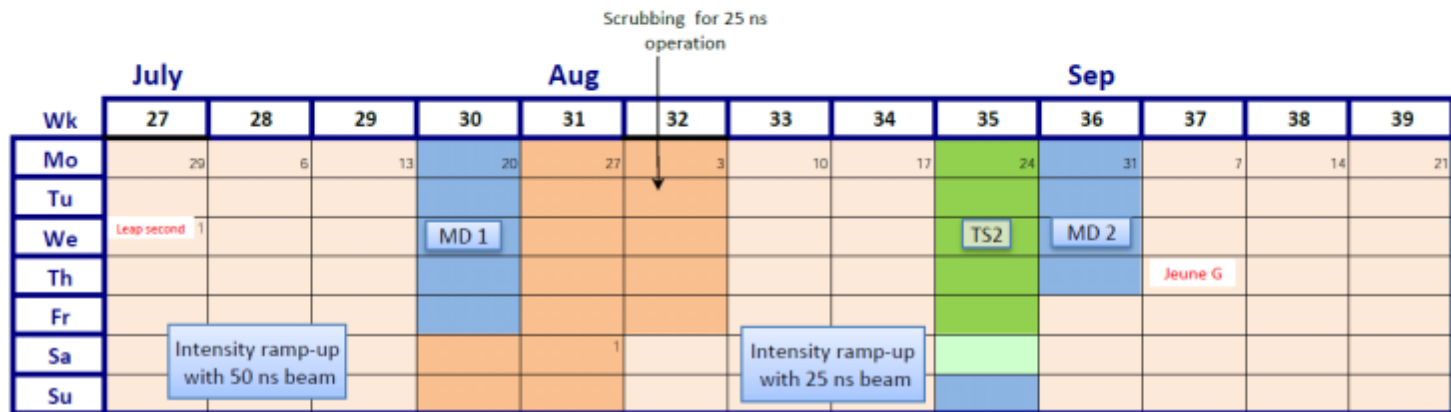


MPS commissioning status / preparation and issues

– Proposal for intensity ramp-up

M.Zerlauth, D.Wollmann, J.Wenninger et al

2015 Q1/Q2



- 3rd week into beam commissioning
- Using INDIV nom bunches at injection + ramp pilots
- First 50ns Scrubbing run after TS1

Courtesy M.Lamont @LMC

Status of (outstanding) MPS tests, preparations and issues 1/2

Item	Required for	Status	Item	Description/comments
1	nominal b	DONE	Completion of MKI waveform measurements	Done Friday / Saturday
			Connection of MKI BETS and AGK + subsequent check	Done, but needs additional adjustment of MKI delays for B1/B2+ re-check
2	nominal b	ONGOING		
3	nominal b	DONE	Additional closing of TDI (to ~ 8 sigma) and rough alignment of TL COLL	Done, aligned to 8sigma, respectively 10 sigma, no major losses seen
			Aperture measurements in extraction region, 14/15 MKD tests, XPOC checks with beam	Done
4	nominal b	DONE		
5	nominal b	DONE	SMP/BIS: B1/B2 mapping of SBF & BPF throughout all systems	Done with offline analysis
			Check LBDS/BIS arming sequence after fixes	Has been working after fix, but needs to be monitored and entirely reviewed, still want to add the BETS TCDQ arming command (ongoing this PM by N.Magin)
6	nominal b	ONGOING		
			XPOC: Connection to Sequencer + SIS	PM seems fixed after removal of symbolic links for LC tools, will redeploy whole service; ABT colleagues to include in automated chain, deployment foreseen 23/4 afternoon + check
7	nominal b	ONGOING		
			Fix IQC – SIS connection problem and BQM	Done from CO side, Giulia/Verena adjusted/checked synchronisation and looks OK now.
8	nominal b	DONE		
			EOF tests for FMCM with beam for RD1.LR1/5 and RD34.LR3/7 + others	Tbd with priority at injection (for unsafe beam), later at flat-top, DONE on RD1.LR1
9	unsafe beam	ONGOING		
10	unsafe beam	TBD	Soft start checks missing for injection systems (MKI conditioning)	Requires RBAC roles, ongoing by M.Barnes
			Alignment of injection protection system for injection of unsafe beam/trains (TL, TDI,...)	Might require subsequent access to update BETS table of TDI?
11	unsafe beam	TBD		
			Correct BETS window on MSI	MSI also used for steering, needs to be corrected for unsafe beam (no masking anymore)
12	unsafe beam	TBD		
			Correct BETS window on TDI	As for MSI BETS tracking table not correct - needs confirmation of final current to generate and load new table
13	unsafe beam	TBD		
			Unmask all BIS channels and make sure there is no hidden/oscillating user input	
14	unsafe beam	TBD		
			Check timing issue on extraction kicker in LSS6 of SPS	Delay card exchanged in MKE6 timing system, no further problem seen - 'old' card started to be tested in lab showing unexplained noise on sme outputs - tbc
15	unsafe beam	ONGOING		
16	unsafe beam	TBD	COLL alignment for unsafe beam (incl sep bumps in the IRs)	
17	unsafe beam	TBD	Define new reference orbit for nominal bunches	Fix issues with unreliable/noisy BPMs in IR1,5
18	unsafe beam	TBD	BLM system interlock Latency	Christos will look into this as of FRI 24/4
			Test interlock for remaining 10% of BLM crates which did not yet trigger the beam dump after losses	List of 'missing' crates to be provided by Christos
19	unsafe beam	TBD		
			Interlocked BPMs in IR6	As not possible to mask with unsafe beam - also in preparation of eventual doublets?!
20	unsafe beam	TBD		
21	unsafe beam	TBD (not blocking)	Verification of unmasking of BIS inputs with SBF changes in SMP	Check equations in SMP and correct unmasking in BIS
22	unsafe beam	TBD (not blocking)	Noisy signal from DCBCT B into SMP which potentially toggles the SBF	

Status of (outstanding) MPS tests, preparations and issues 2/2

22	(inj) trains	TBD	SIS injection interlock for QPS_OK	Validate at least for main circuits and activate, without beam
23	(inj) trains	TBD	Verify the SIS interlock for ring 1 / 2 injection	
24	(inj) trains	TBD	Verify the functionality of the new virtual beta * limits (optics IDs) in the TL	
25	(inj) trains	TBD	SPS SMP: Issue with Intensity from BCT3 in SPS	
			Not blocking unsafe intensity but tbd:	
			Verify the installation of (correct) filter boxes on BLMs	HW correcton mostly done, need to validate with first beam
			Correct BIC timing misalignment in IPOC	CCR BIC as new reference, 70us timing misalignment between SPS and LHC?!
			Verify relative timing of QPS triggers for 6.5TeV quench events (redundancy with BLMs)	
			Diagnostic timing misalignment in Warm Magnet Interlock system	
			Verification of beta* limits for collimators	Tbd when starting the commissioning of the squeeze,..
			Direct BLMs in IR6 to be tested	Requires definition of test procedure and access
			SIS for 13kA	Validate and activate, tbd without beam
			SIS RQD/F current discrepancy interlock to be checked	Validate and activate, tbd without beam
			BCCM commissioning	
			Verify BIS-LBDS arming squence for additional fields and imprvoed sequecne	
			Linking of BPLs via the sequencer and in the BIS	
			Deploy new FMCM FESA class to fix diagnostic issue	
		DONE	PM Data show interlock from beam 1 when beam 2 was injected [2015/04/12]	fix requires modification of the BLM FESA server - pbm only exists if MSK channel is masked (as initial interlock then not considered by BIS_EVENT_SEQUENCE module
			SMP: Check squeezing factors, beam modes, movable device flag,... during later cycle	
			Update IQC thresholds to run 2 limits	
			Clean-up PMA data analysis	Many device name changes, modified sources,..
			Logging of orbit position	Not yet correctly configured, ongoing

Proposal for intensity ramp-up

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How we did it in the past...2011...

Scrubbing run 96b and 75ns
Injection setup at 50ns

- 8 - 32 - 64 - 136 - 200 - 408 - 588 - 800 - 1020b: Smooth ramp at 75 ns.
- 3 - 48 - (228 - 336) - 480 - (624 - 768) - (912 - 1092) - 1380b

Mix of problems: water cooling, cryo, controls,... mini UFO near ALICE

Vacuum spikes in IR8 and IR2

UFO's and SEU
Particularly difficult part 41 fills to reach the step of 1092b!

“Debugging”, example: energy value jumped to FFFF every 20 days

Beam-related problems

50ns road map

	Apr		May					June					
Wk	13	14	15	16	17	18	19	20	21	22	23	24	25
Mo	28	4	11	18	Easter	2	9	EDF glitch	23	30	6	Whit	20
Tu			3 b					228 b					
We			48 b		624 b			480 b					
Th			228 b	480 b			Quench HTS			Ascension			
Fr				G. Friday		MD	RD3.LR4	768 b		1st May comp.			1236 b
Sa			336 b				AUG						
Su					768b		T12	912 b	1092 b				

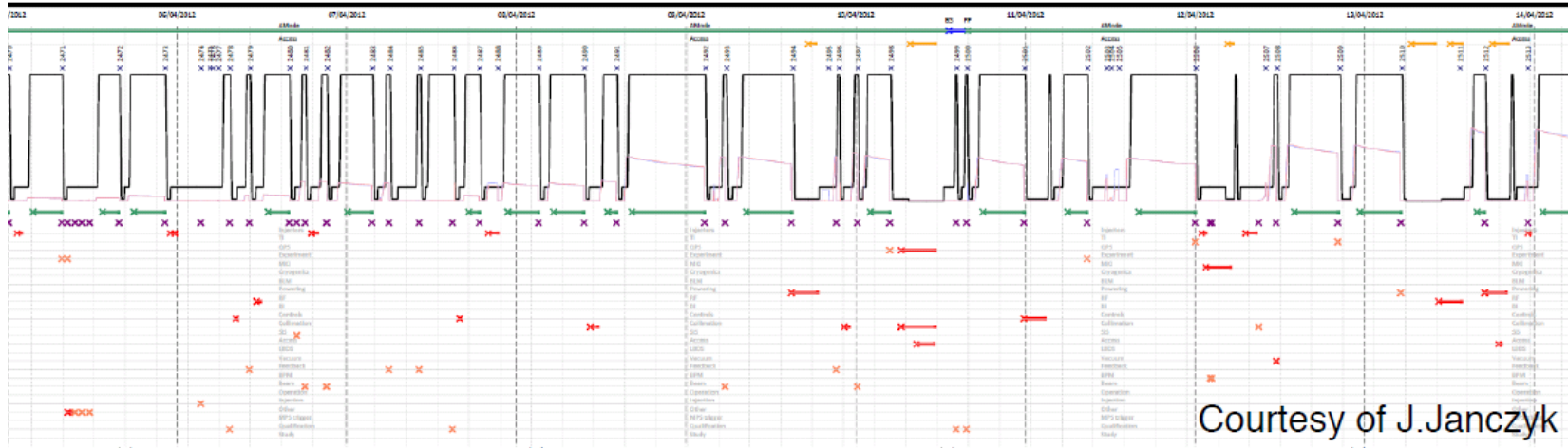
How we did it in the past...2012...

- **When everything goes well**
- Reduced to 6 steps in 2012 (very good machine availability)
 - 3 bunches for MPS validation
 - 2-3 fills and 4-6 hours with 264b and 624b (cycle validation)
 - 3 fills and 20 hours with 840b, 1092b, 1380b

L.Ponce, Evian'14

47x47 + 84x84 b the same day

	Apr			May				June					
Wk	14	15	16	17	18	19	20	21	22	23	24	25	26
Mo	2	Easter 9	16	23	30	7	14	21	Whit 28	4	11	90 m [12 h]	25
Tu					1st May								
We			1380 b	TS1			VdM scans [48 h]						TS2
Th	3 b	840 b									MD		
Fr	G. Friday	1092 b											
Sa	264 b		MD										
Su	624 b												



Courtesy of J.Janczyk

Intensity ramp-up: Run 1 recap

- **2011** intensity ramp up took ~9 effective weeks – **11** intensity steps
 - mixed bag of ‘debugging’-issues until reaching 480 bunches, > ~600 bunches ramp-up dictated by beam issues (losses and BLM thresholds, UFOs, heating, SEUs, instabilities,...).
- **2012** intensity ramp up took 2 weeks – **7** intensity steps.
- **2015 proposal:** 9 steps @ 50ns (50-> 1380?!), 11 steps @ 25ns (140->2800)
 - 50ns ramp up to establish run 1 conditions, first heating checks, e-cloud, feedback on BLM thresholds,...
 - Minimum of 3 fills with ≥ 20 h of stable beams (strict in beginning to allow for debugging time, later 20h might be reduced as fill lengths might decrease?!)

Proposal 2015... (but the machine will tell...)

- 50ns (~9 steps to 1380b)
 - 3 – 12 – 48 – 144 – 288 - 480 –768 –1092 – 1236 – 1380
- 25ns (~11 steps to 2800b)
 - 3 – 12 - 48 – 72 - 144 – 288 – 432 - 588 –1164 –1740 – 2316 - 2748
- Scrubbing run(s)
 - 3 – 48 – 72 - 144 – 288 – 400 – 600 – 800 – 1000,..
- Note:
 - (If aligned) Roman pots could be inserted during each 2nd fill at each intensity step, after 2-3 hours (as part of beam process + TCL6,...). If beams dumped due to RPs no further insertion until reason fully understood.
 - EXP would like to collect data with reduced pile-up ($0.01 < \mu < 1$) early on (without delaying ramp-up or giving in too much int luminosity)
 - Either with separated beams (beam stability, what separation allowed) or with low(er) intensity bunches during commissioning

Conclusions

- Unidentified Lying Object (ULO) in 15R8 might force us to advance scrubbing at low intensity
- Commissioning priority could shift to injection setup for high intensity (@injection only)
- Tentative ramp-up plan for 50/25 ns proposed, similar to 2011
- Further discussions to accommodate for fills with reduced pile-up