SPS High Bandwidth Transverse Feedback System MD

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1. We continue to have problems remaining synchronized with the beam. At this point we are not sure what the cause is. Typical problems associated with the timing shift: loss of synchronization of back end timing with the bunch by as much as a fraction of a nanosecond to several nanoseconds. Sometimes the front end timing changes and sometimes not. We eventually were able to synchronize quickly, by simply looking at the kicker load signal. JC has begun to recognize waveform traces typical of proper synchronization. For these initial tests, this should be good enough. Used a 200 MHz non amplitude modulated signal, measured the sum of the 200 MHz signal out of excitation and feedback systems, file Jan-22-932. Typically, out of the H9, 320 mV_{pp} corresponds to both system begin aligned, with set attenuation. We were able to take many measurements where we scanned the phase of the FIR filter and varied the gain to determine the phase that damps the beam motion. $\phi \sim 90^\circ$. Performed some drive and damp measurements, driving mode 0, see Table 2 for details. Had a chromaticity sweep implemented and monitored the bunch with feedback on and off, see Table 3 for details.
2. A listing of the different timing configurations we had to use during this time in Table 1

Table 1: Timing configurations used. Problem with synchronization led to many configurations.

System	Bunch/Fid. Delay	Prog. Delay (ns)	File (130123_)
Excitation	4089	2.2	133146
Feedback	4081	0.85	
Excitation	4088	4.7	141925
Feedback	4081	0.85	143558
Front end	30	5.7	
Excitation	4088	4.1	
Feedback	4081	3.4	
Front end	30	6.9	
Excitation	4088	?.?	
Feedback	4081	6.9	
Front end	30	6.9	

(a) Excitation system - Bunch delay: 4089, Prog. Delay: 2.2 ns (_133146). Feedback - Fiducial delay: 4081, Prog. Delay: 0.85

(b)

3. Closed loop measurements

Table 2: Data files acquired during closed loop measurements on Jan. 23, 2013, using a 5 TAP filter. Open loop for the first 2000 turns, then the loop for specified number of turns with a filter of certain phase and gain, then the loop was opened again. These records were saved for 5k or 20k turns. Ch1 - sigma, Ch2 - delta, Ch3 - kicker load

File (130123_)	Filter Information			Notes
	# Turns	Gain	ϕ ($^{\circ}$)	
161306	500	16	90	
161516	750	16	90	
161718	1000	16	90	
161927	500	16	-90	
162018	750	16	-90	
162504	750	16	-90	
162557	750	16	-90	open loop
162728	2000	16	90	
162827	2000	16	90	
163128	3000	16	90	
163301	5000	16	90	
163452	10000	16	90	
163638	15000	16	90	
163850	500	16	180	
164058	1000	16	180	
164233	2000	16	180	
164416	4000	16	180	
164544	8000	16	180	
164742	8000	16	180	drive beam unstable
164902	8000	16	180	stable beam
165028	8000	16	180	
165219	500	16	0	
165343	1000	16	0	
165542	2000	16	0	
165708	4000	16	0	
165834	7000	16	0	
165957	10000	16	0	
170126	15000	16	0	
170338	1000	32	0	
170455	2000	32	0	
170640	4000	32	0	
170918	6000	32	0	
171041	10000	32	0	
171302	1000	32	90	
171422	2000	32	90	
171554	5000	32	90	
171723	10000	32	90	
171922	1000	64	90	
172107	3000	64	90	
172237	5000	64	90	
172408	10000	64	90	
172634	1000	64	0	

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Table 2 – continued from previous page

File (130123_)	# Turns	Gain	ϕ ($^{\circ}$)	Notes
172751	2000	64	0	DSP saturated
172920	5000	64	0	
173544	1000	64	45	
173655	2000	64	45	
174243	1000	64	60	
174415	2000	64	60	
190733	1000	64	78	DSP saturated
190926	2000	64	78	
191035	5000	64	78	
191202	8000	64	78	
191339	10000	64	90	

Table 3: Data files acquired when driving the beam in open loop for 5000 turns, then closing the loop for 10000 turns, switched on at variable times (FB Start Turn), warmup 2000 turns. The drive file used was Jan-23-1917, mode 0 type excitation AM chirp 0.17 – 0.18. Ch1 - sigma, Ch2 - delta, Ch3 - kicker load

Filter Information				
File (130123_)	# Turns	Gain	ϕ ($^{\circ}$)	Notes
192414				Drive with no feedback
192528				
192754				
192937	7000	32	90	Drive with feedback
193121	7000	32	90	
193235	7000	32	90	
193424	6000	32	90	
193633	6000	32	90	
193753	6000	32	90	
193929	5000	32	90	
194039	5000	32	90	
194141	5000	32	90	
194235	5000	32	90	
194332	5000	32	90	
204021	16000	32	90	Lower chroma, no drive, feedback on FB Start Turns are FB On Turns
204137	16000	32	90	
204235	16000	32	90	
204333	16000	32	90	
204924				Low chroma, no drive, no feedback
205031				
205206				
205411				
205620				