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Longitudinal matching without Gamma-t quads

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The Yellow e-lens lattice requires a different working point (29.68/30.69 instead of 28.68/29.69) to provide the correct betatron phase advance between IP 8 and the e-lens. Since this raises γ_t by about one unit, it needs to be ensured that longitudinal matching can still be achieved. In an earlier experiment [1], γ_t had been lowered by $\Delta\gamma_t = 0.35$ by means of the γ_t quadrupoles. In the experiment reported here, longitudinal matching was achieved by lowering the 9 MHz RF cavity voltage, while γ_t was raised by 0.5 units to more closely simulate the conditions with the higher integer tunes.

During the experiment, the Yellow γ_t quad design values were set to the park current (2A), and tunes were adjusted through RampEditor. The 9 MHz RF cavity voltage was reduced from 17 kV to the calculated matched value of 12 kV. Figure 1 shows the resulting beam profile evolution as measured by the wall current monitor (WCM). In an attempt to further fine-tune the matching, the voltage was set to 11.5 and 12.5 kV. However, shot-to-shot fluctuations were larger than the effect of these voltage variations. The Yellow Landau was off during this study, as set through the YellowStore tab in RFramps, as well as in the Landau tab. At the end of the study the Landau settings were restored in the Landau tab to the value as found at the start.

The experiment was successful; matching was achieved with around 12 kV on the 9 MHz cavity. Had only one bunch in Yellow during the experiment, but 56 in Blue with the same 9 MHz RF voltage, though unmatched due to regular gamma-t quad settings. No problems due to beam loading at the low cavity voltage occured.

This experiment, together with previous studies [1], indicates that longitudinal matching into the Yellow e-lens lattice can be achieved in spite of the higher horizontal tune.

References

[1] C. Montag et al., THP062, Proc. PAC 2011

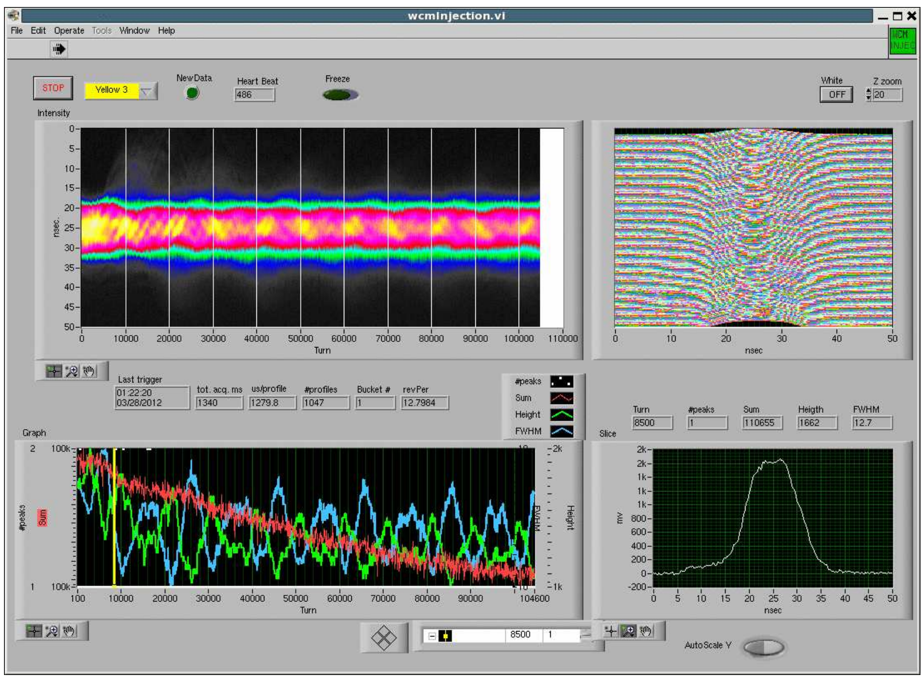

Figure 1: WCM after getting rid of the dipole oscillation above. Called Tom Hayes for advice; he considers this pretty good matching but suggests to take a few more shots to get a feeling for shot-to-shot variations, and then tweak the voltage a little bit to try to improve it even more.