MPP, 17.09.2012

issue with timing synchronization SPS/LHC

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what happened on 4 July

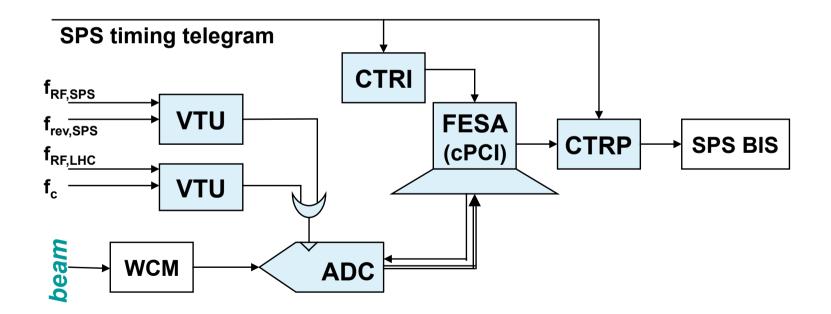
from PM acknowledgement: "Lost six bunches at injection for B1; large BLM signals in injection region and ALICE confirms that their TPC cage was hit." (21:17)

from the logbook: "Called Etienne who will check if he can see the beam wrt the kicker waverform on the last event. IQC does not report anything wrong for the kicker so it seems the timing between prepulse and kicker is correct. It looks like the kicker pulses correctly wrt the prepulse but the beam is some 50 us too early... we have to look to the RF side now." (21:39)

"The "to LHC clock" MUST be enabled, but it is strange that the BQM did not catch this. It was enabled for the probe cycle and not for the nominal cycle..." (22:47)

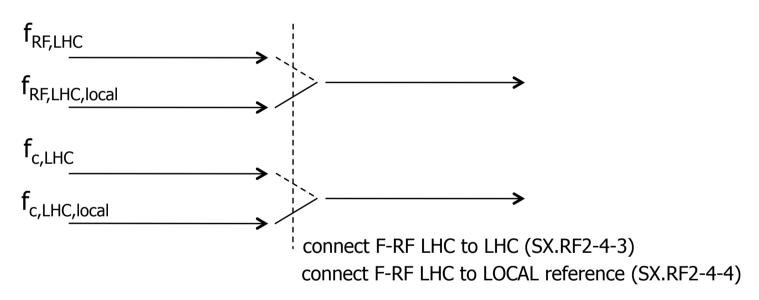
SPS Beam Quality Monitor

- automated analysis of wall current monitor beam profiles
 - checks bunch lengths, beam pattern, position wrt f_{RF,LHC}
- emergency dump if criteria are not met



timings on 4 July

- two switches to connect to LHC or local reference
 - controlled by timings
 - required for setting up beams at the SPS



- how it should have been spotted
 - in SPS alarms
 - in SPS to LHC extraction display

in SPS alarms

Alarm Action	View Configurati	on Help		Laser Console [spsop/spsop_	
Active List					
iority	-	-			
₹# Date	Time	Prio	System Name	Identifier	Problem Description
- 🔷 1990			BOSTEP	BOSTEP_BTVE_61798	Alarm raised when the motor is moved in.
- 🔷 1990		2	BOSTEP	BOSTEP_BTVE_61831	Alarm raised when the motor is moved in.
 1990 		2	BOSTEP	BOSTEP_BTVE_61876	Alarm raised when the motor is moved in.
 1990 		2	BOSTEP	SPS.BOSTEP.BA8.BTV.211743	Alarm raised when the motor is moved in.
- 🔷 1990		2	LHCCollimator	TCSM.51934	The trigger receiver card is faulty
- 🔷 1990		2	ARCON	PMB41	System failure – Equipment requires intervention
- 🔷 1990		2	SpsSEPTAmsWest	MS.LSS6.SEPTA	Actual unequal demanded
- 🔷 06/07	15:51:47	2	TBID MULTIPLICITY	TBID	[OSC] BELOW INTERLOCK THRESHOLD (EXT1)
06/07	15:51:47	2	TBID MULTIPLICITY	TBID	[OSC] BELOW INTERLOCK THRESHOLD (EXT2)
06/07	15:51:52	2	IONIZATION CHAMBER	IC_TBID_L	[OSC] BELOW INTERLOCK THRESHOLD (EXT1)
- 🔷 06/07	15:51:52	2	IONIZATION CHAMBER	IC_TBID_L	[OSC] BELOW INTERLOCK THRESHOLD (EXT2)
-	15:51:52	2	IONIZATION CHAMBER	IC_TBID_R	[OSC] BELOW INTERLOCK THRESHOLD (EXT1)
· • 02/08	06:18:34	2	LHCCollimator	TCSM.51934	At least one outer switche is active
- 02/08	06:18:38	2	LHCCollimator	TCSM.51934	The demanded position has not been reached
- 05/08	18:26:33	2	IONIZATION CHAMBER		[OSC] BELOW INTERLOCK THRESHOLD (EXT2)
- 🔹 05/08	21:32:16	2	ARCON	PAXN2112	System failure – Equipment requires intervention
07/08	12:50:45	2	SpsSEPTAmsNorth	MS.LSS2.SEPTA	Actual unegual demanded
-	11:10:43		MAIN_POWER_CONVERTER	SMD4	[A] Warning
- 👌 N	11:10:43		MAIN_POWER_CONVERTER	SMD11	[A] Warning
- 👌 N	11:52:44		MAIN_POWER_CONVERTER	18KV BUSBAR	[A] Warning
- 👌 N	11:53:28		MAIN_POWER_CONVERTER	SMD3	[A] Warning
[-](1 13/08	20:22:57	_		011.00	
- 1990	_		LHCCollimator	TCSM.51934	At least on axis is out of dump energy limit
-			SPS_SECTOR_VALVES	TS4, VVSB_41753	Sector valve is closed
-	12:20:13		MAIN_POWER_PLC	SMD4	[A] PLC Problem
- 07/08	10:54:36		SPS_SECTOR_VALVES	TDC2. VVSA_250117	Sector valve is closed
- 07/08	10:54:36		SPS_SECTOR_VALVES	TDC2, VVSB_211625	Sector valve is closed
- 07/08	10:54:37		SPS_SECTOR_VALVES	TDC2, VVSA_240102	Sector valve is closed
- 07/08	10:54:37		SPS_SECTOR_VALVES	TDC2, VVSB_220431	Sector valve is closed
- 07/08	10:54:37		SPS_SECTOR_VALVES	TDC2, VVSB_220451	Sector valve is closed
07/08			SPS_SECTOR_VALVES	TDC2, several valves	[MULT 5] More than 2 sector valves closed
- 02/08	16:49:47		MKController	MKP.BA1.CONTROLLER	alarmPrepulseError
- 08/08	10:49:47		FreqMeas	SPSREVFREQMEAS.BA82	No FREV received for a whole SPS cycle
- 09/08	23:07:33		MKController	MKP.BA1.CONTROLLER	alarmPrepulseError
-	23:23:39		MKController	MKP.BA1.CONTROLLER	alarmPrepulseError
-	12:27:27		MKController	MKP.BA1.CONTROLLER	alarmPrepulseError
-	20:22:57		RF_SPS_BEAMCONTROL	PULSE_SWITCH	SPS LHC disconnected
-	20:22:57		RF_SPS_BEAMCONTROL		SPS LHC disconnected
	20.22.57	3	RF_3F5_BEAMCONTROL	RF_SWITCH	
				Search list: all E	QUALS Select Clear

in SPS to LHC extraction display

Mastership LHC Sequence				Injection(s) Requested			Ring Requested							
sps	UT1			SPS RF Timings				SPS Inte	nsities Hi	story				
Time	2012.08.13	8 20:23:34								egend				7
User	LHCFAST1			To LHC Clock DISABLED				1.2E11 -	 Total Mean 	ntensity Bunch Intens	ity 🔥		-	-1E10
MMI Traget	LHCPILOT			Rephasing	ENABLED			1E11-	-			-		-8E9
Total Intensity	0.00E0	1.248	11	Playback	DISABLED)		8E10-						- 6E9
Mean Bunch Intens	0.00E0 9.22E9		Playback Record	DISABLED			6E10-						029	
Number of Bunches	0 1		Blowup Longitudinal	nal DISABLED from LSA			4E10-						-4E9	
МКР	1 INJECTION			Blowup Transv. H	W. H DISABLED									- 2E9
BQM	DUMP			Blowup Transv. V	DISABLED)		2E10-			-			
Scrapers	RETRACT	RETRACT	RETRACT					0E0-	19:30	19:40 1	9:50 20):00 20::	10 20:2	••• 0E0 0
Beam 1 Transfer Line				Beam 2 Transfer Lin				Transfe	r Line FBC	T Intensiti	es Histor	у		
FBCT TT60	0.00E0	1.048	11	FBCT TT40	0.00E0	1.15E	11	1.2E11 -	Legend			A		7
FBCT TI2	0.00E0	1.138	11	FBCT TI8	0.00E0	8.63E	10	1.2E11	■ TT60 ▲ TI2			•	~	
Beam Mode	LHC-RING			Beam Mode	LHC-RIN	G2		1E11-	■ TT40 ▲ TI8					_
BIS	ок			BIS	BIS NOT OK								•	
MKE 6	ENABLED			MKE 4	ENABLED)		8E10-				•		_
TED TT60	BEAM			TED TT40	BEAM	1					•			_
TBSE TI2	BEAM			TBSE TI8	BEAM									
TED TI2	BEAM			TED TI8	BEAM			4E10-	Ī					
EIS LHC	ON	ON		EIS LHC	ON	ON		2E10-						_
Interlocked PCs TI2	ON	ON	ON	Interlocked PCs TI8	ON	ON ON	ON		· .					
				LTIMs RBI816	ENABLE	D ENABLED	ENABLED	0E0-	19:30	19:40 1	∮ 9:50 20):00 20::	10 20:2	 N
LHC Beam 1			LHC Beam 2				LHC Intensities History							
								2.5E11 -	Leg	end			_	4500
									Intens	ity Beam 1 ity Beam 2				-4000
Energy [GeV/c]	450			Energy [GeV/c]	450			2E11-	 Energ 	y [GeV]				-3500 -3000
FBCT	2.48E11			FBCT	2.49E11			1.5E11 -						-2500
Number of Bunches	2			Number of Bunches	2			1E11-		_	-		<u></u>	-2000 -1500
Energy [MJ]	0.0			Energy [MJ]	0.0			5E10-						-1000
														-500
								0E0 -	19:30	19:40 1	9:50 20	:00 20::	10 20:2	0 0

improvements since

- by Delphine Jacquet
 - In addition, in the LHC RF RESYNCH sequence, I've added tasks that will force the SPS frequency on LHC frequency for the users LHC1, LHC2, LHC3, LHC4, LHCFAST1, LHCFAST2."
 - "I've added a check of the corresponding XTIM in the LHC Injection Sequencer before each injection.
 - By default, the check is done for the users LHC1, LHC2, LHC4, LHCFAST1, LHCFAST2. It is possible to add or remove users from the check with the button "LHCusr chck freq linked".
- by Louis Pereira
 - SPS SIS interlock (to be done)