The Diamond Light Source Control System Interface to the Libera Electron Beam Position Monitors

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SYSTEM SOFTWARE

Configuration (CF)

Clock Control (CK)

SYSTEM INTEGRATION

Individual overview screen for each Libera, shows health and status, together with links to more detailed displays.

? TS-DI-EBPM-02							
Version: 2.00.1	-dev Built:	2009-10-01 14:47					
Health	4320 4320 41 Ok						
	Free RAM: Temp files: CPU:	48.25 MB 0.213 MB 16.2 %					
Clocks	0.0 s						
Uptime:	16.83 h						
First Turn	Turn by Turn	n Slow Acq.					
Mean Sum	TT / 64	Fast Fb					
Free Run	TT / 1024	Postmortem					
Configure	Restart	EXIT					

? TS-DI-EBPM-02 Configuration								
Geometry KX: 21.6000 KY: 14.6000 Q0: -0.0147 Vertical I	Interlock Enabled Action Act							
Origins X Y BBA: 0.0760 0.0370 BCD: 0.0000 0.0000 Golden: 0.0000 0.0000	Y: -1.0000 1.0000 Auto 12.0 0.0 on/off: 0.0 0.0 Ovfl detect: Disabled □ Max ADC: 80.0 % = 26214 ADC Time/IIR: 5 / 0							
FT Channel Gains G0: 1.0000 G1: 1.0000 G2: 1.0000 G3: 1.0000	Test mode: Normal Signal Configuration Switches:							
First Turn: Enabled Free Run: Enabled TT / 64: Enabled Mean Sums: Enabled	Trigger src:InternalDSC:Fixed gainsManual Switch:3Switch delay:150Attenuation:40							
Current Scale	Trigger delay: 0							

Current at OdBm: | 57.0

Notch filters: Enabled

The clock PLL is controlled and monitored via this screen which also shows PVs for managing timestamps and clock synchronisation.



clock detune and turns the RF crossbar switch rotation on or off.



This controls Overview screen shows the status of all Libera EBPMs in the machine, as well as the status of all other Diagnostics IOCs. Any Libera can be selected for a more detailed view of the associated status, configuration and data.



More detailed overview of the functions provided by the Concentrator. Shows waveform with aggregate status of all Liberas, together with controls to automatically manage gains and other settings on all Liberas from a single place.



ADC data (FT)

On this screen the ADC sampled waveform is shown frequency shifted to DC. The envelope of the fill pattern is visible, convolved with the RF bandpass filter. From these waveforms "first turn" positions are calculated.



This screen shows a number of configuration settings for Libera, including scaling factors, position offsets, interlock configuration, rotating crossbar switch and attenuator control together with a number of other options.

EXIT

FA Spikes Clocks

This display aggregates all the important Diagnostics controls for the storage ring including a number of global Libera options provided by the concentrator, for example the measurement mode controls the

Signal Conditioning (SC)

? TS-DI-EBPM-02 Conditioning								
SC Control Max deviation IIR factor: Interval (s): DSC: Triggering: Delay:	2.0 0.20 1.0 Automatic Free Run	Devi Stati But But	Inputs ation: JS: ton B-A: ton C-A: ton D-A:	1.0 God -0.1 -1.9 -1.9	% od 96 deg 987 deg 969 deg I & Q			
Channel Gain: Angle (deg): Magnitude: Variance:	37.966 0.97085 0.0029	11.032 1.05958 0.002	2 -30 3 1.0(1 0.().672 0361 0027 Str	-17.301 0.96862 0.0028			

Signal conditioning is managed through the screen above, and the figure below shows its operation. Because the cable lengths are matched, the four button inputs are in phase, but the individual channel gains are distributed over $\pm 30^{\circ}$ or so and $\pm 5\%$. We still see switching spikes in the magnitude data, but much smaller than they would be if not compensated.

Turn By Turn (TT)

Turn by turn data, captured on trigger, showing spikes from switching transients. During machine physics investigations the switching is disabled to avoid these spikes.



			ONETC		
Attenuation:	Auto 🗆	22 dB Ok	Dingon V	Discourse	Temperatu
Auto BCD:	Off 🗆	Ok	Pinger X	Pinger Y	21.52 deg
Measurement:	Orbit 🗌	Ok	TMBF-01 X	TMBF-02 Y	21.10 deg
Config BPMs	Interlocks	Sync BPMs	AMP-01 X	AMP-02 Y	21.91 deg
Beam Loss Fill	Pattern XI	BPMs PM		BS	All

Expert					Be	am Ci	irrent Depen	ndent	
Attenuation:	Read	1 22	Ok			lead	Set Point	Ok	
Switches:	Read	Automa	ati c □ Ok			lead	Set Point	Ok	
DSC:	Read	Automa	iti c 🗆 ok				,		
Detune:	Read	400	Ok		FR Wa	vefor	ms		
Auto attenuat	ion	Down at: 10	/ % Upat:	75 %	Beam	Curre	ent 0.016 n	nΑ	EXIT

Slow Acquisition (SA)

Global view of beam position before orbit correction, updated every 100ms. During fast feedback the orbit deviation is well under a micron, here we see the uncorrected orbit during machine startup.



Fast Feedback (FF)

Fast feedback network. The figure below shows the topology of the fast feedback network with 7 Liberas in each cell connected in a circle, and the entire storage ring connected as a 6x4 torus. Nodes are coloured by the time taken for communicate to complete (up to 42µs). The screen to the left shows the fast feedback links on an individual Libera; these are compiled to form the figure below.

Postmortem (PM)

The postmortem data is automatically archived from all Liberas each time a postmortem trigger is generated. This particular postmortem shows a machine protection trip generated by the Libera position interlock: one EBPM jumped in position (due to a cabling fault), forcing a fast feedback response from the rest of the system, which then exposed a bug in the fast feedback network as the entire beam was driven away from nominal position. Other beam trips have their characteristic postmortem signatures.





