

Accelerator Complex Status

End week 6 (Monday 15 February 2021)

Technical Infrastructure (C. Pruneaux):

Quite an eventful week.

Statistics:

- Slightly more than 4000 alarms.
- 836 phone calls (560 incoming, 276 outgoing).
- 135 ODM created.

Events worth mentioning:

- Tue 09.02: Alarms and stop of pumps of the cooling station FSEM-02627 + alarms cryo LHC6 tunnel. CV piquet on-site and had to reset the pneumatex expansion vessel. CRYO installations reset (vacuum pumps had tripped due to low pressure).
- Wed. 10.02: EUI091*6 emergency stop by accident during EN-EL ongoing work in the area. No impact for any of the machines.
- Wed. 10.02: At 15:02 Lots of various technical alarms for North Area, including AU-68-X emergency stop alarm. GIF experiment stopped, Neutrino CRYO platform lost all communication with installations, CCC phones cut, except the TI secondary line. Piquet on-site and traced the problem back to a team working for the access system that had accidentally removed the cables from the emergency stop button.
- Fri. 12.02: 10:30 No access to TI logbook, and alarms console. IT contacted, the problem is CERN wide, a configuration was removed accidentally by IT.
- Fri. 12.02: Call received from EN-ACE-COS to report oil mist and smell in air related to vacuum pumps sector 4-5, 4L5-6L5. After various investigations it was clear that the oil smell is normal (related to vacuum pumps) however dust was coming in from the HiLumi worksite. HiLumi contacted to improve the seal between the worksite and the tunnel and if possible increase the ventilation. See event.
- Sun. 14.02: TI detected correlation between a puisard high level alarm that was received and the trend of the filling valve. The trend was suggesting that more filling than usual was being done. DALKIA was contacted and they went down, they found a leaking air purger between BA5 and BA4, intervention will be planned during HO. Trend suggests that it started on Saturday around 5:00 am. SPS operations informed.

Details: <https://wikis.cern.ch/display/TIOP/2021/02/15/TI+week+summary%2C+Week+6>

LINAC 4 (Luca Timeo):

Availability: ~90.7%

Monday:

- One issue concerning the chopper was understood (missing SoftInit) and solved by deploying a new SW version (B. Bielawski).

Tuesday

- There was a scheduled beam interruption (~6 hours) concerning mainly the following equipment:
 - CCDTL04: replaced the klystron's vacuum chassis (SY-RF)
 - PIMS0506: installed an independent chiller for the two circulators (SY-RF)
 - Klystrons: updated the filament setpoint (SY-RF)
 - PIMS0102, PIMS0506 and PIMS0708: verified consistency of modulator HV measurements (SY-EPC), no offsets detected

- Chopper: installed measurement pick-ups on pulser outputs (SY-RF)

Wednesday

- POPS-B prevented injection into the booster for a couple of hours. SY-EPC sorted out the issue.
- Prepared the tests for the stray field compensation.

Thursday

- BE-OP (P. Skowronski, T. Bukovics) and SY-EPC (R. Murillo) successfully validated the stray field compensation. They found a solution to the problem of synchronisation in communication. They also agreed on a sounder approach that considers potential latencies (real-time). Yet, this requires some time for the implementation.
- Overnight, during a routine measurement, the BSM2 wire remained stuck into the vacuum chamber inducing losses. The operator could not remove it via the application. After having called me, he contacted F. Roncarolo for remote support. Federico could not solve the issue, as well. He suggested organising the access on Friday morning to allow the specialists intervening in the tunnel.

Friday

- In the morning, SY-BI (J. Tan, M. Hamani, M. Durauffourg) team access the tunnel. They found and solved a mechanical problem affecting a gearbox.
- Since there was no beam, SY-RF (G. Piccinini), with the remote support of BE-ABP (J.B. Lallement), stopped the source to replace the grid-1 power supply in the RF amplifier with a more reliable unit.
- In the afternoon, the stray field compensation studies continued as well as the booster commissioning.

Weekend

- The chopper tripped several times. Yet, the downtime is typically very short.

General

- Along the week, the temperature of the klystrons water circuit was stable when pulsing. One could see oscillations only without thermal load (RF power OFF during interventions). Yet, this is normal behaviour. Discussions are still ongoing to find a sound solution to prevent drifts.
- The chopper still trips due to another problem that SY-RF is investigating (not related to the SoftInit).

PS Booster (Gian Piero Di Giovanni):

Access:

- Following the **vacuum leak last Monday afternoon at R2V wire scanner**, an access was organised Tuesday morning to replace the wire scanner with its spare. During this intervention unfortunately the wire broke, so a blind flange was installed. The 2 wire scanners will be repaired, calibrated and should be ready by end of February. The access also allowed to check and **correct the problems present for the pre-LS2 wire scanners - since then they are providing good profile measurements.**
- During this access the **BSW stacks were measured by survey; important roll angles >5 mrad (ring 2)** were noted - will be discussed in the MPC meeting on Wednesday.
- Vacuum conditions were OK to restart Tuesday evening.

Perturbed injection trajectories were traced back to the commissioning of the LBS line for ion measurements and more precisely to magnetic leakage of the spectrometer magnet LBS.BVT10 (DC magnet). A meeting is organised for Wednesday to discuss potential mitigations.

Optics measurements:

- Resonance compensation ongoing in all 4 rings and different tunes
 - At the low intensities present, decided to deploy a constant tune along the cycle
- Beta beating measurements at the beginning of the ramp

- Orbit measurements performed for working point 4.4/4.45; kick response measurements confirm good data also for R1
 - As for pre-LS2, R1 exhibits the largest rms orbit in H; ABP is checking if a tilt alignment could homogenise the 4 rings
 - Orbit corrections performed
- Emittance measurements for different length of KSW plateau confirms that foil scattering can be used to blow up the emittance

Injection studies:

- Several measurements taken to better understand the interplay between KSWs and BSWs on the injection oscillations and orbit excursions —> data to be analysed

RF commissioning:

- Phase alignment for all cavities in all rings
- Longitudinal shaving
- Improved B-train calibration and energy matching
 - For MPS14 the LSA calibration curves will be updated
- Stabilisation of known instability around 450 MeV kin. energy with new damper

Extraction Line:

- Improved model containing the edge effect tested and uploaded to all cycles.
- The script to scan kicker waveforms has been successfully tested.

Stray Field Compensation:

- Commissioning of PS main magnet Stray Field Compensation of PSB injection line using SIS commissioned during 2nd half of the week
- Tested with different POPS B-fields
- Had to delay the time when the FGCs in the LTB line could receive the new CCV (otherwise action 1 cycle too late); use now BX.WCY350-CT
 - Should still be optimised to use the real-time reference channel; SIS needs to be adapted
- Added LTB.DHZ20 to LTB.DHZ30 and LTB.DHZ40. To be seen if one more corrector would give even better results.
- Piotr and Tibor have successfully tested the SFC on Friday and parametrised it for 100 keV and 280 keV energy spread such that the BI line fluctuations are minimised (some excursions remain in LTB)

Q-strips: the 2 broken power converters were repaired; spares are therefore again available.

POPS-B: implementation of an improved voltage regulator for the MPS control; will be tested in the coming days

Started setting up LHCINDIV and TOF for PS commissioning

On TOF an intensity of $\sim 300 \times 10^{10}$ was reached last week, but on R3 for the moment and with a lot still to improve in the longitudinal (and also transverse) characteristics.

ISOLDE (Alberto Rodriguez):

- Water back at the facility last Monday.
- Unlocking of almost all power converters later that same day. HRS front-end and cooler/buncher left for later since work on those sectors is still on-going.
- Powering tests of all available power converters completed (work on the RA0 and RBx lines still on-going).
- Beam recommissioning of the GPS separator, CA0, LA0 and LA1 completed.
- Newly-installed (very special) long scanners after the GPS separator commissioned with beam. A small issue with the direction of movement was found and it is being addressed by BI.

PS (Oliver Hans):

In total good progress was made, no show stoppers for beam on 1st of March. Only (as known) the wire scanners are late.

- Work in progress for the moving vacuum chamber on magnet F16.BHZ377/378. After first test, more vacuum chamber fixations have been installed inside magnet. Next pulsing tests is foreseen for Tuesday.
- RF team identified an issue with the 10 MHz amplifier. All amplifier have to be revised. In total 2 working days which could be arranged to minimise the impact for the cold checkout. Issue will be presented at the FOM.
- Good progress of Dry Runs:
- Cavities controlled by CCC. Matrix and make rule have been tested
- Synchronisation of injection bump
- KFA reliability run for Injection SEMGrid MDs
- PFW test for MTE working point stability
- Septa position controll
- Setting management: Generated TT2 quads values from TT2 MTE optic
- Test for BI equipment has been started, like: BLM, BSM, WCM

AD (Laurette Ponce):

The leak on the stochastic cooling kicker (which was fix with resin 20 years ago) did re-appeared after the bake-out of the sector. We have a meeting with RF and vacuum on Wed to see what can be done.

Also to be noted that we have planned partial DSO test of AD ring on Friday 19/02 to allow testing of the C10 cavity.

ELENA (Davide Gamba):

The week had the following main objective/results:

- Advance on transfer line commissioning by ABT:
 - further measurements taken in LNE00 and following lines for characterisation of wire beam profile monitors.
 - measurements in LNE50 looking at GBAR beam profile monitor (MCP) to try characterise beam coupling.
 - ast doublet of LNE07 (BASE) seems to be connected inverted cabling investigation planned for Tuesday 16/02/21.
- Setup of decelerating cycle with H-:
 - Now almost possible to fully mimic a short pbar deceleration cycle (without cooling)
 - Studies maybe limited by H- lifetime, but very important for optics verification, non-linearities, hysteresis effects.
- Advancements in e-cooling-related studies:
 - Demonstrated the feasibility of measuring and matching ions/e- orbit in e-cooler using standard BPM acquisition chain.
 - Demonstrated the feasibility of combining several BPMs in the ring to obtain a cleaner Schottky signal for cooling studies.
 - Demonstrated the feasibility of cooling an H- beam at 100 keV! Excellent result as this might pave the way for detailed e-cooling studies in ELENA without the need of pbars.
- Advancements in the installation of PUMA line as scheduled.

Additionally:

- Debug/improvement advanced features of the BPM FESA class (including the Schottky acquisition mentioned above)
- Investigations on not-working profile monitor in LNE06 (ASACUSA): there might be a bad connection inside the vacuum, which makes the monitor not usable. To be followed up.

- Debug/improvements of new beam request server able to properly distribute beams to 4 experiments at the same time. For this, a cycle with actual 4 bunches has been set up.
- Continuous improvements of other OP-tools, in particular for scraper, tune (chromaticity) meter, transfer line profile monitors.

Problems encountered:

- Identified a mis-configuration of timings for GBAR after the modifications done in January. The issue was quickly solved by timing colleagues.
- Tune meter FESA class still behaving in an unexpected way, often slowing down optics-related studies (e.g. setup of decelerating cycle). Expert is further investigating.
- The head amplifier of LNE50 longitudinal pickup was found to mis-behave after the attempt of implementing a different calibration line last week. Experts are investigating.

SPS (James Ridewood):

Summary week 6:

- Evolution of Main power supply transformer issue:
 - SMD12 transformer now replaced.
 - ~80 cast resin transformers to be verified and repaired where required:
 - Faulty earth connection to BT/HT earth screen.
 - Reinforcement of interphase conductor insulation (busbar HV).
 - BA3 to be prioritised to allow continuation of main quadrupole commissioning asap.
- Missing or damaged VSC and BLM cables re-pulled.
- MKDH cable connectors insulation resistance problems resolved.
- MKDH faulty terminating resistor replaced .
- MKDV returned to DC conditioning following spark events.
- Incorrect polarities identified and resolved on sextupole and octupole circuits.
- Water cooling leak solved on QD50310.
- FII FGC_91 ok with bis and multiple injections.
- Inflecteur MKP pulsed with multiple injections ok.

Planning week 7:

- Main dipole transformer verifications and repair all week.
 - Main quads hopefully available by Wednesday.
 - Dipoles hopefully available by Friday evening.
- BEQ1 compensator to be put in service Monday.
 - Testing when dipoles become available week 8.
- MKDV reconnection for pulse conditioning Monday with short pulses.
- BHZ377 & BHZ378 removed from chain to allow vac chamber issue resolution in parallel with SPS ring access.
- SPS Fire safety systems global re-testing Tuesday.
- Aux PS testing and general HWC continue in parallel as planned.
 - Some AUX PS affected by cast resin transformer issue.
- Continuation FII/FEI debugging Kicker MKE4 pulse check. Once RBI back in chain and main dipoles pulsing .
- SBDS control and software commissioning continues.
- Continued BLM testing.

AWAKE (Giovanni Zevi Della Porta):

WEEK SUMMARY: Access week (work on laser and streak line). Progress on streak cameras. Water leak discovered in radiator of RF cooling system: no beam for 1 week.

Access System annual maintenance: no access to TAG41 on Tuesday. Patrol lost (expected) and re-established by Access System team. Maintenance of TAG42 on Thursday. Patrol lost (expected).

TAG41 interventions: DALKIA intervened on Monday to understand a CV alarm which appeared during the weekend. They found a "Moteur grippé" and resolved it.

TAG41 interventions: a leak was found in the electron gun cooling circuit on Monday. CV closed the circuit immediately, and tried to fix this issue on Wednesday. Unfortunately the leak comes from the radiator, so a special team of radiator experts need to come in. They are only available next Thursday (Feb18), so they will come then. No beam next week.

SPS Magnet tests (continued from last week): issue was resolved, and tests were completed on Tuesday.

Upstream streak camera: spatial alignment almost complete. Unfortunately the motorized slit controller broke, the manufacturer has been contacted.

Laser: Re-aligned marker laser to streak room. Re-aligned UV laser. Aligned energy meter (so we are ready for QE measurements). Turned on IR laser in low-power mode and started alignment in the tunnel, with the goal of seeing it on the downstream streak camera.

Downstream streak camera: aligned marker laser all the way to the streak camera. Marker can be seen by streak in both high-power and low-power mode.

AWAKE BLMs: HV still down. Plan to replace power supply (rental from CERN electronics pool)

Next week: no beam because of water leak. Monday-Wednesday: continue downstream streak alignment. Thursday-Friday: fixing water leak.

LINAC 3 (Giulia Bellodi):

The source continued to show better performance stability of the extracted beam current. On top of that, after 4 weeks since the last oven filling, there is still no sign of running out of lead.

During the week there were tests of the HTadjust module of GHOST to validate recent changes (i.e. it now averages the BCT15 current over a certain shot number and not a time window for every HT voltage setting). The tests were successful.

A substantial part of the week was dedicated to the LBS measurement line re-commissioning. During the studies, an interference was discovered on Linac4 operation, with the Linac4 injected beam trajectories being significantly affected by the LBS.BVT10 bending magnet being turned on. After discussion with the equipment groups it turned out that some magnetic screening material that was present in the past around the magnet was not re-installed after LS2. The issue will be followed-up this week to find a mitigation strategy.

Initial tests took place of the ITH quad scan application for emittance measurements, which is being developed by OP.

Finally first measurements were carried out on the new stripper mechanism on the 4 already installed ACF foils.

A limitation was discovered in the stripper arm movement range. This will be checked on Wednesday in parallel to the installation of additional GSI-type stripper foils.

LHC (Jörg Wenninger):

Second week of powering in S78. Phase 1 powering completed in S78. Phase 2 powering permit signed for sectors S67 & S78 on Wed 10/02. First phase 2 tests completed on RB, RQ, IPQ, IPD and IT circuits. More than 90% of tests completed on S78.

Start of cool down of S81. Cool down of S67 paused at 200K to investigate an intermittent earth fault on RQF.A67.