Accelerator Complex Status

End week 3 (Monday 25 January 2021)

Technical Infrastructure (C. Pruneaux):

- A week with increasing number of activities at CERN.
- Statistics:
  - Close to 6500 alarms
  - 948 phone calls 601 incoming, 347 outgoing)
    130 ODM created
- Events worth mentioning:
  - Mon. 18.01: SPS evacuation following access system manipulation, quickly reset.
  - Tue. 19.01: Evacuation of SPS4, 5 & 6 due to a start of ventilation in ECA5 which was full of dust and triggered the fire detection system. The person that did the manipulation immediately informed the Fire Brigade.
  - Wed. 20.01: Trip of demineralised water-cooling pumps in BA3, the pumps tripped on flow alarm, even though the flow is stable.
  - Thu. 21.01: Fire alarms in BA5-BA6 of the SPS. Intervention coordinated with SPS and Fire Brigade. Minor issues with ventilations that needed to be stopped manually and some doors not closing correctly due to insufficient pressure in the tunnel. Insulation of an MBB magnet coil caused the smoke.
  - Thu 21.01: Temperature oscillation of LINAC4 Klystron water cooling circuit. The trend of the supplied water temperature suggests that there are temperature oscillations in the circuit. It can be seen that one thermal cycle started at ~12:20, lasted for 2h45min and reached a T°min/T°max of 18.7°C and 27°C respectively. After this point, the temperature continues to oscillate but with a smaller amplitude until it sets to its setpoint. CV responsible investigated and changed the sprinkler's pump timing of the running order in relation to the working percentage of the cooling tower's fan.
  - Fri. 22.01: More than 7 electrical perturbations in the evening! Tripped POPS-B which was left off since not needed for the moment.
- Details: https://wikis.cern.ch/display/TIOP/2021/01/25/TI+week+summary,+Week+3

LINAC 4 (Alessandra Lombardi):

After the start-up week a good week for linac4.

Measurements / studies done:

- Study of the apparently lower transmission through the RFQ : measurement during an access with a long beam showed that the transmission is nominal (76%). When the beam is very short the transmission goes down because the data is taken on the edge of the pulse that is not yet stabilized. This investigation is concluded.
- ToF for energy matching: measurements taken during the week to monitor if any drift in energy is coming from the linac.
- Profiles in the MEBT to study and optimize chopping of the head of the pulse. Good measurements but not processed yet.
- MD on source stability to investigate the effect of the 2MHz power amplifier on the beam stability and interaction with autopilot and gas drifts.

Retunings needed

- Increasing the source gas to improve source stability (several small adjustments)
- PIMS 11-12 for energy matching

Issues

- LEBT SIS generating an interlock. A data disruption in the NXCALS-FGC-UCAP-SIS data chain caused the interlock, and is partially understood. Experts are meeting to find a remedy. This interlock came from the einzel lens, the einzel lens power supply was actually on but the voltage value was not transmitter correctly to the LEBT SIS. All details in athttps://issues.cern.ch/browse/APS-8646
- Klystron temperature being watched. It had an influence on klystron stability.

PS Booster (Gian Piero Di Giovanni):

A more difficult week than the previous ones, characterized by a few accesses and identification of issues which need follow-up. Nevertheless, a week of important milestones:

- First of all, the RF team managed to solve the problem with the phase loop which was pending since last year and for the **first time accelerated protons at 2 GeV in ring3 on Monday evening.**
    - Most of the week was invested in cleaning up the setting for the other rings still on the 160 MeV flat-bottom, and then start a more systematic work on the acceleration.
    - Please note that, as the extraction line to the dump is not yet commissioned, RF and OP devised a cycle with a ramp and a deceleration to 160 MeV at extraction, to allow the RF commissioning on the acceleration.
- **On Tuesday a 3-hours long access was needed to correct the polarity of the 2 out of the 4 KSWs for the painting at injection**, which was observed during the first phase of commissioning. Afterwards, the goodness of the correction was confirmed with the **reduced oscillation at injection**. During the week ABT and ABP reviewed and cleaned-up the setting of the new PSB injection.
- **On Wednesday an un-planned access was needed to replace an electo-valve of the BI.SMV10 and remove a broken flow-meter in the BT.QNO20**. In the shadow of these activities, a new release of POPS-B FGC software was performed to correct a bug which in a couple of occasions had delayed the POPS-B restart.
- During the commissioning, **large oscillations (several amperes) on the main quadrupole currents** have been observed at the beginning of the ramp. Dedicated time was allocated to EPC experts on Thursday morning, as anyway **another access was needed to replace the broken flow-meter of the BT.QNO20 and allow a few Linac4 investigations** on the 2 MHz RF noise observed recently and to re-commission the BIC RF input. Unfortunately, **the EPC experts did not find a solution yet for these oscillations**. In agreement with OP, we have reserved a dedicated user for their studies in parallel with the commissioning activities with beam.
- On Friday, an **incorrect OP manipulation of the setting resulted in the loss of the BEBEAM/MOMENTUM and BIBEAM/MOMENTUM**. The immediate consequence was the impossibility to control the power converters in the transfer lines. It took a few hours of combined work from the CO and OP to restore the configuration. The activities stopped in the PSB transfer lines for these time. **A big thank to the CO team so prompt in responding and supporting OP!**
- Despite the issues (anyway typical of a beam commissioning period), the work is progressing on many fronts. A few highlights:
    - Extraction at 160 MeV. After fixing a few issues with the KFA14L1 which was intermittently triggering along the cycle, the beam was finally extracted at 160 MeV and thread through the first part of the recombination line. It did not yet reach the dump. Major losses (>50% of the beam) have been observed at the first septum, which is a known aperture bottleneck. On Monday, ABT will decide if continuing the setting-up at 160 MeV (large beam) or moving to the 2 GeV beam.

- The commissioning of the pre-LS2 and LIU WS is ongoing. The first measurements with the old WS at 160 MeV showed profiles with sigma ranging from 5-10 mm. A possible issue with the inversion of signals in the pre-LS2 WS was observed in a few rings. Several measurements consistently showed a negative profile. BI is looking into the issue and may request an access for further investigations.
- Continuous work on optics measurements to refine the tune control.
- The commissioning of the TFB has started in ring 1 on Friday and will continue in the other rings this week.
- RF is monitoring closely the energy matching at PSB injection.

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PS (Oliver Hans):

- Last week Main Unit High Voltage test failed. Problem was identified on a faulty bus bar, connecting MU 89 with 90. Bus bar was replaced and tested, all ok.
- RF bypass measurement completed. No issues were identified.
- 80 MHz cavity fast tuner was dismantled
- Many more PSR accesses were done to make the machine ready for the coming POPS "degraded mode" test.
- This week magnet commissioning for TT2 and FTN line.
- EPC will continue the fine tuning of power converters which could not be finished before Xmas, like PFWs, ejection bumps.

SPS:

To come….

ISOLDE:

No report, as water cooling will be switched back on 8 February after which re-commissioning will start.

ELENA:

This week was the first week with circulating beam after the Christmas break.

- We have restarted the ring operation on Monday, spending the whole day to re-set/readjust timings after the new FESA class deployment of the timings system on 14-15th of January. The new release concerns mainly the management of the extraction timings to cope with the experiments requests.
- Extraction towards LNE00 and LNE50 restarted on Tuesday and optics studies going on in LNE04 and LNE07 by ABT colleagues
- spend time on 2 cycles adjustement: converting the cycle to LNE00 to h=4 and programming a cycle late injection for Gbar to adjust the pre-warning timings.

LINAC 3 (D. Küchler):

Week 3 was dominated by the startup of the ion source after the installation of the new plasma chamber last week.

On Monday the filament of the oven had to be replaced after the old one showed some strange behaviour. With the new filament the oven could be ramped as expected.
Tuesday the conditioning of the plasma chamber with microwave started.
A first charge state scan on Wednesday showed some nitrogen and carbon (which is normal for an unused plasma chamber), but fortunately no aluminium.

After progressive increase of the oven power and source tuning Thursday afternoon the first lead beam could be seen out of the source.
On Friday I reached up to 90 eμA out of the RFQ (but very unstable).
The aim is now to further increase the intensity and the stability.

The only very annoying issue I got this week was with the new logbook. Regularly issues from Linac4 showed up between the Linac3 entries.
Additional remark: The remote use of the new logbook over a SSH connection is not very convenient. Due to all the fancy optical features it is very slow.

LHC (J. Wenninger):

First phase 1 powering tests in S45 on 60A, 120A, 600A, IPQ and IPDs. Good progress, many software issues to be fixed (many FGC version 92 releases). Close to 45% of tests completed, but mainly low current circuits and tests (PIC tests).
The tests were interrupted more than 24 hours due to cryo compressor problems in point 4 (Thu-Fri).
The survey group announced a 8mm (!) vertical offset on a connection cryostat LHC.LEJL.5L6. The issue will be investigated in W4.
ELQA at cold completed in S78. Unfortunately spool octupole circuit **RCO.A78.B2 had to be condemned** due to a fault to ground.