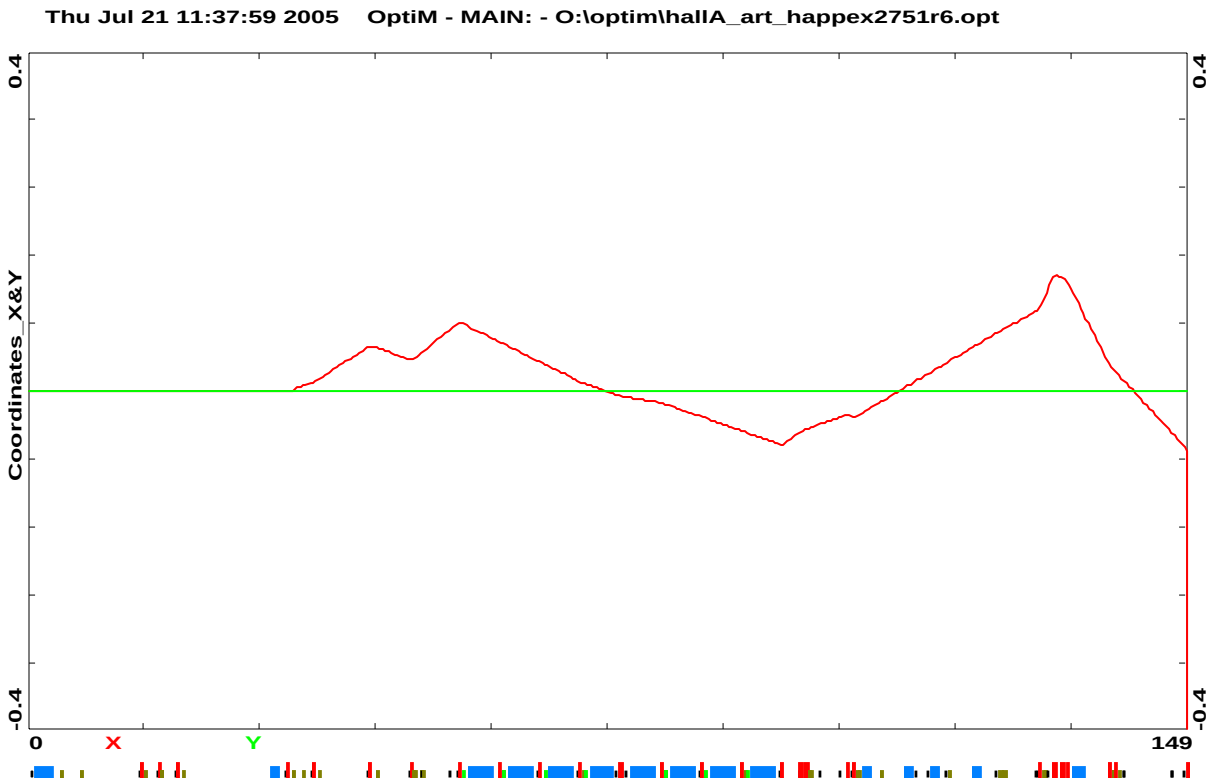

Figure 8 MBC1C04H 328 G-cm Vertical scale in cm (+- 4 mm)

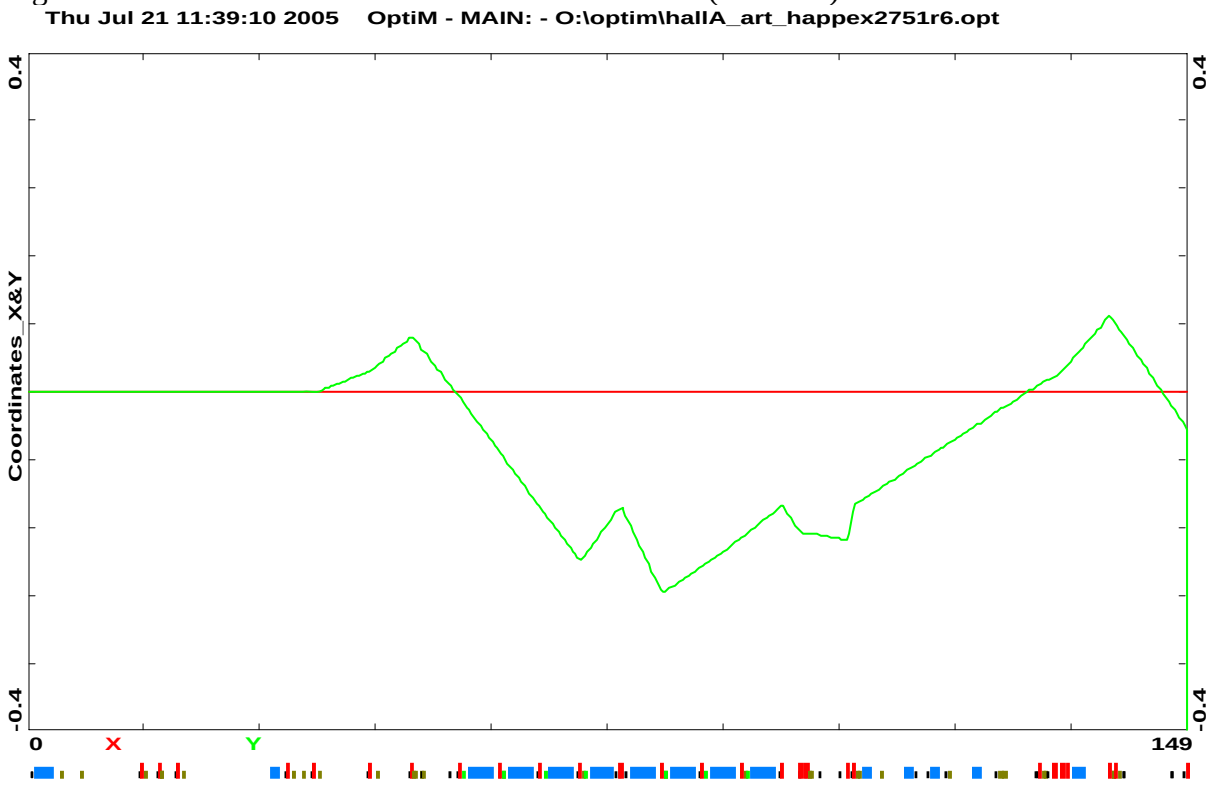

Figure 9 MBC1C05V 328 G-cm Vertical scale in cm (+- 4 mm)

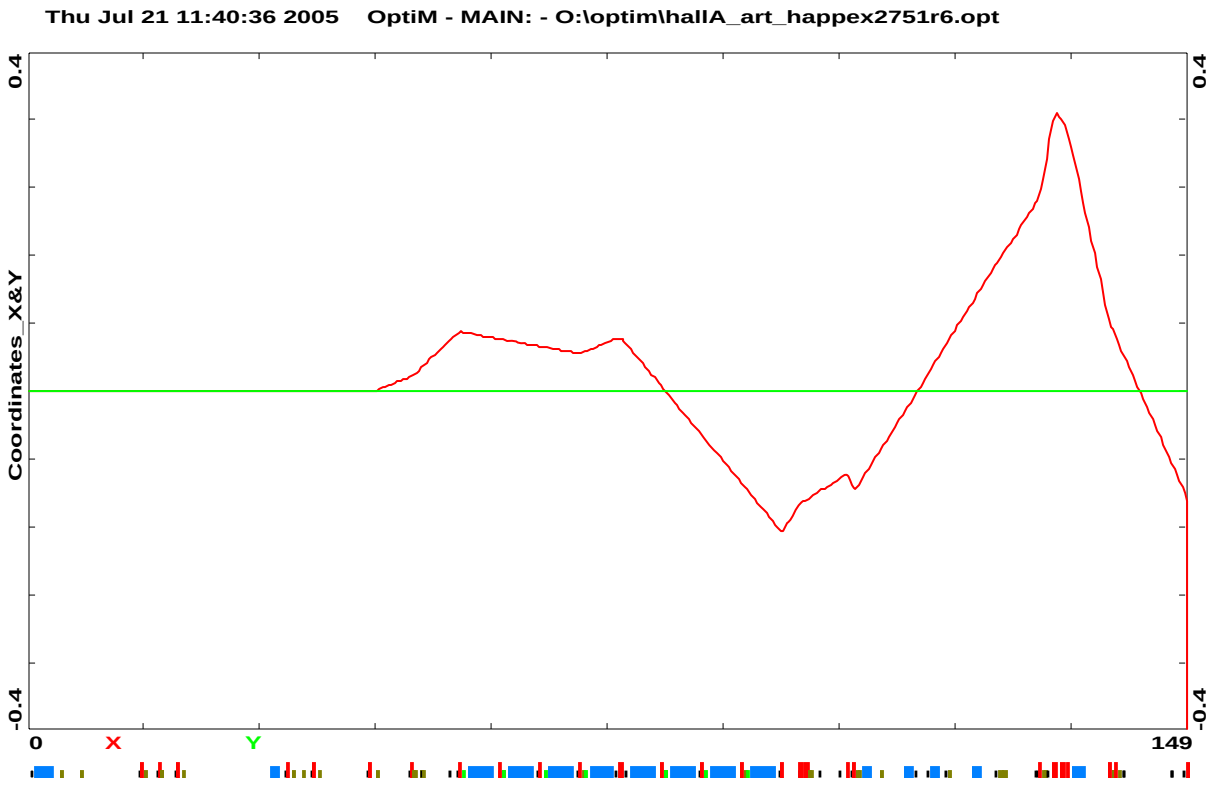

Figure 10 MBC1C06H 328 G-cm Vertical scale in cm (+- 4 mm)

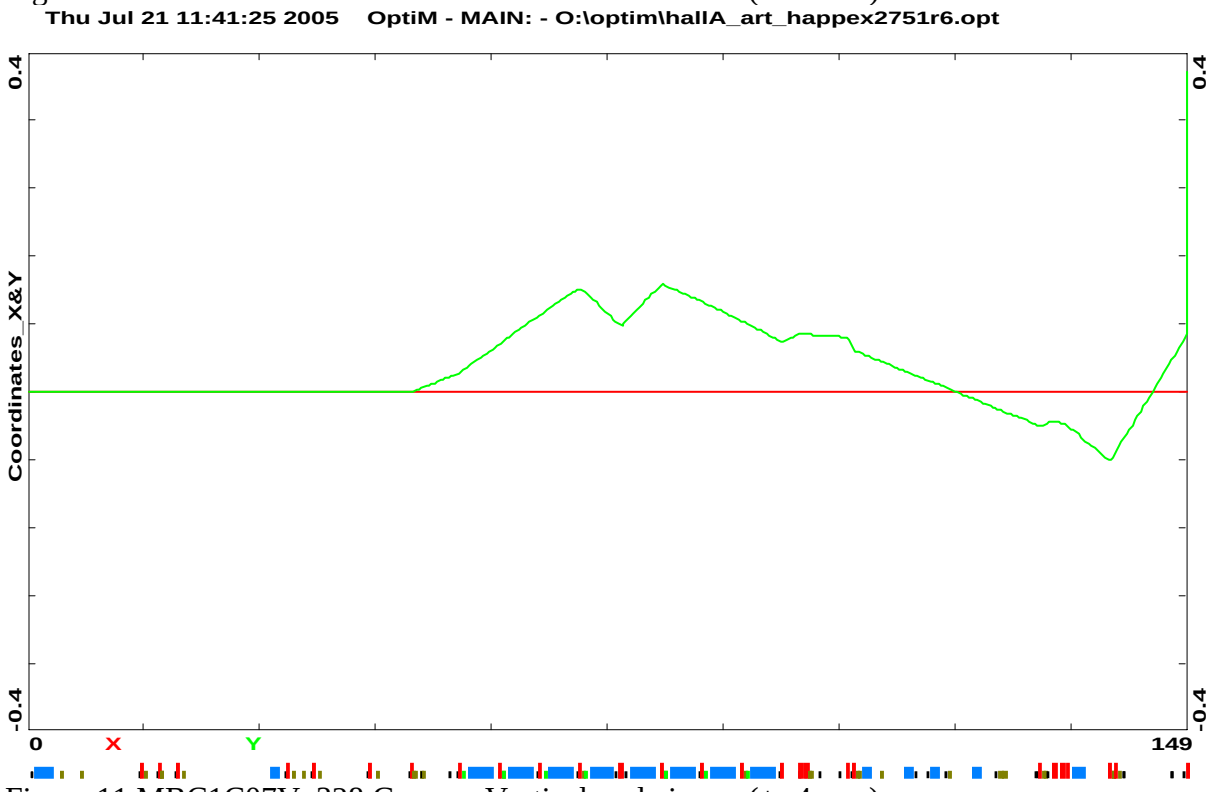

Figure 11 MBC1C07V 328 G-cm Vertical scale in cm (+- 4 mm)

The next seven plots show the last eight meters before the target. 1H04A BPM is at ~141 m and 1H04B BPM is at ~147 m on the horizontal axis; there are small vertical ticks at the bottom of the figures to indicate them. The target is the tick at the far right.

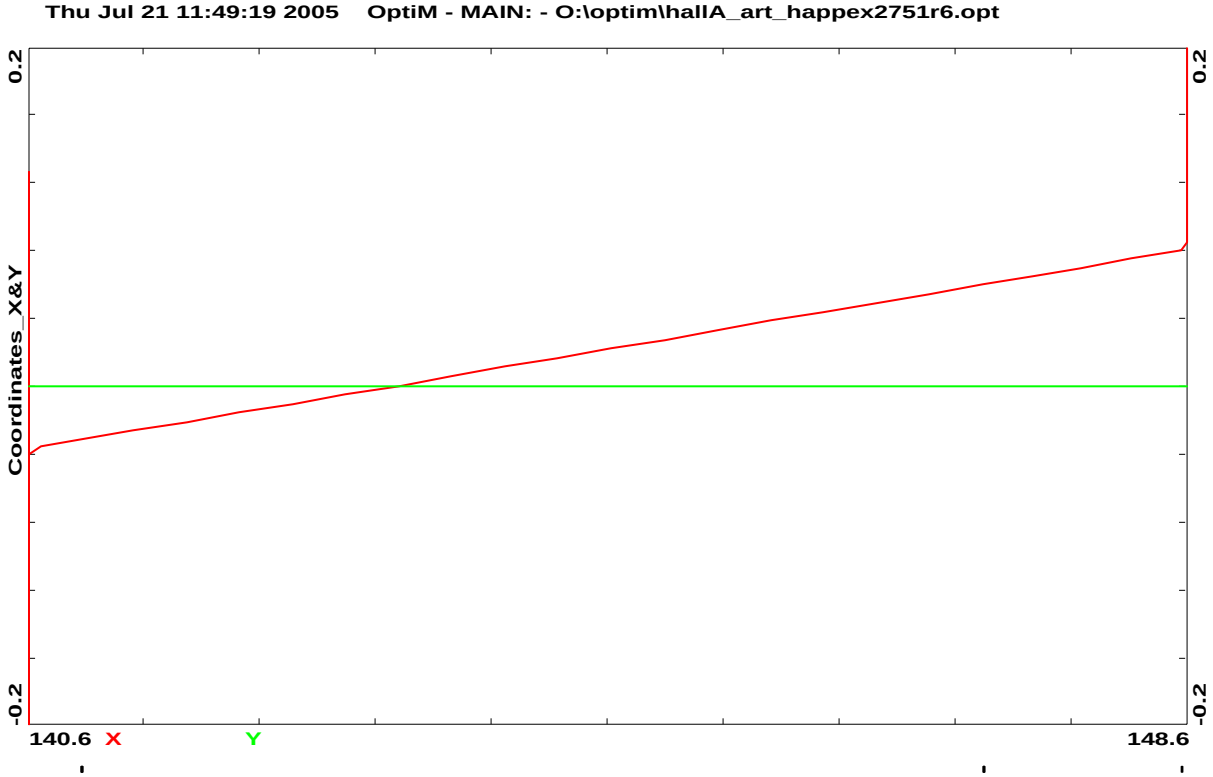

Figure 12 MBC1C01H response in last two BPMS. Vertical scale +- 2mm

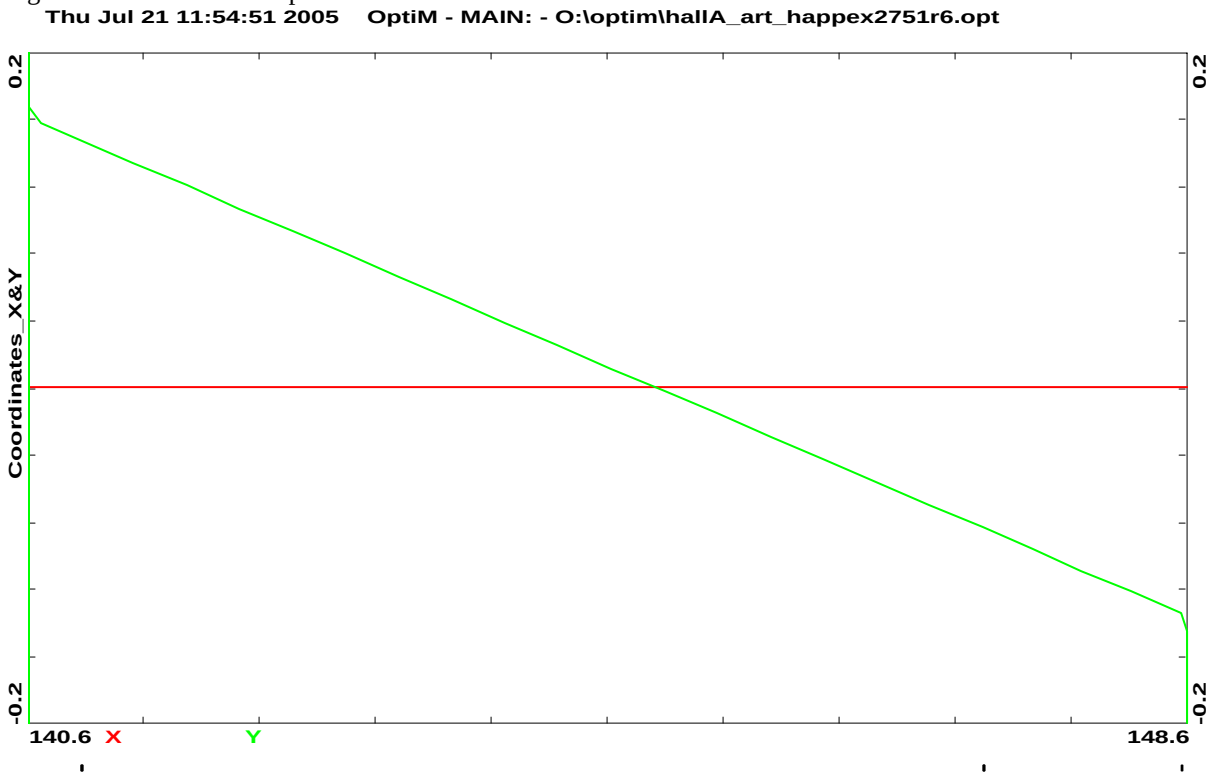

Figure 13 MBC1C02V response in last two BPMs. Vertical scale +- 2mm

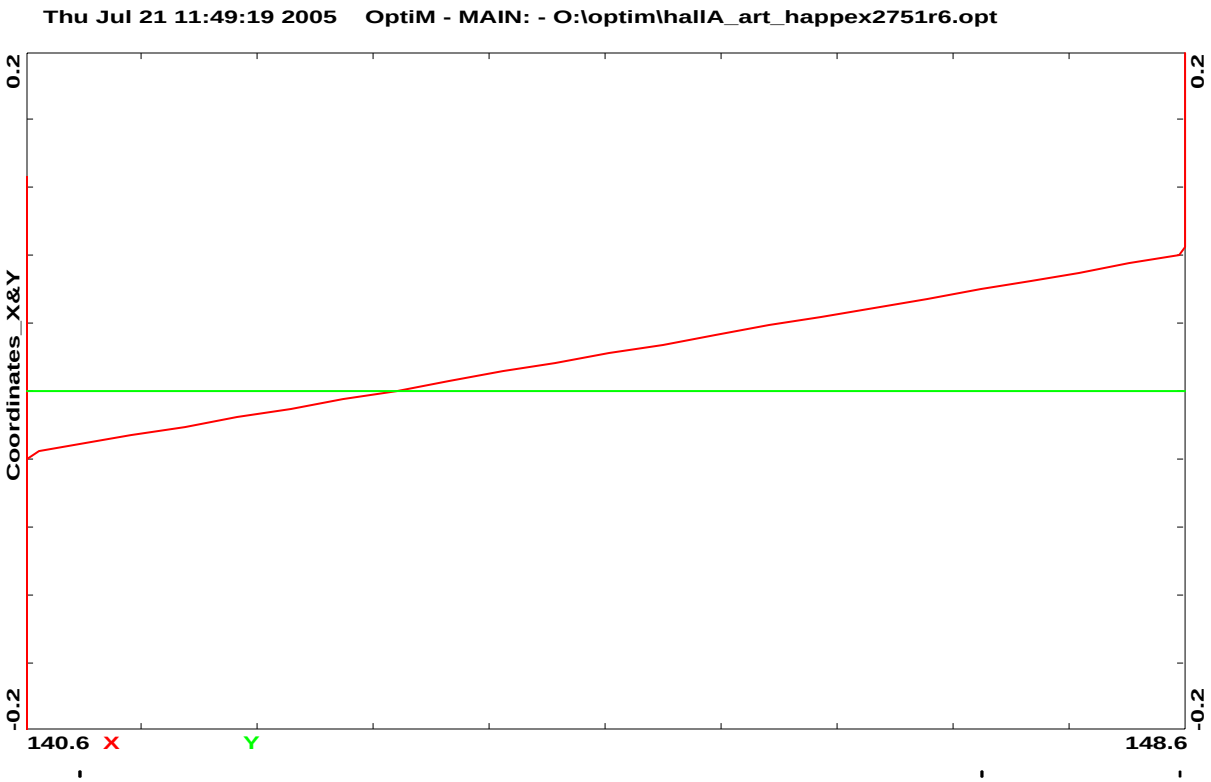

Figure 14. MBC1C03H response in last two BPMs. Vertical scale +- 2mm

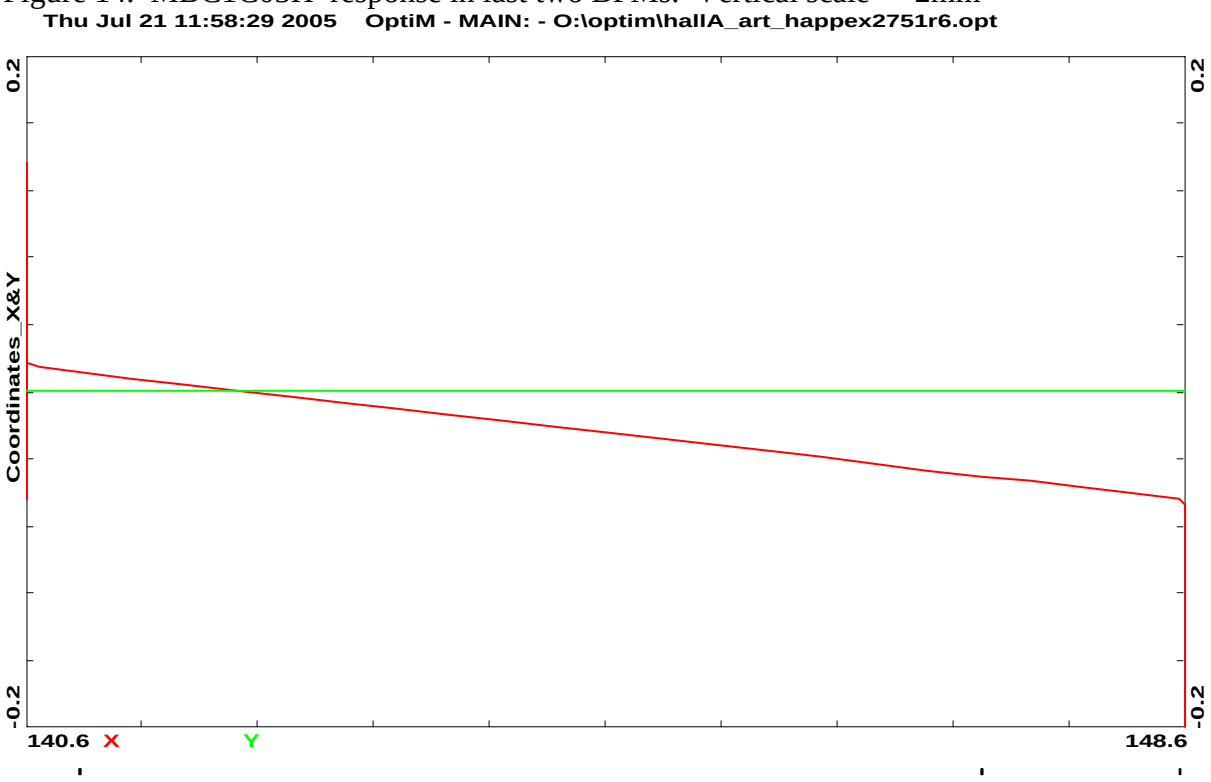

Figure 15 MBC1C04H response in last two BPMs. Vertical scale +- 2mm

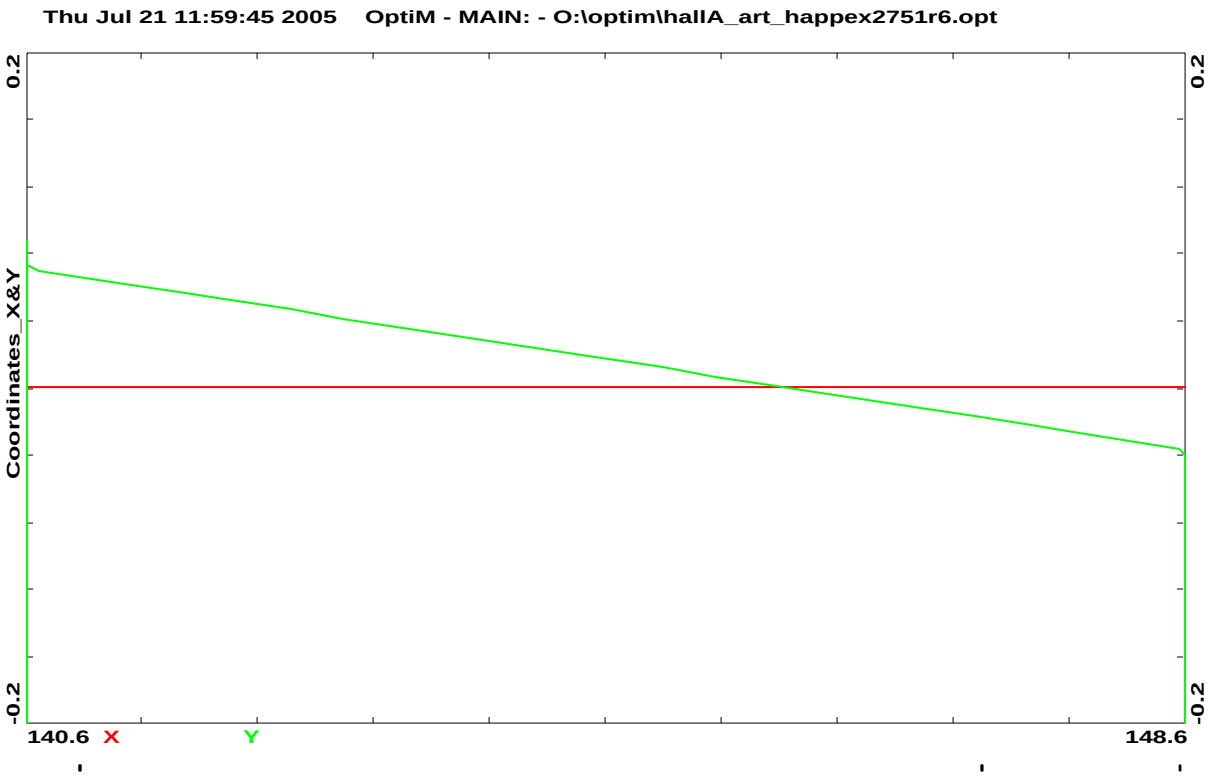

Figure 16 MBC1C05V response in last two BPMs. Vertical scale +- 2mm

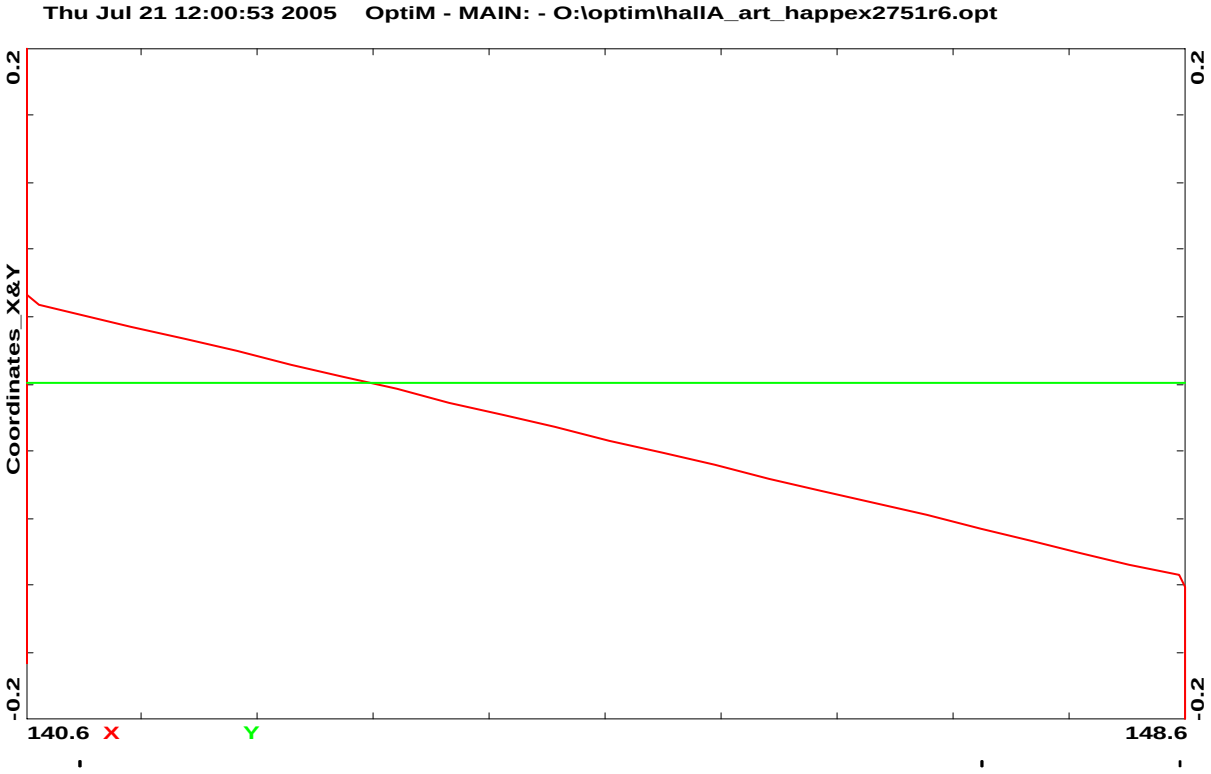

Figure 17 MBC1C06H response in last two BPMs. Vertical scale +- 2mm

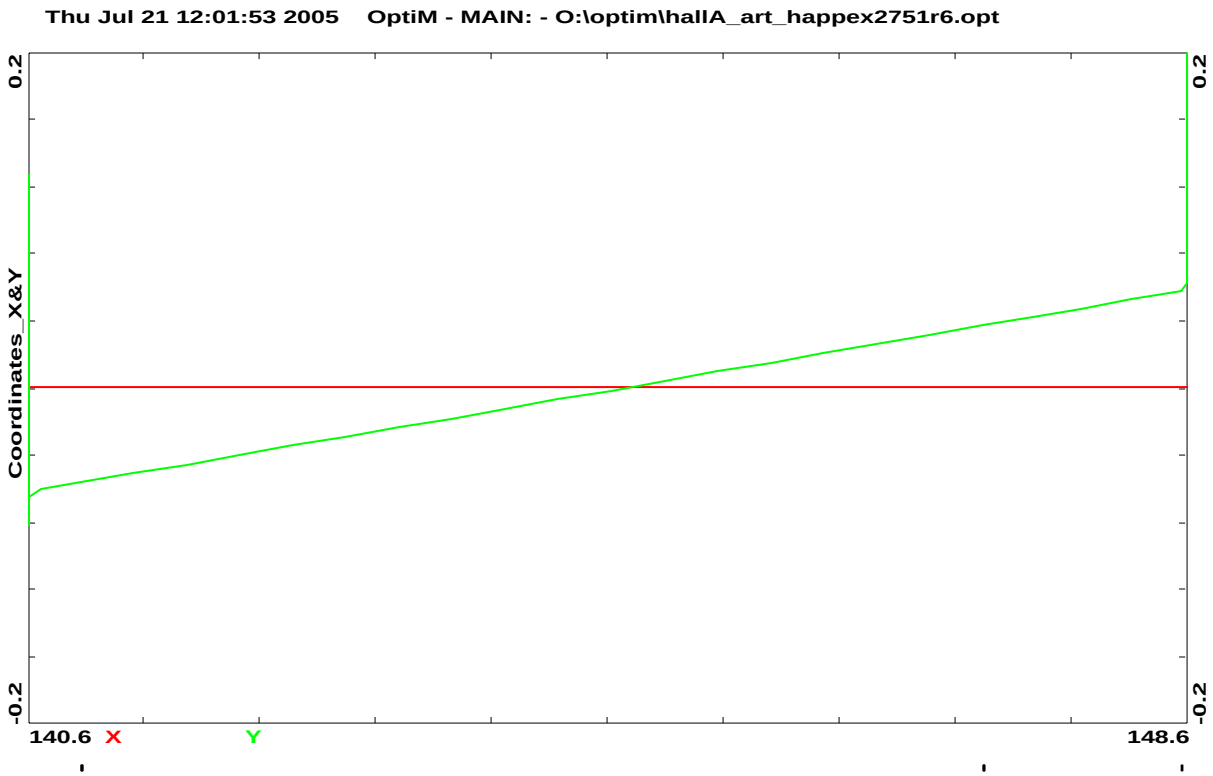

Figure 18 MBC1C07V response in last two BPMs. Vertical scale +- 2mm

Summary

Three quads should be changed as noted below to eliminate the horizontal beta function blowup. After these changes, HAPPEx constraints on the beam line optics, including differing response at 1H04A/B BPMs to modulation coils, appear to be met.

MQA 1C08 change from 9609 to 13959
MQA 1H01 change from -18350 to -16700
MQA 1H04 change from -26400 to -25350