

3 April 2023

# ACCELERATORS & EXPERIMENTAL FACILITIES STATUS

## SUMMARY OF WEEK 13- 2023

Technical infrastructure – *Jesper Nielsen*

Linac 4 – *Piotr Skowronski*

PS Booster – *Jean-Francois Comblin*

ISOLDE

PS – *Benoit Salvant*

PS – East Area

PS – nTOF – *Nikolas Patronis*

AD – ELENA – *Laurette Ponce*

SPS – *Kevin Li*

SPS – North Area

SPS – AWAKE

SPS – HiRadMat

Linac 3 – *Not running*

LEIR – *Not running*

LHC – *Jorg Wenninger*

CLEAR

Technical Infrastructure (TI)			
<b>Facility Coordinator last week</b>		Jesper Nielsen	
<b>Facility Coordinator this week</b>		Jesper Nielsen	
Facility Status			
<b>Summary</b>	Very busy week, with many events!		
<b>Issues</b>	Mon 27/03/23 07:22: PH high on station WMS102. FireBrigade notified.		
	Tue 28/03/23 03:14 POPS-B trips due to CV pump stop. A pressure switch was faulty, and was replaced.		
	Wed 29/03/23 08:19: Electrical fault on EBD118/42 breaker in RE42. Origin of the fault not yet understood, could be switched on again without problems.		
	Thu 30/03/23 21:18: PLC for cooling in UW45 in fault. LHC dumped beam to go and restart the PLC.		
	Fri 31/03/23 06:50: pH High alarm with a 8.5 value on PMW920, Fire Brigade informed but no intervention since the values stabilised rapidly.		
	Fri 31/03/23 08:59: SPS mains tripped, and LHC beam loss. TI checked with both EDF and SIG, no signs of electrical perturbation.		
	Fri 31/03/23 10:16: Fire detection in ECN3. FireBrigade and RP on site. CO measured and a little smoke detected. Not possible to access in these conditions. Cause is not yet found. SFDEI- 10477 detection feu tunnel TT83 - TDC8		
	Fri 31/03/23 17:38: Electrical perturbation. Confirmed on like 225kV Genissiat - Verbois. Second perturbation shortly after.		
	Sat 01/04/23 13:56: nTOF beam lost. A problem with a pressure switch. The switch has been left in manual "simulated mode" for the moment.		
	Sat 01/04/23 22:05: Stable filters in LHC4 tripped. Caused unbalance on the electrical network in LHC4. EPC on-site for intervention, by error the neutral for the 66kV was cut instead of the filter, which caused a complete cut of LHC4. CRYO was stopped for too long, which caused the RF rupture discs to break.		
<b>Plans</b>			
Intervention Request			
Yes / No	<b>Duration</b>		<b>Preferred date/time</b>
<b>Reason</b>			
<b>Impact</b>			

## Linac 4

<b>Machine Coordinator last week</b>	Skowronski Piotr		
<b>Machine Coordinator this week</b>	Sanchez Alvarez Jose-Luis		
<b>Statistics</b>			
<b>Availability</b>	98%		
<b>Facility Status</b>			
<b>Summary</b>	OK		
<b>Issues</b>	1. On Wednesday PS access to Switchyard blocked the beam delivery towards PSB for 2h30 2. On Friday power supply of corrector L4L.RCH.121 tripped 3 times in a row, rebooting FGC gateway fixed it - 30 minutes 3. On Thursday Chopper tripped – 4 min		
<b>Plans</b>	Regular operation. During accesses to Switchyard dedicated measurements investigating variations along the pulse.		
<b>Intervention Request</b>			
No	<b>Duration</b>		<b>Preferred date/time</b>
<b>Reason</b>			
<b>Impact</b>			

<b>PS Booster</b>			
<b>Machine Coordinator last week</b>		Jean-Francois Comblin	
<b>Machine Coordinator this week</b>		Chiara Bracco	
<b>Beam Scheduled</b>			
<b>ISOLDE</b>	Yes	<b>PS</b>	Yes
<b>Beam Availability by Destination (AFT)</b>			
<b>ISOLDE</b>	%	<b>PS</b>	%
<b>Facility Status</b>			
<b>Summary</b>	<b>AFT Availability: 94.5 %</b> <b>General machine status</b> <ul style="list-style-type: none"> <li>Operational beams ready and delivered as requested.</li> <li>Parallel MDs restarted.</li> <li>Transactional problem of BI.KSW solved by timing specialist.</li> <li>Ejection trajectories optimized for all PS beams.</li> </ul>		
<b>Issues</b>	<ul style="list-style-type: none"> <li>Monday, BI3.BSW1L1.2 tripped several times. The specialist switched the converter to the spare one. The total downtime was 2h20. The converter was switched back Tuesday during the PS access, after a firmware update.</li> <li>Friday afternoon, a power glitch occurred. Only 2 quads in BTY line and POPS-B were affected.</li> <li>Friday evening, BT1.KFA10 tripped several times. The piquet was called. He had to change the charge control unit. The total downtime was 2h00.</li> </ul>		
<b>Plans</b>	Follow the operational and MD schedule.		
<b>Intervention Request</b>			
No	<b>Duration</b>		<b>Preferred date/time</b>
<b>Reason</b>			
<b>Impact</b>			

PS							
<b>Machine Coordinator last week</b>		Benoit Salvant					
<b>Machine Coordinator this week</b>		Bettina Mikulec					
Beam Scheduled							
<b>East Area</b>	Yes	<b>nTOF</b>	Yes	<b>AD</b>	No	<b>SPS</b>	Yes
Beam Availability by Destination (AFT)							
<b>EA T8</b>	%	<b>EA T9</b>	%	<b>EA T10</b>	%	<b>EA T11</b>	%
<b>nTOF</b>	%	<b>AD</b>	%	<b>SPS</b>	%		
Facility Status							
<b>Summary</b>	<p><b>Good continuation of the beam commissioning in the PS, with first fast extraction to EAST, first beam to T8 target and first beam and steering to n-TOF target, while providing LHC25 beams to SPS. Availability is 92% until now.</b></p> <p><b>Beam status</b></p> <ul style="list-style-type: none"> <li>• <b>LHC type beams:</b> <ul style="list-style-type: none"> <li>○ Delivered regularly batches of 72b to the SPS (with up to 2.3e11 ppb).</li> <li>○ The 8b4e beam was prepared (56b) but it trips cavity 81.</li> <li>○ The beam intensity on the LHC nominal cycle was pushed beyond 2.6e11 ppb (72b).</li> <li>○ The 2 basic period cycle (12b-48b) was prepared in view of possible use for LHC filling.</li> </ul> </li> <li>• <b>SFTPRO</b> <ul style="list-style-type: none"> <li>○ MTE beam delivered to the SPS to 1500e10 ppb and barrier bucket, fine tuning ongoing both in transverse and longitudinal planes (no change since last week).</li> </ul> </li> <li>• <b>EAST</b> <ul style="list-style-type: none"> <li>○ Beam delivered in acceptable condition to the T8, T9 and N targets (fast and slow extractions). Losses in septum 23 are still too high and additional work is needed on that side.</li> </ul> </li> <li>• <b>TOF</b> <ul style="list-style-type: none"> <li>○ Beam prepared at several intensities for aperture scans this weekend.</li> </ul> </li> <li>• <b>AD to be continued next week.</b></li> </ul> <p><b>Other activities</b></p> <ul style="list-style-type: none"> <li>• Constant finetuning on LHC, EAST, TOF beams this week.</li> <li>• Losses at transition crossing with low intensity TOF beams were solved by RF experts.</li> <li>• Work on low tune single turn EAST extraction is ongoing.</li> <li>• Emittance measurements on LHC beams were performed.</li> <li>• The patrols for EA2 and n-TOF target were done and beam permits were signed in time to start FTN steering and aperture check on Saturday and Sunday.</li> </ul>						
	<b>Issues</b>	<ul style="list-style-type: none"> <li>• A leak in the cooling system of POPS was repaired on Monday (2 beam stops of 40 min to put POPS in degraded mode in order to intervene on Monday and Tuesday).</li> <li>• A leak was observed on the RF cavity demineralized water circuit by EN-CV. An access was organized in the PS ring and switchyard in the shadow</li> </ul>					

	<p>of an access in SPS and LHC on Wednesday morning for an inspection by EN-CV (3h without beam from PS and PSB). A small leak was identified and a pressure limiter was readjusted by the RF specialist.</p> <ul style="list-style-type: none"> <li>• Magnets BHZ377 and BHZ378 tripped many times on a SLAVE fault this week and more and more frequently, which started to perturb operation significantly. SY-EPC experts investigated and recommended exchanging 3 network switches. The intervention was done on Thursday afternoon and solved the issue.</li> <li>• A broken cathode power supply was replaced on KFA45 on Monday, and there were less KFA45 faults afterwards.</li> <li>• On the EAST_T8 beam, the signal was good on BPM1, but very low on the 3 following BPMs. It took significant time and effort by the operation team to realize that BCT T08.BCTF072 was not fully out with a position at 0 mm.</li> <li>• There were several 10 MHz cavity trips throughout the week, which were followed up by the RF piquets and experts.</li> <li>• The main recurrent faults that remain to be solved are with KFA71 module trips as well as with cavity 81 that trips after a couple of hours when the 8b4e beam is played in the supercycle.</li> </ul>		
<b>Plans</b>			
<b>Intervention Request</b>			
No	<b>Duration</b>		<b>Preferred date/time</b>
<b>Reason</b>			
<b>Impact</b>			

PS nTOF			
<i>Facility Coordinator last week</i>		Nikolas Patronis	
<i>Facility Coordinator this week</i>			
Beam Requested			
<i>EAR 1</i>	No	<i>EAR 2</i>	No
Facility Status			
<i>Summary</i>	<ul style="list-style-type: none"> <li>• Beam at the n_TOF target since Saturday morning. Everything looks OK!</li> <li>• NEAR: Diamond detector test started. Very nice and promising results from the first shots.</li> <li>• EAR1 &amp; EAR2: detection setups are working as expected, except for some issues with the umegas pre-amps.</li> <li>• DAQ in all areas looks to work nicely and smoothly</li> </ul>		
<i>Issues</i>			
<i>Plans</i>	<ul style="list-style-type: none"> <li>• Increase the intensity of the proton beam towards to the nominal one</li> <li>• Finalize beam settings for the FTN line (many thanks to PS)</li> <li>• EM “ringing” study will take place based mostly to the Si detectors.</li> <li>• EAR1: Optimization of the umegas electronics, data taking with SiMON</li> <li>• EAR2: Preparation of the capture setup; data taking with SIMON</li> <li>• NEAR: Final steps of the diamond detector tests and data taking</li> </ul>		
Foreseen Beam Stop			
No	<i>Duration</i>		<i>Date/Time</i>

<b>AD - ELENA</b>			
<b>Machine Supervisor last week</b>		Laurette Ponce	
<b>Machine Supervisor this week</b>			
<b>Beam Scheduled</b>			
<b>AD</b>	No	<b>ELENA</b>	No
<b>Availability (AFT)</b>			
<b>AD</b>	-%	<b>ELENA</b>	-%
<b>Facility Status</b>			
<b>Summary</b>	<p>AD target:</p> <ul style="list-style-type: none"> <li>• start of HW commissioning</li> </ul> <p>AD:</p> <ul style="list-style-type: none"> <li>• Magnet extracted and machine prepared for closure</li> <li>• start of HW tests on Thursday afternoon</li> </ul> <p>ELENA:</p> <ul style="list-style-type: none"> <li>▪ GBAR taking Hminus beam</li> </ul>		
<b>Issues</b>	<ul style="list-style-type: none"> <li>• Replacement of 3 generators of the magnetic horn</li> <li>• problem to restart the AD BHZ-MAIN circuit after reconnection of the BHZ-TRIM</li> </ul>		
<b>Plans</b>	<ul style="list-style-type: none"> <li>▪ Installation of collimator in AD target</li> <li>▪ Start of HW commissioning in AD ring</li> </ul>		
<b>Intervention Request</b>			
Yes	<b>Duration</b>	-	<b>Preferred date/time</b> -
<b>Reason</b>	Magnet inspection after YETS		
<b>Impact</b>			



SPS							
<b>Machine Coordinator last week</b>		Kevin Li					
<b>Machine Coordinator this week</b>		Stephane Cettour Cave					
Beam Scheduled							
<b>LHC</b>	Yes	<b>NA</b>	No	<b>AWAKE</b>	No	<b>HiRadMat</b>	No
Beam Availability by Destination (AFT)							
<b>LHC</b>	-%	<b>NA</b>	-%	<b>AWAKE</b>	-%	<b>HiRadMat</b>	-%
Facility Status							
<b>Summary</b>	<p>An intense week of scrubbing has passed for the SPS. As originally foreseen, the week was entirely dedicated to scrubbing, in partuclular with the new injection kicker magnet installed (MKP-L). The hope was to be able to now perform continuous scrubbing at high duty-cycle without being quickly limited due to MKP-L heating, which in the past required regular long cool-down periods. Indeed, the MKP-L perfomed marvellous in terms of heating with temperatures behaving rock-solid despite high intensity scrubbing at the long flat bottom over several days. Thanks to this, long flat bottom scrubbing could be completed efficiently and well in advance and the machine was ready to tackle scrubbing up the ramp already by Tuesday.</p>						
	<p>Unfortunately it turns out that, as opposed to the past, the new MKP-L is highly sensitive to the bunch length - very similar to the MKDH - and is thus subject to heavy outgassing only when moving close to the end of the ramp. Due to this, the scrubbing strategy was changed. A new cycle was designed after consultance with EPC on the PC limitations, with a long flat top at 400 GeV in order to enhance the scrubbing dose and efficiency at short bunch lengths to try and speed up the MKP-L conditioning. To be able to exploit the enhanced scrubbing, the software interlock strategy also had to be adapted and a change was implemented at the SIS level (MPK-L actual pressure monitored at end of cycle rather than maximum value attained). This allowed for intensified scrubbing at flat top for short bunches throughout the weekend. Although the MKP-L remains nearly flat in temperature, the MKP-S are still heating up and are now stepping out of the shadow of the MKP-L. Although the temperature levels are below the thresholds, the MKP-S are still being operated in regimes the magnets have not seen before. Over the weekend a spark occured in one of the MKP-S and required a kicker conditioning. During conditioning and in absence of beam, another pressure spike occurred, probably in the MKP-L. This should be further checked and analyzed next week by ABT. The re-conditioning of the MKP-S went slow and rather tedious.</p>						
	<p>In addition to scrubbing, on Wednesday, slow extraction setting up the the TT20 TEDs was completed; girder and ZS alignment was done. Noise correction algorithms are being tested on the spill throughout the week and on the weekend to help and solve the problems with 50 Hz and 100 Hz spill noise of the last years.</p>						
	<p>Beam has been extracted to the LHC since Tuesday and general availability of LHC beams is good. A MKE-6 kicker waveform scan was done on Friday as part of the fast extraction commissioning.</p> <p>Interventions were required for the inspection of RF complex loads, ZS exchange of the 3M circuit motor, and an intervention on a 18 kV transformer.</p>						
	<p>On Monday a test on the main setxupole and octupole power converters was done where the voltage has been artifically clamped to a limit of 1440 V. The impact on the chromaticity has been marginal. It was decided to keep running in this configuration for a more longer term experience in order to detect any potential issues with this. If this configuration is acceptable by the machine, future power converter consolidation could be significantly simplified and improved.</p>						

<b>Issues</b>	The new MKP-L is highly sensitive to the bunch length - very similar to the MKDH - and is thus subject to heavy outgassing only when moving close to the end of the ramp			
<b>Plans</b>	For next week, a meeting will be held on Monday to decide on how to proceed with scrubbing, which is currently heavily impacted by the MKP-L outgassing at flat top. Also, on Monday the commissioning of the new RF feedforward is planned. Furthermore, several high intensity long parallel MDs were planned. It will have to be evaluated how compatible these are with the required scrubbing.			
<b>Intervention Request</b>				
Yes	<b>Duration</b>	2 x 12 hrs	<b>Preferred date/time</b>	tbc
<b>Reason</b>	Investigative work for the crack in the SPS tunnel			
<b>Impact</b>	Beam stop for all downstream facilities.			

LHC			
<b>Machine Coordinator last week</b>		M. Solfaroli	
<b>Machine Coordinator this week</b>		E. Bravin	
Statistics			
<b>Availability</b>	74%	<b>Stable Beam Ratio</b>	In beam commissioning
Facility Status			
<b>Summary</b>	<p>The vacuum pump down was completed Monday afternoon. After a last evening of checkout, the first beams were injected Tuesday 28th March during the morning. With the end of 2022 corrections in place, very little steering was required and both beams circulated by midday. The same day the optics was measured and corrected at injection. On the second day a probe bunch was ramped to 6.8 TeV and squeezed to 30 cm in a single step. With the 2022 MD corrections in place, the squeeze was very smooth. On Thursday the ramp was repeated with a nominal bunch, the orbit bumps were switched on and tested through the ramp to the end of the squeeze.</p>		
	<p>The aperture at injection was verified to be larger than 12 sigma in all planes, in line with previous years, with the aperture limiting elements in IR6 as expected.</p>		
	<p>The three crystals in the machine, B1V, B2H and B2V, were tested. Channelling was obtained for all three planes.</p>		
	<p>A first round of linear optics measurements and corrections between 2m and 30m were performed on Saturday.</p>		
<b>Issues</b>	<p>Around midnight Saturday, an electrical issue in point 4 took out the cryogenic system and <b>**two RF burst disk broke again on the S34 RF modules**</b> (one module of each beam). Fortunately, the rupture disks could be replaced within 3.5 hours. Since the cavities remained below 60K, it was decided to cool down the cavities directly on Sunday. The machine is expected to be ready for beam sometimes on Monday.</p>		
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<b>Plans</b>	Continue beam commissioning		
Intervention Request			
Yes / No	<b>Duration</b>		<b>Preferred date/time</b>