SPS High Bandwidth Transverse Feedback System MD

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1. ADC snap shot memory working again

- (a) John C. was able to get the ADC snap shot memory working again. The problem was probably two fold. First, during the data transfer, so problem must have occurred which locked the system. This problem was most likely cleared with a power cycle of the feedback system. The next problem was a user error. If one does not load a filter file to the FPGA, the snap shot memory will not record any data. A file will be written, but it will contain no information and have size 0 KB.
- (b) Some notes on the matter from John D:
 - i. VB will definitely choke if the coefficient file it not loaded (it throws an exception when it sees the strings associated with the coeff file empty). This pops up the vague message than JC forwarded a few messages ago in the compiled version we are running. There are lots of little features in the VB GUI (e.g. typing a non-numeric value in a number field throws an exception) and it turns out SW wise, that adding in checks for all of these exceptions is not insignificant.
 - ii. I cannot explain what happened in the case where you started to save and it froze. The fact that it started writing out the file indicates that the block read operation started, but paused. My guess is that Win7 had suspending the USB xfer for some reason (perhaps some process running in the backgrounddunno), and Im wondering if it would have continued after some period of time (of course that could have been infinity!).
 - iii. I have added a check to the code that will pop up a message box if the coeff file has not been loaded.
 - iv. I have also restored the block read size back to its original value so that saves will not be unbearably long.
 - v. New version v3.06.

2. Observe the beam motion. See Table 1

Table 1: Data files acquired during beam observation of pickups on Feb. 5, 2013.

Tek File (130205_)	Notes
150733	Tune 0.174, strong motion. Cycle we are using MD2 – SFTMD
151005	
151201	
151305	
151956	Cycle changed to MD2 – SFTMD – LHCFast2 (ramp to 450 GeV). Beam offset is different, measure delta on 70 mV/div. 1.1×10^{11} protons

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Table 1 – continued from previous page

Tek File (130205_)	Notes
152100	
152152	
152259	
152418	
160551	Hannes centered orbit. Cycle remains the same, MD2 – SFTMD – LHCFast2
160633	
160717	
160829	
160910	

3. Monitor the kicker load to check the back end timing. Excite file Jan-22-932. Bunch delay 4088.

(a) 161544 - 4.00 ns

(b) 161816 - 4.10 ns

(c) 162112 - 4.05 ns, Looks good, use this delay.

4. Hannes increases the intensity of the bunch. See table 2.

Table 2: Data files acquired during beam observation of pickups on Feb. 5, 2013.

Tek File (130205_)	Cycle #	Intensity ($\times 10^{11}$ p)	Notes
162533	31086	1.5	
162618	31087	1.5	
162705	31088	1.6	
162755	31089	1.6	

5. Back end timing settings for the feedback system, Fiducial delay: 4081, Prog. delay: 0.8 ns.

6. Observe equalized delta signal for level. Existing padding is 16 dB (before equalizer). For a 300 - 350 mV_p signal, we need 19 dB of padding.

7. Front end timing settings for the feedback system, ADC Fiducial delay: 26, Prog. delay: 5.15 ns

8. Excite the beam with a 200 MHz burst signal, AM via file Feb-3-2200. Observe signal on pickups, see Table 3

Table 3: Data files acquired during beam observation of pickups on Feb. 5, 2013.

Tek File (130205_)	Notes
170947	tune a bit low at 0.158. Check with Hannes, he adjusts tune
171033	
171117	
171158	

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Table 3 – continued from previous page

Tek File (130205_)	Notes
171410 180922	Hannes says tune is 0.17. Chroma is a bit high
181014	Artifact in spectrogram at 0.157? Can not see betatron tune. Ask Hannes to reduce chroma.
182239 182323	Can faintly see tune, but not chirp signal.
182620	Strong mode 0, mode 1
183611	Tune moving
183735 183938	no chirp

9. John F. designs a 5 TAP filter with 90 degrees phase (40.5 specified phase to get the 70 degree phase for resistive damping). Feb-5-1716.
10. We have a problem with injection trigger and fiducial revolution marker are no longer in phase with our SPS cycle. This is caused by a new proton cycle that was used this afternoon. For our cycle, after injection, we don't receive any revolution triggers. This is strange, since we are supposed to get a revolution marker continuously regardless if there is an injection trigger.
11. Lost beam, LHC to be refilled. Head to dinner. After dinner, RF problem in the PS. After 5 hours, we have beam back.
12. Check timing again.
 - (a) Kicker load - 000556, prog. delay 4.05 ns. looks fine.
 - (b) Pickups
 - i. No excitation, 000708
 - ii. Excite with mode 1, 000823, 000937
 - iii. At 00:15, Wolfgang loads voltage settings of Feb. 3 14:15. 200 MHz - 1.4 MV, 800 MHz - 0.238 MV (about 17% of 200 MHz voltage). 001708
 - iv. At 00:25, Wolfgang loads voltage settings, 200 MHz - 2 MV, 800 MHz - 0.2 MV. 002647
 - v. No excitation, 004758, 004953, 005111
13. A few feedback measurements.
 - (a) Feedback on, no excitation signal. Gain 8. Tek - 005405, SS - 0053, no saturation
 - (b) Feedback on, no excitation signal. Gain 8. Intensity 1.2×10^{11} . Cycle 31743. Tek - 005633, SS - 0056
 - (c) Feedback on, no excitation signal. Gain 16. No beam. Tek - 005911, SS - 0059.
 - (d) Cycle gone.
 - (e) Excite with file Jan-22-1018, beam tune 0.185. Feedback on, by mistake. 020532, see strange line at 0.178 in spectrogram.
 - (f) Feedback off. 021400
 - (g) Cycle change
 - (h) Tune 0.18, strong line at 0.1765, 021555

- (i) Observe delta signal without splitting signal. (Note, changes the relative delay between the sigma and delta signals.) 021919.
 - (j) No beam. 022301
 - (k) Wolfgang adjusts the horizontal tune. See a big line in the spectra at the horizontal tune with head-tail motion. Could it be from horizontal dynamics?
 - (l) Orbit has grown, offset vertical now 0.8 mm.
 - (m) Still observe strong band in spectrogram at 0.176 - 025336, 025814
 - (n) Try to figure out where the artifacts present in the spectrogram are coming from. observe the sync signal of the scope trigger in Ch1 and the scope trigger in Ch2. 033044. There seems to be some sort of frequency modulation in the trigger vs the RF which gives us an aliased line in the spectrograms computed from the Tek scope data.
14. LHC to be refilled, call it quits for the night. Rough day. Not much useful data taken.