Floating MD – 24/08/2010 - Summary

BBLR studies at SPS

- Beam parameters: 12 bunches, 25 ns bunch spacing, N_b=~5.10^{10} ppb

- Cycle parameters: 31.2 s cycle length, 6 s flat top at 55 GeV in pulsed mode.

1) We measured and adjust tunes to the working point (0.31,0.32).

2) We enter in compensation mode and do the same. We get (0.3105, 3213). Then We moved the W2a by 1 mm and the W2b by 1.5 mm closer to the beam (now we can say we operate approximately at distance of 9.5σ, considering error bar). The tunes don't change significantly.

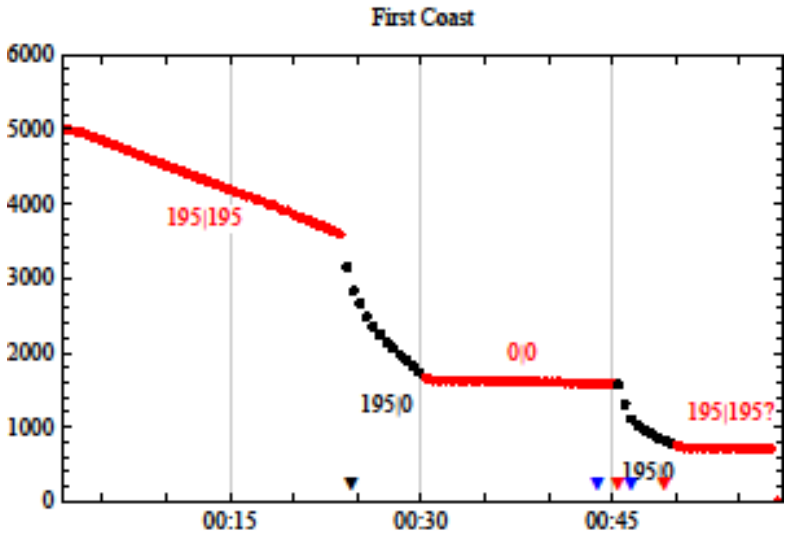
3) We observed some coupling but we decide to work with it (mainly due to the timing of the tune monitors).

4) Taking in consideration the measured emmitances (ε_{Nx}=1.175 μm, ε_{Ny}=1.22 μm) we decided to **simulate 2 IPs at ultimate intensity** (N_b=1.7 10^{11} ppb), i.e. 60 encounters (30 per IP). Using a scaling law we set the current of the wires to 195 A.

First coast

5) We entered in coast in compensation mode (I_{w1}=I_{w2}=195 A). The tunes are set at the start of the coast and are not changed during it. We observed that **we are far away from compensation** since the losses are significant. Nevertheless, the lifetime is much better than during excitation mode (I_{w1}=195 A) as observed later.

6) Switching off both wires we recovered the stability and no significant losses are observed (as expected).



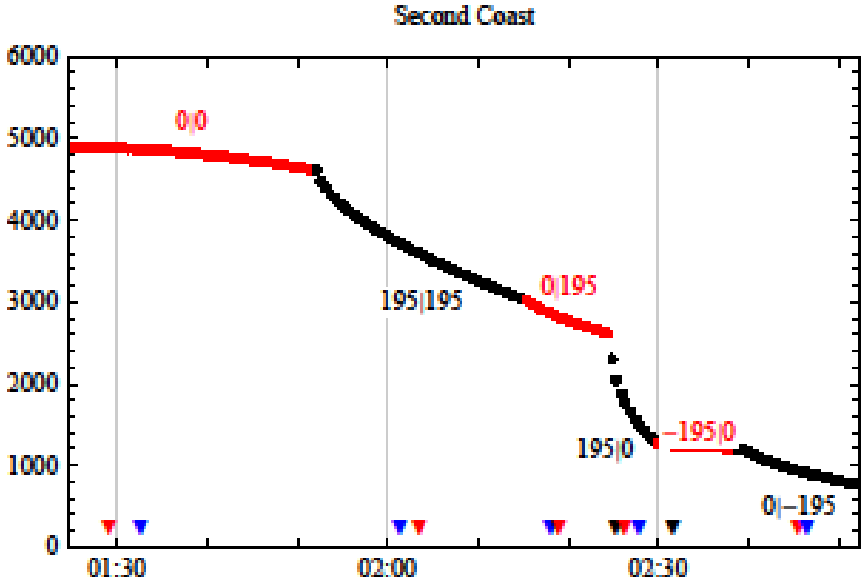
7) We switched again to pulse mode to investigate the coupling and to correct the tunes (with both wires switched off).

Second coast

8) We switched off the current in both wires and enter in the second coast. Even in this situation we observed some losses.

9) We enter in compensation mode (I_{w1}=I_{w2}=195 A) and the beam lifetime get much worse.

10) When we switch only one wire (either W1 or W2) **we observed a strong effect on the polarity we chose** (as expected), being I_{w1}=195 A the worst case and I_{w1}=-195 A the best one. In the next plot the different situations can be observed.

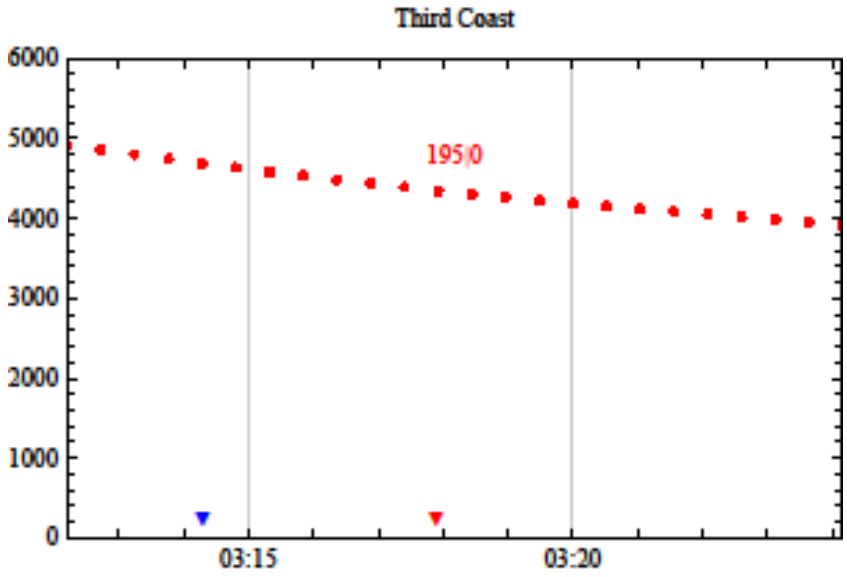


11) We switched again to pulse mode to investigate whether the losses are more due to the tune excursion or to the wires.

12) We corrected the tunes with in excitation mode (W1 on).

Third coast

13) We entered the coast in excitation mode. We observed a much better performance (much longer lifetime). **That makes us think about the importance of the working point and the tune excursion caused by the wires**. **We are close to a resonance, so maybe when setting the tunes for the no excitation case and getting into excitation mode, we cross this resonance and the losses are much more relevant.**



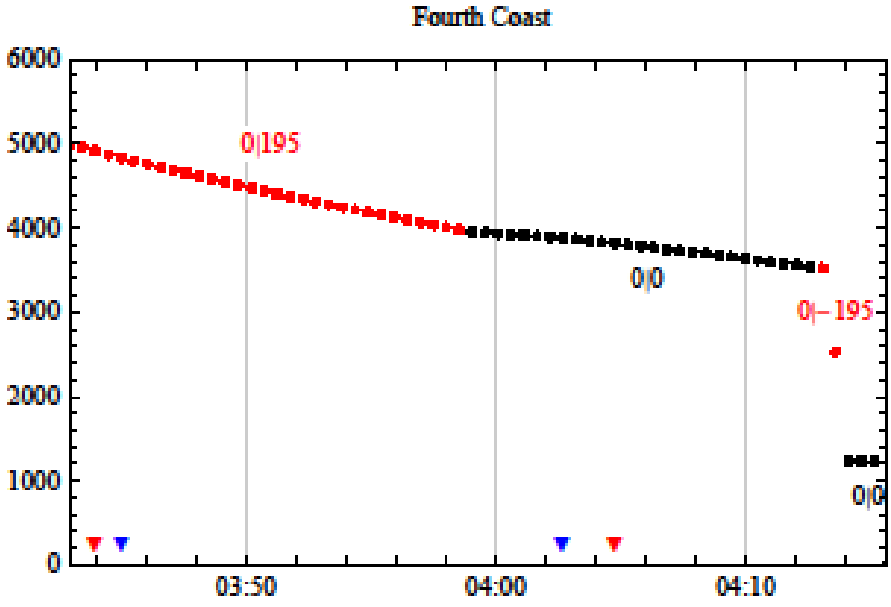
14) Pulsed mode. We repeat the same process with W2.

Fourth coast

15) W2 on (I_{w2}=195 A).

16) W2 off. Even in **no excitation** mode we still can observe **relevant losses**. That's due to the **deviation from the WP**.

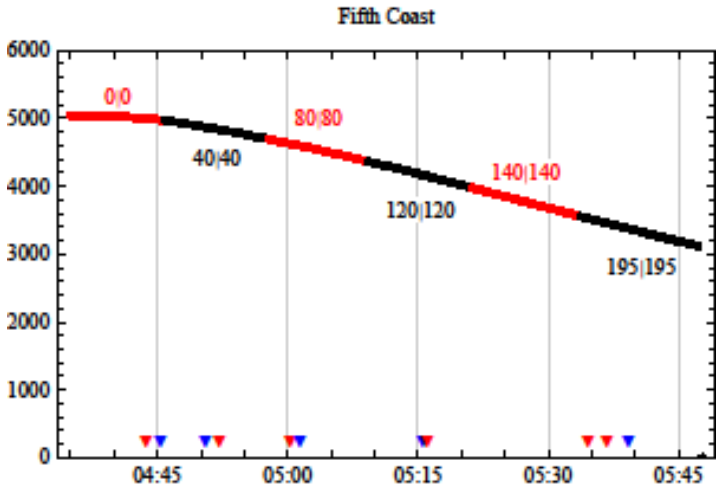
17) W2 on changing polarity (I_{w2}=-195 A). Very strong losses. It confirms our hypothesis of the third order resonance.



18) Pulsed mode. We repeated the same process in compensation mode. Tunes optimized at $I_{w1}=I_{w2}=195$ A.

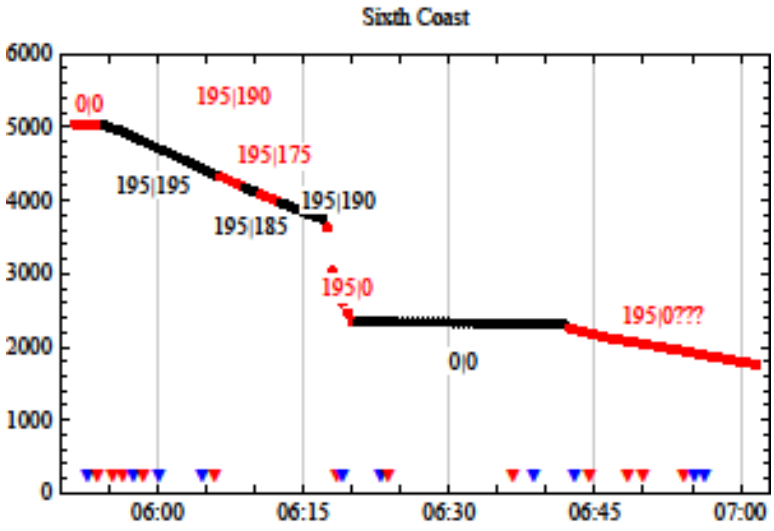
Fifth coast

19) We entered in no excitation mode (as before, losses are observed due to the displacement of the WP). Then we increased the current in both wires in intervals of 40 A. We wanted to see a modulation of the time constant with increasing current. Only small differences were observed.



Sixth coast

20) This time we wanted to study the change of emittance in time since in previous coasts we observed a growth and we want to see if it was mainly due to the change in current or not. Furthermore we try to scan I_{w2} in order to see if we find a better compensation mode.



21) **This emittance growth is observed during the whole coast**:

ε_{Nx}= 1.3 → 2.7 μm

ε_{Ny}= 1.7 → 3.4 μm

→ We have observed that at this energy is **difficult to set properly the distance beam-wire**. Furthermore, the beam profile exhibited a large noise during the whole shift, what complicates more this issue.

→ Further post-processing needs to be done, but at this point is clear that **we would need further MD sessions to be able to understand better the compensation mode** at this energy since we observe that the losses are still too big when both wires are on. Beam lifetimes are still to be well calculated but they don't look so promising for our purposes.

→ We need also to make **further studies on the emittance evolution** during a coast since it is still not so well understood.

Next MD

→ We need to measure and correct the tune during the coast.

→ We need to spend more time on the positioning of the wires at the final closed orbit. This time was difficult because we need an expert (Gerard Burtin) to move the wires and the night is not the best moment to have his availability, so we had to set it as fast as possible.