

PS Report W22 – “Beam Commissioning”



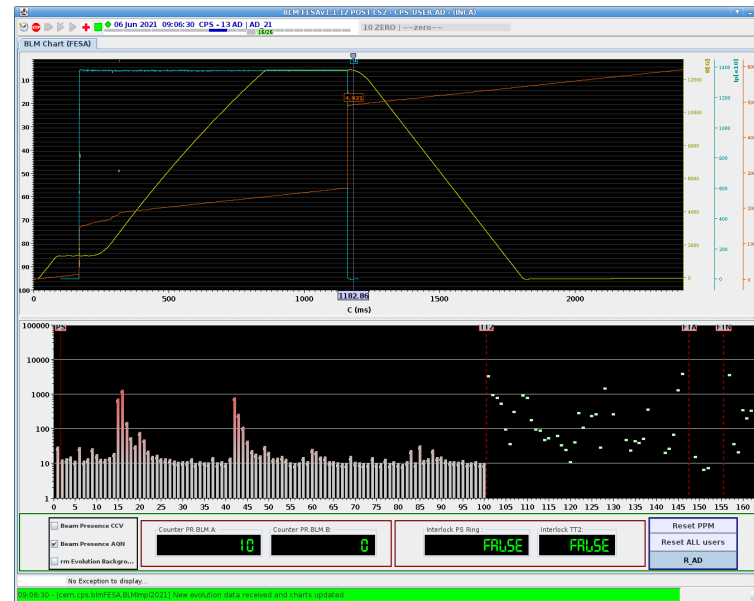
Many thanks to: Fernando, Marc, Patrick, Mike, Antoine, Thierry, Pieter, Alvaro, Didier, Thibaut, Denis, Frank, Raul, Vincent, Fabrice, Abdel, Oliver, Stephane, Jeroen, James, Yves, Fulvio, Quentin, Gilles, Jean-Marc, Todor, Carlo, Heiko, Alexander, Alexandre, Matthew, Ana, Olivier, Dominique, Anthony, Hannes, Ben, Bettina, Klaus, Gil, Benoit, Ewen, Gerd, Tom, Anti, ...

Beam commissioning (2021 week 22)

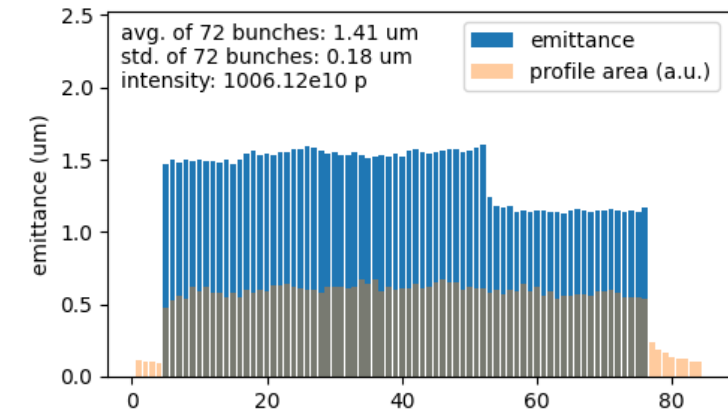
Wk	Mon	Tue	Wed	Thu	Fri	Sat	Sun
22	31	1	2	3	4	5	6
		Access	Tuning of LHC25ns – Low-Chromaticity Optics Loss maps with and without magnets of BGI82 and BGI84 / with and without compensation AD setting-up continue				

- in the shadow of a SPS stop
- C20-92 cavity repair, put back into operation later that day
- access pont PS for MU busbar
- tests
 - Wire Scanner noise - no effect from switching off equipment
 - radial position detection
 - BSW14 and 22
 - timing for the synchronization of the BLMs in TT2

AD Beam at 1.4e13

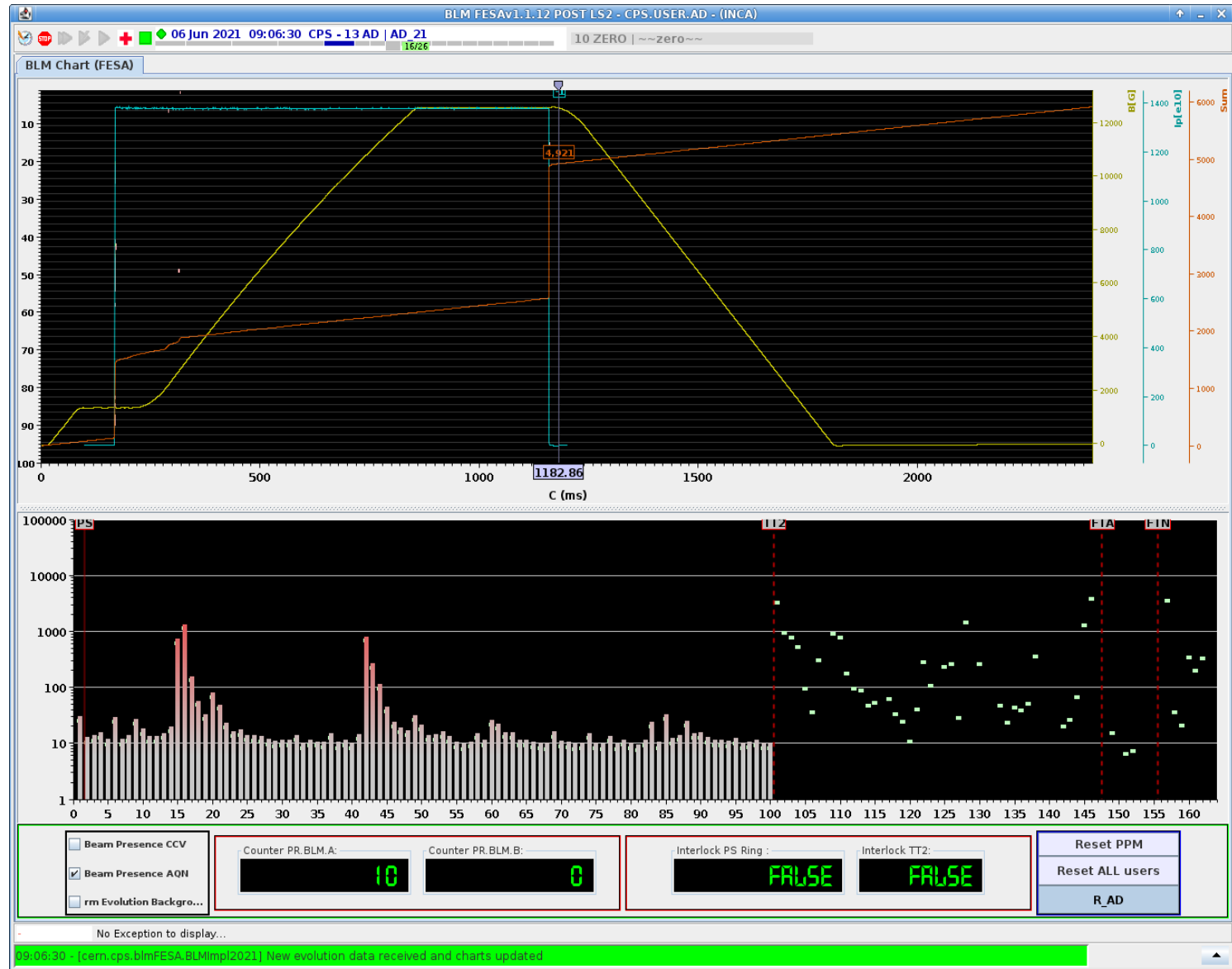


Extensive wire scans for LHC25 beams



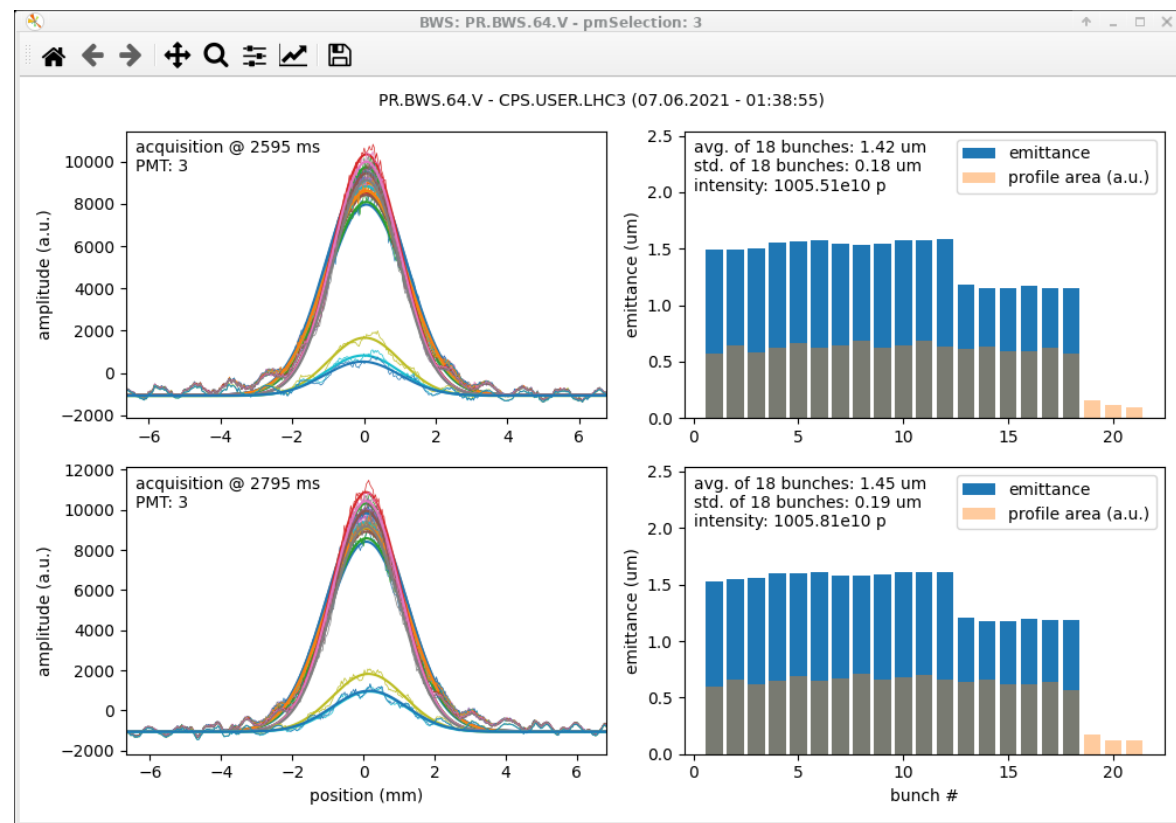
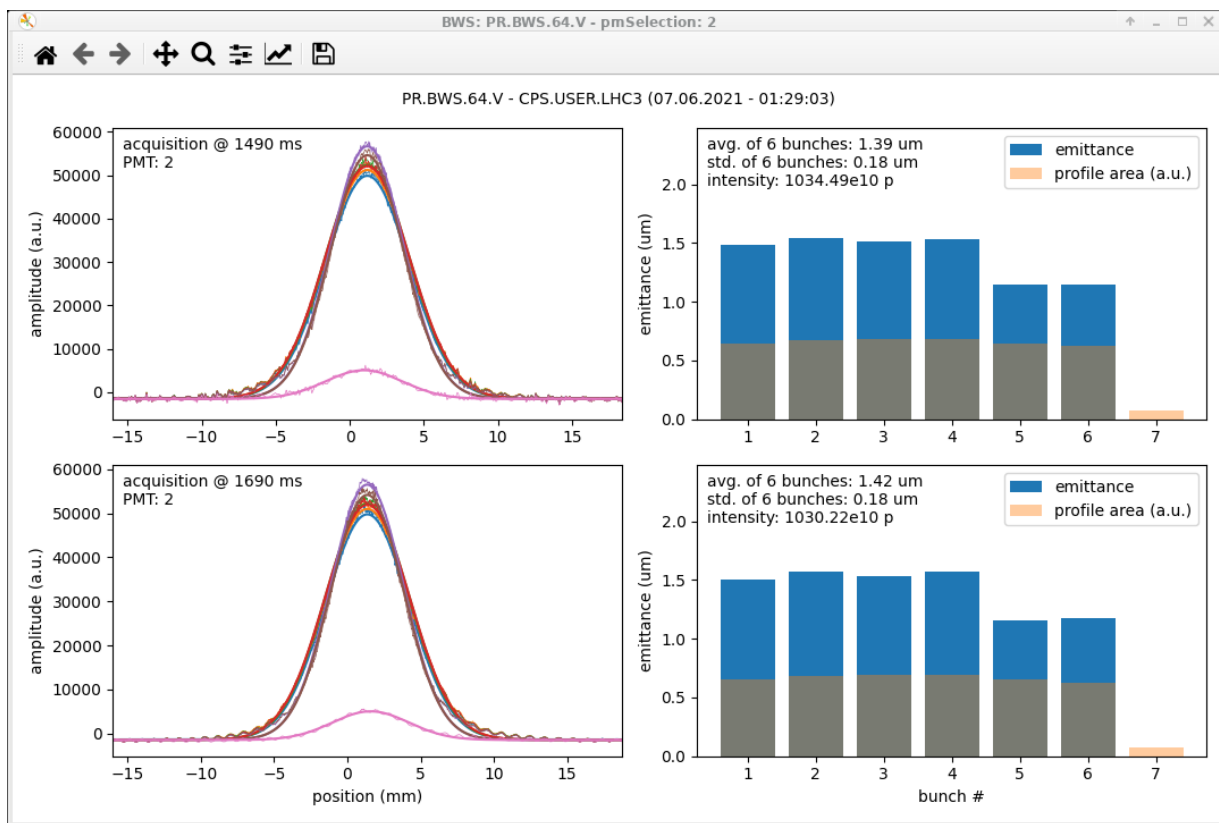
AD setup

- Work on longitudinal
 - Blow-up modulation frequency / amplitudes
 - transition crossing timings
 - RF settings adjusted
 - One-Turn-Delay Feedback enabled
- Negative chromaticity corrected
- Intensity increased to the nominal value of $1400e10$.
- Some remaining losses at injection - very sensitive to the magnetic cycle placed just before



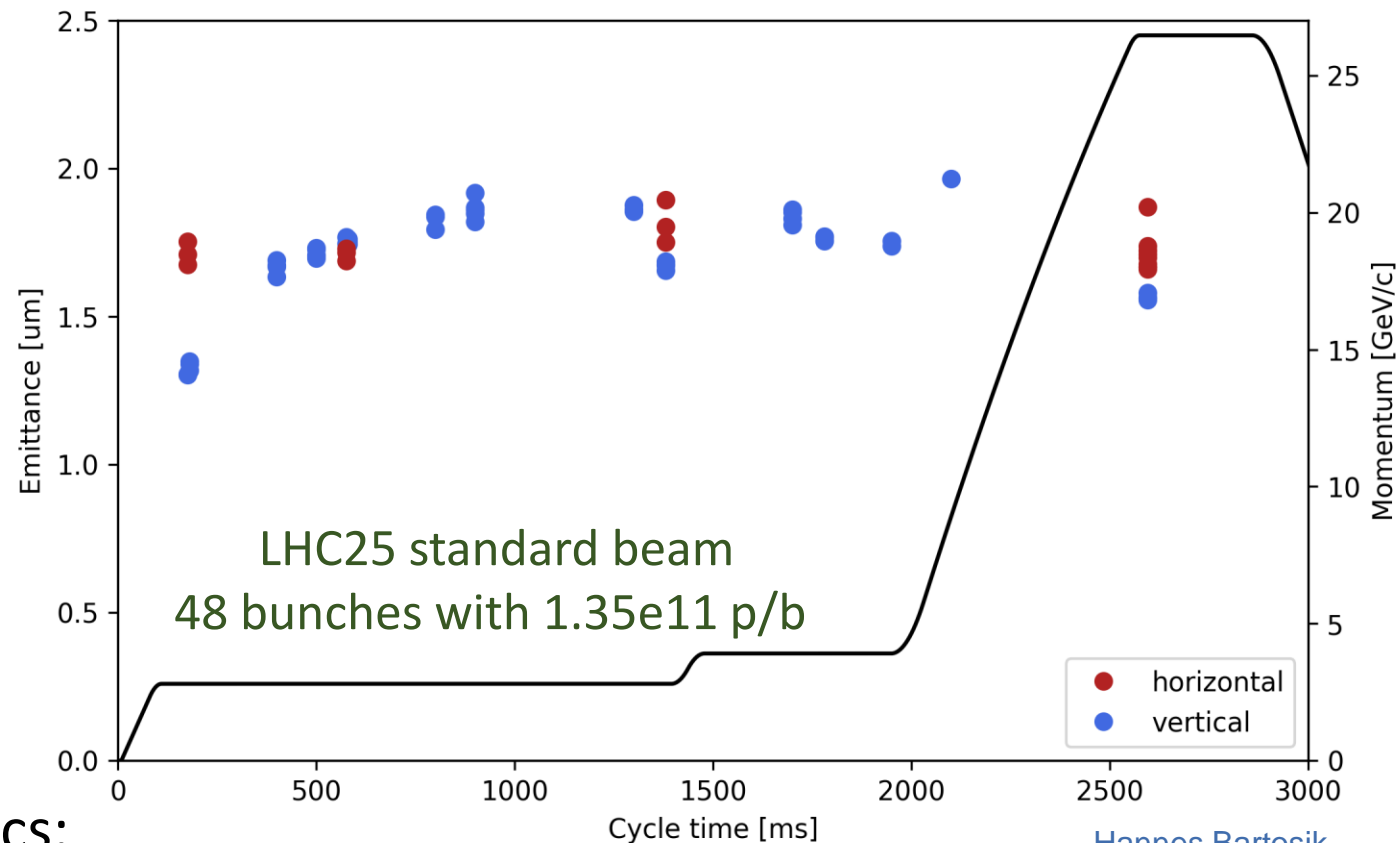
LHC 25ns - emittance

- Python script adjusted from SPS WS made extensive wire scans possible
Thanks to Hannes Bartosik and Alex Huschauer!



LHC 25ns - emittance

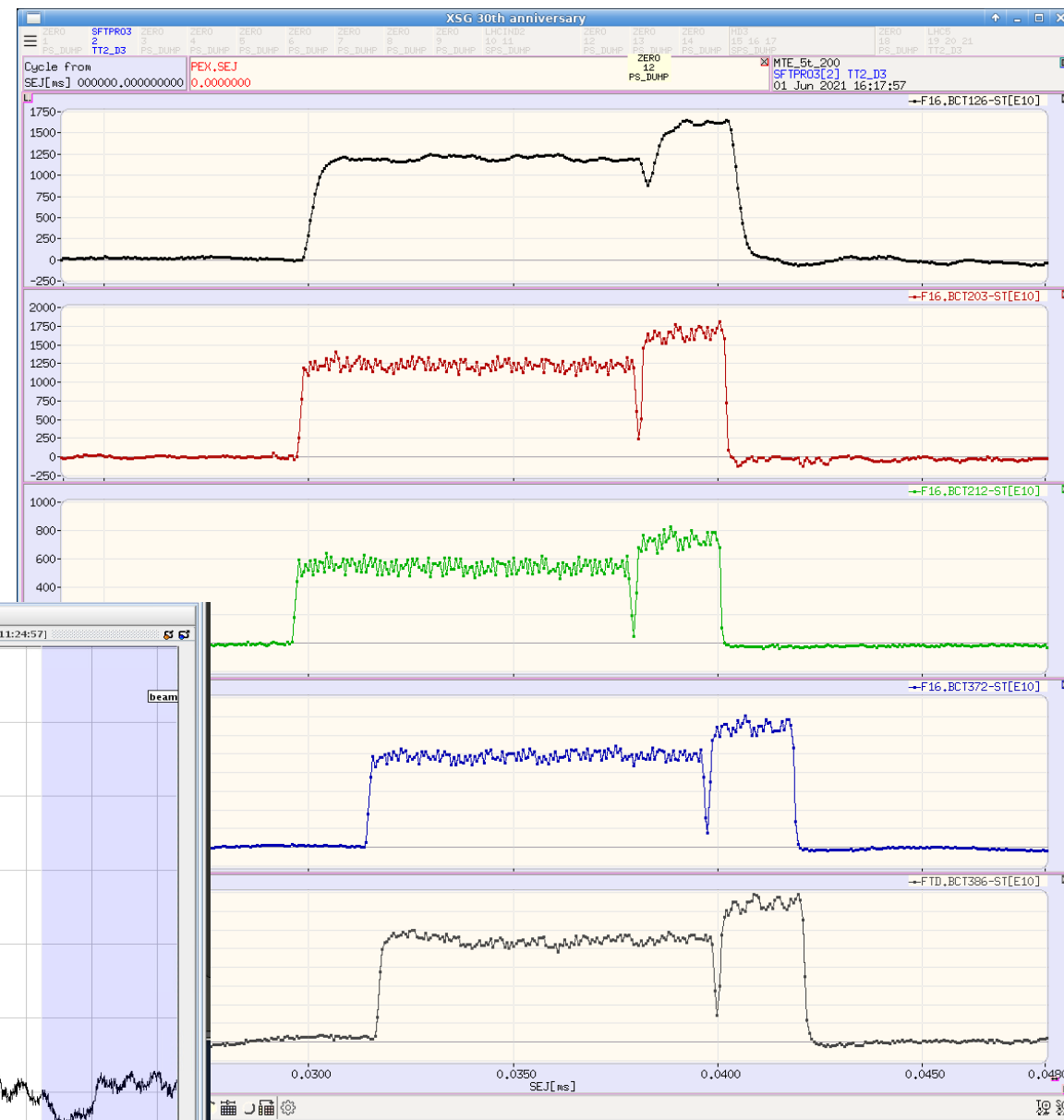
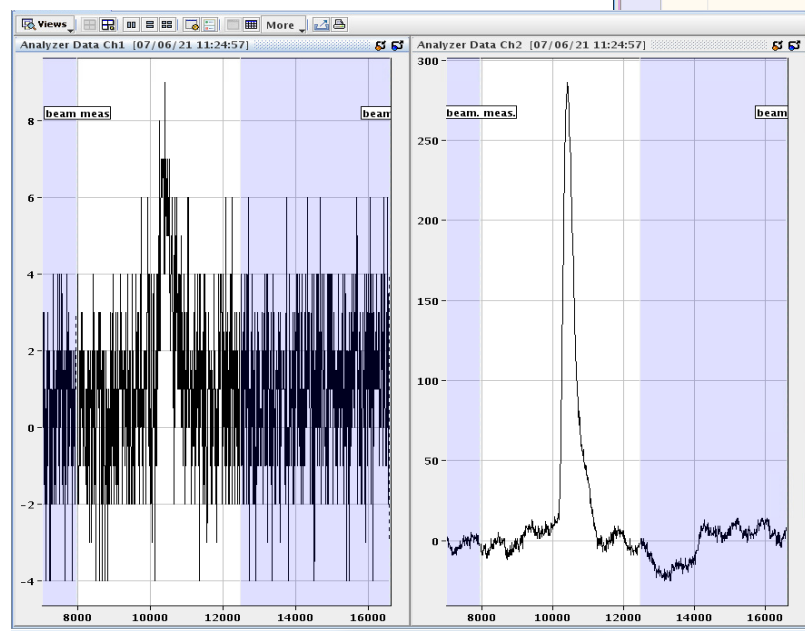
- Measurements along LHC cycle for nominal intensity:
 - horizontal emittance is in the order of 1.7-1.8 mm mrad
 - the vertical is 1.25 at injection, growing to ~ 1.9 mm mrad before the second injection
- Various configurations with/without low-chromaticity optics measured
- BCMS cycle with low-chromaticity optics:
 - no significant vertical emittance blow-up at injection plateau:
 - from 0.58 mm mrad @ C180 to 0.72 @ C1350.
 - Horizontal in the range of 1.2 to 1.4 mm mrad after injection and at C1100



BCTs in TT2

- Many tests were performed at various intensities. The signal is much cleaner after removing amplifiers in the tunnel
- Being followed up with the experts
- An amplifier has been installed at the surface rack for BCT126 to measure low-intensity beams

Romain Ruffieux



Other items

- **Internal dump TDI47**: tests were done after an update of the FESA class and PLC. The test were successful and we can use it without problems up to an interlock setting at 1500e10.
- **F16.BHZ377 and F16.BHZ378**: A problem appeared with 2 consecutive MTE cycles, first to SPS then to dump D3: the second cycle is also (wrongly) sent towards the SPS. It is related to the way the central timing and the destination based economy mode work. This cannot be changed and as a consequence consecutive 1 and 2BP cycles with the same user but different destinations need to be avoided. This will be implemented in the SC rules.
- **DFA** timings adjusted. One was wrong but adjusted on Wednesday. Effect on beam seen. Another iteration of adjustments with SPS foreseen
- **10 MHz cavities**: a number of trips during the week-end (66, 36, and 11) required expert follow-up but did not impact the beam sent to the SPS. 36 had a broken fan and the amplifier chassis was changed during access on Monday
- **QKE16**: had spurious interlocks from a thermoswitch + problems on power converter side => access for checking and changing the thermoswitch + converter repaired

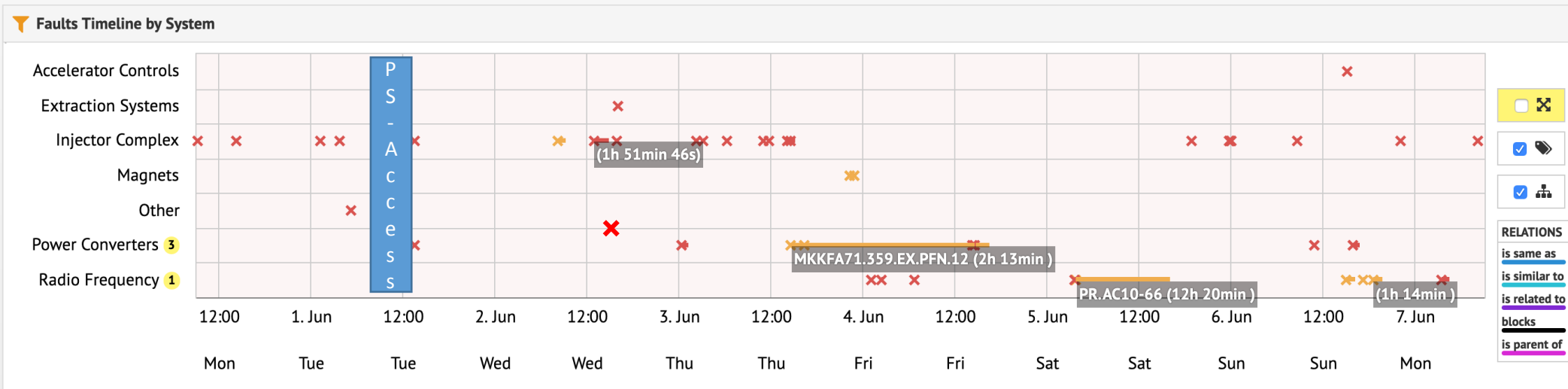
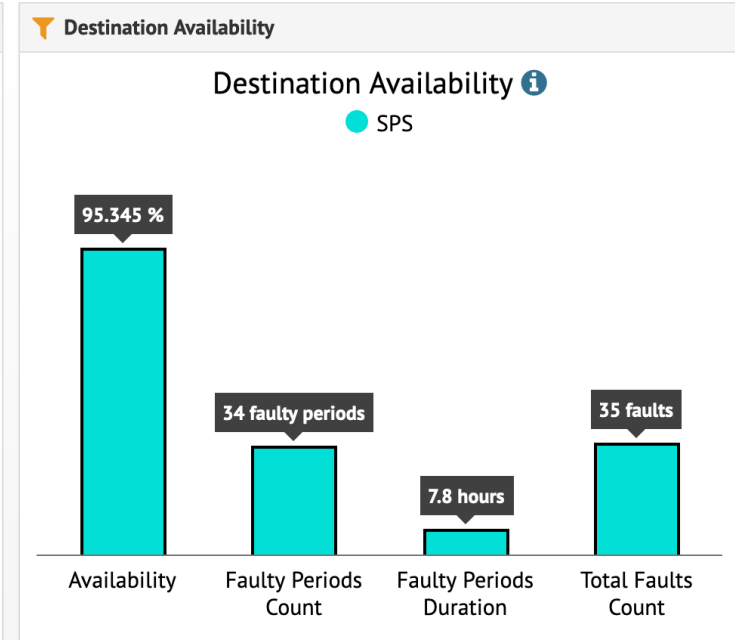
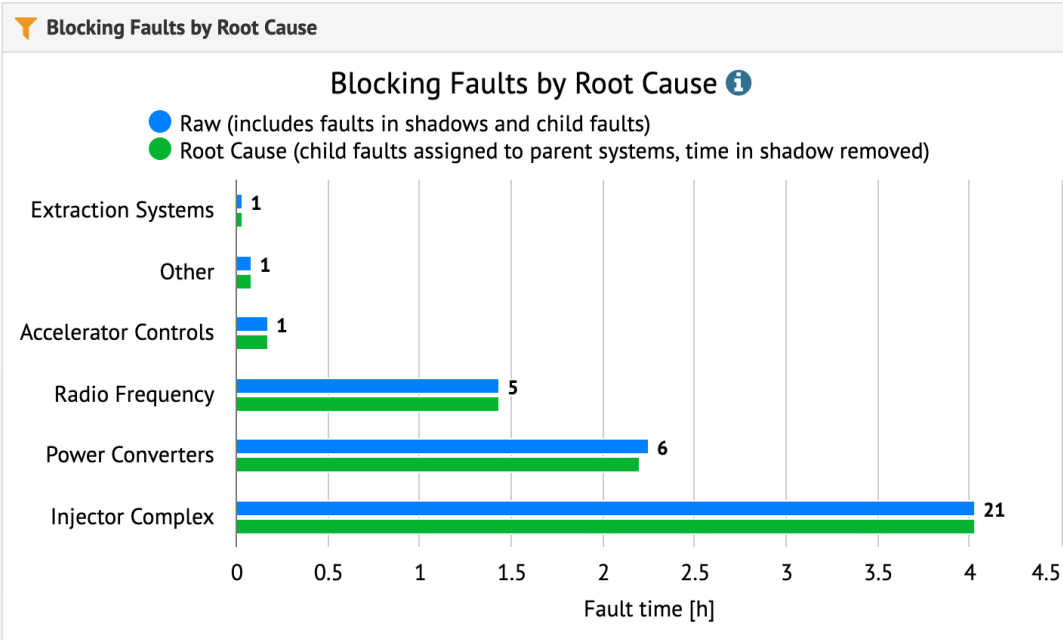
Accelerator Fault Tracking (AFT)

Availability
95.3%

Blocking Faults
35

Total Faults
44

Fault Duration (overlap excluded)
48.3h



Summary of operational beams

Fixed target beams	Status	Comment
SFTPRO (core only)	Operational	Delivered to SPS at $\sim 6...7 \cdot 10^{11}$ p/p
SFTPRO (5 turn extraction)	Intensity increase	2-5 10^{12} p/p delivered to SPS at $4.5 \cdot 10^{12}$ p/p
AD	Setup	$1.4 \cdot 10^{13}$ p/p, losses at injection
TOF	Setup	First basics
LHC-type beams	Status	Comment
LHCPROBE, LHCINDIV	Operational	
LHC25 (72b)	Operational	Polished up to $1.3 \cdot 10^{11}$ p/b ϵ_h (arrival flat-top) \approx 1.8 mm mrad ϵ_v (end flat-bottom) \approx 1.6 mm mrad
LHC25 (12b or 24b)	Temporary	3 bp cycle delivered to SPS
LHC25 BCMS (48b)	Operational	Polished up to $1.3 \cdot 10^{11}$ p/b

Priorities for this week

- **Polishing and intensity increase of SFTPRO**
 - Quantify **benefit of longer bunches** from PSB
 - Reduce losses along the cycle
 - DFAs
- **Continue the setting-up of AD beam**
 - Bunch rotation
 - Intentional mismatch versus larger longitudinal emittance from PSB
- **Wire scanner control to be improved**
 - **Careful checks** (gates, offset of first bunch, saturation)

Questions and Comments

PS Supervisor of the week 23 – **Matthew Fraser**



8:45 Daily Zoom meeting during beam commissioning

Web address: <https://cern.zoom.us/j/9372114100?pwd=L29BcmIHUENCdFBRSyYVcrM1B4Zz09>

Meeting ID : 937 211 4100

Passcode: 525463

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