

Accelerator Complex Status

End week 10 (Monday 14 March 2022)

Technical Infrastructure (Ronan Ledru):

Statistics:

- Close to 6'000 alarms.
- 717 phone calls (491 incoming, 226 outgoing).
- 106 ODM created.

Events worth mentioning:

- Tue 08.03, SEQ8 restarted and CallCenter issue during the router migration in CCC.
- Wed. 09.03, Trip of Alice dipole magnet. Apparently this was caused by opening an interlocked door in the course of an EL inspection.
- Mon. 14.03, Smoke from UPS Battery ESS108/BE in BE (new type of batteries). Fire Brigade and Electrical piquet onsite to open the installation.

Major EL works for this Week:

- Mon. 14.03: Switchover from EHT1 to EHT3 (400kv/18kv transfo for the SPS)
- Thu. 17.03: 48V charger replacement in SE4 (LHC 4)
- This Week, Restart of all the RTU in the LHC tunnel (remote terminal unit for EL controls), this has been coordinated with the LHC.

Details: <https://wikis.cern.ch/display/TIOP/2022/03/14/TI+week+summary%2C+Week+10>

LINAC 4 (Giulia Bellodi)

A machine availability of 93% for Linac4 this week so far (just less than 11h downtime).

The main faults were due to:

- A pre-chopper HV transmission cable failure on Wednesday afternoon, requiring tunnel access for repair (1h30')
- A PIMS 9-10 modulator failure on Thursday evening/night (5h15') : in a first event at 18h the modulator tripped with a current spike and the protection circuit was damaged. PIPO intervened to exchange the card and the system was restarted gradually. However after a few minutes of pulsing at nominal voltage a second trip with overcurrent occurred and the protection circuit had to be repaired a second time (by PIPO and EPC specialist). The modulator voltage was then lowered overnight as precaution to keep the system pulsing. Further adjustments were made during the scheduled beam stop the next morning (reduction of modulator pulse length and resynchronisation with RF).
- A scheduled access on Friday morning (3h30') to allow for a series of interventions:
 - Pre-chopper HV cable exchange (back to the original, after repair)
 - BCT head amplifier exchange in the L4P line
 - RFQ klystron inspection
 - LN4 source tests : these confirmed a further 4kW loss in the 2MHz RF tube amplifier performance, and an intervention was therefore agreed to exchange the amplifier with a spare. After discussion with PSB/PS/SPS teams, this has been planned to take place on Monday 14/03 from 14h for an expected beam stop duration of 3-4 hours.

PS Booster (Jean-Francois Comblin):

The availability of the Booster was around 85%.

- Tuesday night, BT.BHZ10 tripped and could not be restarted. The problem took a long time to be diagnosed and the piquet was called. A local reset was enough to restart the power converter. The total downtime was 3h30.
- Wednesday afternoon, the Linac4 pre-chopper was down for 1h30.
- Thursday, the Linac4 PIMS09-10 was down for 5 hours.
- Friday morning from 8h30 to 12h00, we profited from the beam stop in the PS to do some interventions in the Booster: the scheduled Quad-A of POPS-B, some visual inspections in the machine, and the polarity inversion of 2 octupole magnets.
- Friday afternoon, unfortunately, POPS-B could not handle the charge of the supercycle and tripped twice. The specialist had to swap the Quad circuit. We lost 2 hours of beam time.
- Saturday, the ring 4 could not be captured. The piquet, then the specialist were called. They finally traced back the problem to the servo loop control of Finemet S13. In total, the ring 4 was unavailable for 9 hours.

The main activity of the week was the setting-up of the BTY line.

- We started with the steering of the line to GPS. Then kick response and optic measurements confirmed a good agreement between the data and model in the horizontal plane. In vertical there are some disagreements probably due to a BPM problem. And finally a full set of references were taken for 3 different intensities and 2 different optics.
- We repeated the process for HRS: steering and full set of references. The optic measurements will be done Monday.

There was also progress on operational beams:

- AD: The stability was improved at extraction, the losses reduced and transverse emittances homogenized.
- ISOGPS/ISOHRS: the RF team worked to improve extraction and reduce losses.
- LHCPILOT: the beam was created following a request by PS.

ISOLDE (Emiliano Piselli):

HRS:

Plasma target beam to VITO beamline on Tuesday, Wednesday and Thursday.

During these days we have performed many investigations on a jitter visible in most of the profile measurements devices after the central beamline. Unfortunately we could not understand the problem and we will try to continue this week.

People involved in the investigations: M.Duraffourg, M.M. Nieto and S.B.Pedersen (SY-BI), J.P.Lopez (SY-EPC). On Friday we have installed the semgrid target and we could get the first proton of the year in the afternoon! PSB crew has completed the program for the reference measurements to HRS in the weekend...thanks a lot for their work.

GPS:

Spare semgrid target put on the front end on Thursday. Measurements performed showed some small issue (SY-BI aware of it). LIST (Laser Ion Source and Trap) target installed on Friday and stable beam to RILIS on Sunday.

REX-Hie:

C.Gagliardi (SY-RF) has worked hard to repair the IHS amplifier and to restart 7GAP2 and 9GAP amplifier. We have restarted REXTrap and REXEbis and we are doing some test with stable beam coming from the local ion source.

PS (Alex Huschauer):

The PS had a good week with significant progress commissioning the different beam types.

Throughout the week we continued to provide LHC single bunch beams and SFTPRO (MTE core only)

beams to the SPS. Energy matching with the SPS was performed for SFTPRO beams and another iteration might be done this week.

The commissioning activities focussed on EAST and TOF during the week. In the absence of the beam permit, the EAST cycle setup was started without extracting the beam. Adjustment of the flat top momentum, the working point and the radial position were carried out and tune and chromaticity measurements were performed in different configurations. The ring optics tables were adjusted to allow generation of the strengths of the main parameters (QSE, XSE and absolute knobs for the bumps around SEH23 and SMH57). Furthermore, optics for the F61T8 and F61DUMP lines were created, uploaded to LSA and linked to the newly generated logicals. This work is done to prepare a YASP configuration for the F61 line, for which a UCAP node will eventually publish the IRRAD BPM data (and potentially position data from BTVs as well) to overcome the lack of dedicated beam position instrumentation. The F61 elements can now be controlled with functions to program them according to the momentum sweep in the ring.

Following the signature of the beam permit Friday evening, slow extracted beams could be successfully sent to the EAST dump over the weekend. Setup of a fast extracted cycle for BCT calibration purposes was also started. This is a very good starting point to optimise the extraction over the next weeks before starting physics.

This Monday studies start to validate the FTN optics modifications following the removal of the two quadrupoles. Therefore, a low-intensity large emittance TOF beam (200E10, $\sim 8\mu\text{m}$ in both planes) was prepared during the week. The PSB already modified the beam production to deliver larger transverse emittances, which were then further increased by approaching the integer resonances in the PS and exploiting some linear coupling.

On Friday the DSO tests for nTOF, AD target and AD ring were successfully performed, despite several issues that required interventions on a beam stopper in FTN and on some magnets in FTA. Following the DSO tests, the nTOF beam permit was signed and first beam was sent to the target on Friday evening. Proper functioning of the SEM grid in front of the target (important for the optics studies), the target instrumentation and signals on the experiments' side was successfully verified.

Following a firmware upgrade for the high-frequency cavities, the phasing between them could be performed. As a result, the LHC25 quadruple splitting was set up and 72b are available at $\sim 0.8\text{E}11$ ppb. Nominal intensity is planned to be delivered to the SPS for scrubbing in the middle of this week.

The main issues perturbing operation this week were related to the PR.WFNP PFW circuit, where we are currently running on the spare power converter, which behaves clearly worse than the operational one (strong 50 Hz ripple). The expert has been repairing the operational power converter and its reconnection is planned for this Monday. Furthermore, a digitiser card for the tomoscope needed replacement, leaving us with only one available channel for a few days. Several power converters required for the EAST extraction (SMH57 and some elements in T8) couldn't be started and required piquet intervention over the weekend. Sending beam down the T8 line wasn't possible as an access to the zone is necessary to close an open door, the facility coordinator couldn't be reached over the weekend and OP didn't have the rights to sign an urgent impact - to be followed up.

PS - East Area ():
YETS.

AD - ELENA (Laurette Ponce):

AD:

- AD target zone: DSO tests performed successfully on Friday, all EIS unlock-out, HW tests of the power supply and horn starting on Monday
- Waiting for result of the bake-out of last sector
- Closure of the ring delayed by 1 week, shortening the C10 cavities and e-cooler tests,
- DSO tests performed partially on Friday to move to BEAM ON mode on 21/03 to allow FTA studies, C10 cavities and power supply will be tested on 21/03

ELENA:

- Beam commissioning progressing well with Hminus source. Acceleration/deceleration cycle operational with extraction to LNE50
- All systems back operational, fine tuning on-going for LLRF and e-cooler
- Problem with cathode e-cooler power supply tripping under investigation by BI, nominal e-beam.
- No extraction to LNE00 due to vacuum not OK (leaking vacuum valve between LNE00 and LNE07 which is at PA)
- Big spark in the ion source on Friday, some electronics damaged, back operational on Friday evening.

SPS (Verena Kain):

Very successful first week with beam in the SPS. The fixed target proton cycle, LHC PILOT, LHC25NS to 450 GeV, AWAKE, the scrubbing and the HiRadMat2 cycle were all set up with low intensity beam and without extractions (in the case of LHC single bunches, fixed target 2 us MTE beam at $5e+11$ ppp). Kick response measurements were carried out to check the BPMs before BBA and BBA was successfully executed by moving 6 quadrupoles in V and 5 in H resulting in an RMS orbit at flattop for SFTPRO of 1.8 mm in H and 1.7 mm in V, for LHC of 2.6 mm in H and 1.3 mm in V. The orbit distortion in 213 in the vertical plane on the SFTPRO cycle could be improved and will hopefully lead to reduced losses in this region. Energy matching was done for LHC and FT beams to allow for capture. While the results are good in both cases, the procedure for the FT beam is not straight forward and does not easily allow to obtain good 200 MHz structure. We will therefore come back to energy matching with FT beams next week.

The aperture was also measured and revealed an aperture bottleneck in 511 (probably in the half cell 510) in the vertical plane. The aperture at the QDs in the horizontal plane has not improved with the removal of the synchrotron light masks at 3 BPCN locations. The aperture bottleneck at 511 will be investigated/repared on Monday.

The cavities 3 and 6 are tripping very often. The experts are working on a solution that will be deployed during the aperture bottleneck stop on Monday.

The pilot cycle is now also using 800 MHz, which stabilises the INDIV beam at flattop. The team also set up the 800 MHz cavities for the SFTPRO beam right after transition. Next step for SFTPRO is to commission the blow up to generate tailor-made emittances for slow extraction.

The extraction kicker in LSS6 could be pulsed successfully (prepulse, interlocks, BETS), but not in LSS4. ABT needs time to work on it next week.

During a false fire alarm in BA6 last Thursday, the fire doors in 5,6,1 and TT60 closed. All have been reopened, except the ones in TT60. Needs to be done next week.

All patrols except for COMPASS are done for the NA DSO tests.

SPS North Area ():

YETS.

AWAKE (Edda Gschwendtner):

Beginning of beamline interventions to make room for HF BPM and ICT

Opened beampipe in 2 places near quadrupole magnets (MQAWD.412347 and MQNBR.412433), brought beampipe and magnets to the surface for vacuum chamber modification and recertification of magnets.

Next week: Finish beamline interventions and close beamline. Several other accesses: cathode exchange, BCT cabling, Puisard, Shielding of TSG4 tunnels for radiation protection, crane maintenance.

[LINAC 3 \(\):](#)

YETS.

[LEIR \(\):](#)

YETS .

[CLEAR \(\):](#)

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[LHC \(Jörg Wenninger & LHC Coordination webpage\):](#)

S12	S23	S34	S45	S56	S67	S78	S81
Completed	Training	Completed	Completed	Completed	Completed	Completed	Completed
77 / 11950 A	6 / 11176 A	71 / 11950 A	87 / 11950 A	76 / 11600 A	62 / 11600 A	21 / 11600 A	55 / 11600

Vacuum interlock tests completed with the exception of IP2 X beam (ALICE manual valve closed), point 6 due to the dump lines (at atmospheric pressure) and IP8 X beam due to VELO.

Powering tests are completed in 7 sectors, isolated HW issues being addressed. Some additional tests requested by MP3 in progress. Training of S23 started on Thursday, based on the first few quenches training is not faster than during the first campaign in 2021.