

Facilities Operation Meeting – Minutes

29/11/2022 (#44), via Zoom

Chair: Alberto Rodriguez

List of participants: Aguiar Y., Albert M., Albright S., Alemany Fernandez R., Antoine A., Asvesta F., Bacak M., Baltasar Dos Santos Pedrosa F., Barbet V., Bartosik H., Bidault N., Bracco C., Chapuis D., Chapuis F., Cotte D. G., Dalla-Costa J., Damerau H., Deghaye S., Delrieux M., Di Capua V., Di Giovanni G. P., Fadakis E., Findlay A., Fleury S., Giles T., Haase M., Holzer B., Huschauer A., Jaekel M., Johnston K., Lang T., Lasheen A., Li K. S. B., Lozano Benito M. L., Madysa N., Mahner E., Mataguez S., Nielsen J., Nisbet D., Papotti G., Pasquino C., Pereira L., Petrika G., Pittet S., Rae B., Rodriguez J. A., Rossi C., Rumolo G., Saint Sulpice B., Salvant B., Schenk M., Scrivens R., Skowronski P. K., Steerenberg R., Verra L., Vincke H., Woolley B., Zamantzas C.

Indico: <https://indico.cern.ch/event/1200187>

Agenda

1. Approval of the minutes of the previous meeting & Action follow-up (*A. Rodriguez*)
2. Reports from Accelerators & Facilities (*Coordinators*)
3. MD requests and dedicated MDs (*A. Huschauer, B. Salvant*)
4. Short-term injectors schedule outlook (*A. Rodriguez*)
5. AOB

1. Approval of minutes of the previous meeting and action follow-up

Minutes from last week:

- Approved without further comment.

2. Reports from Accelerators & Facilities

a) **TI** (*J. Nielsen*):

- **Wed**, fire alarm in the SPS, on the central SFDIN00513 sextant3+. Nothing to see on site, no real alarms. After a little while, the alarm could be reset.
- **Fri**, several ventilations stopped for no obvious reason in East Area, CHARM, IRRAD + and others. Only reason found was a signal from the "Fire fighter" that was active for 45 seconds only.
- **Sun**, water leak in BA6, caused the cooling station to stop. The magnet was isolated, and the cooling station could be started again.
- **Energy consumption**, [link](#) to see all the energy consumption per machine and [link](#) to access the live 400 kV consumption. For the moment, we consume more electricity than we wished baseline. Recommendation to stop all unnecessary systems, to meet the requirements for the contract signed with EDF.

Questions and comments:

- *Rodriguez*: Can you give the details of the current energy consumption and the gap with respect to the objectives? *J. Nielsen*: Yesterday at 9 am, we were at about 105 MW and were supposed

to be at 100 MW. Today we are at about 95 MW for a goal of 88 MW, and tomorrow we are supposed to be at 70 MW. *A. Rodriguez*: The situation will certainly improve when the last tests end this week. *M. Albert* (on the chat): There are still equipment tests in the injectors this week. *J. Nielsen*: It would be of good help if each section could verify that everything unnecessary is shut off.

- *Rodriguez*: Regarding the automatic shutdown of the cooling plant in the case of an excessive water leak, is it immediate or are there warnings that give time to react? *J. Nielsen*: There are several levels depending on the water leak flow. During the incident on Sun, it was 500 L/h so there was a small time to confirm the shutdown, about 30 seconds. This is to avoid filling the tunnel with water.
- *C. Zamantzas*: The water cooling is switched off in many places in LHC, do you think it should be stopped everywhere else in LHC? Meaning that we will stop all the systems in those places and we will not be able to continue the tests or upgrades. *J. Nielsen*: Everything not needed should be turned off. *C. Zamantzas*: In two points out of the eight, the water circuit is switched off. Should we ask to have all of them switched off? We are now in a mixed situation. *R. Steerenberg*: For the LHC, the best option is to contact Marzia first to see what the plans are.

b) **LINAC4** (*P. Skowronski*):

- **AFT**: 99.9 %
- **Downtime**: Only two faults: on the Chopper (8 minutes) and on the CCDTL05 modulator (6 minutes).

c) **PSB** (*G. P. Di Giovanni*):

- **AFT**: 99.6 %
- **Downtime**: Mis-steering in one of the MD users triggering HOH- interlocks. Trip of a power converter BI1.QFO50, affecting only R1 (degraded mode).
- **Activities**: All beams are operational. Supported the multiple parallel MDs as well as LHC floating MDs (2023 optics validation, and in particular, BSRT). Profited from the last few days of proton run to perform a stress test on the LIU WS in R1H. See the results in Slide 4 for almost 14e3 scans. Acknowledgements to the BI team for the stability of this device.
- **YETS22/23**: TE-MSX experts removed the BR.QDE5 covers and found the water leak running down the electrical connection.

Questions and comments:

- *Rodriguez*: Concerning the transverse beam profile scans in R1H, does the wire scanner have bellows or is it magnetically coupled? What is the expected lifetime of such a system? *G. P. Di Giovanni*: We are exploring this question of the lifetime; that is why we ran a stress test. Generally, we do about a thousand scans per year, and we tested it with fourteen thousand in three days. *C. Zamantzas*: Federico, the expert, is not here today to answer the technical questions. All the wire scanners were tested for thirty thousand scans in the lab. The motor is outside the vacuum.

d) **ISOLDE** (*M. Lozano*):

- **AFT (REX/HIE)**: 82.6 %
- **AFT (HRS)**: 99.5 %
- **Activities on REX/HIE**: $^{182}\text{Hg}^{45+}$ at 4 MeV/u delivered to Miniball from GPS with a liquid lead target. Slow extraction setup and optimization of beam injection into Miniball. $^{22}\text{Ne}^{6+}$ at 4.0 MeV/u delivered on Tue evening and night for calibration. Target change on GPS on Monday afternoon.

- **Issues during REX/HIE runs:** 7GAP3 low-level RF failure on Thu soon after starting sending radioactive beam to users. 7GAP3 problem solved on Fri afternoon and beam for users until Mon at 6 am (end of protons). IHS accelerating cavity trip, restarted by users.
- **Activities on HRS:** Target irradiated for the winter physics (AcF to CRIS). MEDICIS target irradiated in parallel. Target retrieved for implantations. Separators and RFQ setup to CRIS.

e) **ISOLDE Users** (*K. Johnston*):

- **Last week:** A good week at ISOLDE for the users. The final HIE-ISOLDE experiment of the year was taking ^{182}Hg beams at 4 MeV/u to Miniball for gamma-ray and conversion electron spectroscopy. After the repair of the 7GAP3 the run was mostly smooth until the protons were turned off yesterday morning. The experiment was very successful, and the main goals were achieved: this is the first time that conversion electrons have been measured with a radioactive beam without the use of transport magnets, and is a major milestone for the Miniball collaboration, which opens up new perspectives for Coulomb excitation measurements. The users also want to express their gratitude to the technical teams and to Cristiano Gagliardi in particular, whose efforts on Thursday and Friday saved the run, and as the experiment has been pending for many years, it would have been disappointing to lose it at this stage.
- **Upcoming week:** This week it will be the final week of physics at ISOLDE, with the so-called "winter physics" run measuring long lived radioactive molecules using laser spectroscopy at the CRIS experiment.

f) **PS** (*A. Lasheen*):

- **AFT:** 93.8 %
- **Downtime:** Fault of the PS corrector at ejection (protons only). Fault of F16.BHZ167. Setting fault on an MD cycle triggering RF trips. Major fault with TT2 stripper foil overnight on Sat-Sun that will be inspected during the YETS (see Slide 4 for the investigations on the issue).
- **Activities:** Single bunches sent to SFTION, mitigation of longitudinal instability at transition by increasing the longitudinal emittance. Spill at variable energies sent for the CHIMERA run (EAST), three cycles prepared at 0.65, 0.75 and 1 GeV/u. Optimization of TOF bunch for short bunch extraction: 28 ns bunch length at extraction and bunch rotation adjusted for a sharper rising edge of the bunch. See the status of the operational beams in Slide 5.

Questions and comments:

- *A. Rodriguez:* Concerning the reduced bunch length for TOF, is it to reduce the uncertainty on the time-of-flight of the neutrons afterwards? *M. Bacak:* It is exactly the reason. *A. Rodriguez:* Will it be the default bunch length that you would wish for from now on? So, not going back to the 40 ns length. *M. Bacak:* Preferably, yes, it also depends on the experiments. We discussed with the PS the possibility of having reduced bunch intensity but a shorter bunch. To be investigated early next year. We have experiments, especially the ones measuring the 100 MeV neutron energy region, every nano-second in the bunch length significantly widens the resolution function. We will conduct two experiments next year that would recommend using this short bunch length. *A. Rodriguez:* Does the energy spread increase following the bunch length reduction? *A. Lasheen:* Yes, it does, it is one of the drawbacks. Also, the bunch distribution is skewed. We can adjust the bunch rotation at extraction to shorten the bunch to have the rising front sharper, but the bunch will be asymmetric, the momentum spread will be larger, and the momentum distribution will be skewed. So, in such a case, we need to verify the losses in the transfer lines and that the profile on target is still with satisfactory symmetry in the horizontal plane. *A. Rodriguez:* Is the increase in energy spread an issue for neutron production? *M. Bacak:* We can simulate

the effect of the energy spread, and it is still a better compromise to have a larger energy spread with a reduced bunch length.

g) [East Area](#) (*B. Rae*):

- **AFT:** 97.2 %
- Nothing specific to report.

h) **EAST Area Users** (*B. Holzer*):

- Acknowledgement to everyone involved in the run. The feedback from the users is that the beam in the EAST Area had a significant improvement in purity and quality.

i) **n_TOF** (*M. Bacak*):

- Acknowledgements to OP: the users received exactly what they wished. The beam delivery was excellent.

j) **AD - ELENA** (no speaker):

- Nothing specific to report.

k) [SPS](#) (*G. Papotti*):

- **AFT:** 87.5 %
- **Downtime:** Beam stopped 20 minutes earlier than planned (for access) due to a false alarm. Water leak at RFQIF.6104, which affected the transfer to the LHC.
- **Activities:** Production of SFTION throughout the week. Beams for AWAKE with 1, 2, 3e11 ppb as requested, with different optics. Beams for LHC physics and MDs (BCMS and BSRT calibration). Also, test of dedicated LHC filling in 34 minutes on Sat. Supported the multiple long and short parallel MDs, in particular, to investigate the pressure spikes with MKDH and 8b4e. Acknowledgement to the physics coordinator and physics community for showing flexibility.

Questions and comments:

- *A. Rodriguez:* Can you elaborate on the pressure spikes produced by the different pieces of equipment and the technique used to investigate the problem? *G. Papotti:* We use sonometry to try to determine which from which equipment the vacuum problem arises. We could identify one of the 100 MHz cavities and pickups in the same vacuum sector. We are trying to observe potential electrical shorting, but the results do not show what we were hoping for. To be further investigated. We are trying to rethink whether the measurement system could be improved. We have a dedicated SPS-MPC this afternoon to discuss this subject and plan additional measurements next week with endoscopy.

l) [North Area](#) (*B. Rae*):

- **AFT:** 87.7 %
- Nothing specific to report.

m) **North Area Users** (*B. Holzer*):

- The physics experiments and the test beams were very successful. Acknowledgement to all the technical teams involved and for COMPASS in particular.

n) [AWAKE](#) (*L. Verra* on behalf of *G. Zevi Della Porta*) :

- **Week 45 report:** On Mon, electron-seeded hosing with 1, 2, 3e11 ppb beam. On Tue, proton/laser timing scans at 1/2/3E11p intensity for plasma light studies. On Wed, access for small

interventions. On Thu, proton/laser timing scans at increased plasma density (from 1 to $2e14 \text{ cm}^{-3}$) and electron/laser timing scans after the protons stopped. On Fri, increased plasma density to $4e14 \text{ cm}^{-3}$, and performed proton/laser timing scans and electron-seeded self-modulation studies. Also studied self-modulation with wide-bunch proton optics. On Sat, proton/laser timing scans with nominal optics and wide-bunch optics at increased density ($7e14 \text{ cm}^{-3}$, nominal). On Sun, Wide-bunch optics at $7e14 \text{ cm}^{-3}$ density in the morning and proton/laser timing at $4e14 \text{ cm}^{-3}$ in the afternoon.

- **Upcoming week:** Interventions for magnets and RP on Mon and Tue. Electron beam steering algorithm tests on Wed-Fri.

o) **HiRadMat** (no speaker):

- Nothing specific to report.

p) **LINAC3** (*R. Scrivens*):

- **Downtime:** Two source trips (interlock PLC in Failsafe mode and HV trip) and one RF Cavity 1 trip during the week (each about 1-hour downtime).
- **Activities:** The source stability was not so good, and it required a lot of tuning. On Fri and Sat, it was not possible to keep the LINAC's intensity target (average of 29uA achieved). On Sun morning, the conditioning had improved, and it was possible to get above the 30uA and quite stable. See the plot of the source intensity and intensity out of the LINAC over the week in Slide 3. Stripper foil change on Tue.
- **Upcoming week:** RF reference measurements. Stripper foil 29+ test. Extraction gap change, return and ITL emittance. On Wed, extraction gap final tune, magnet tests and FGC update.

Questions and comments:

- *A. Rodriguez:* Is the source stability issue affecting the program of this week? *R. Scrivens:* No, on Sun we got back to a stable condition. The last 24 hours were with a good performance.

q) **LEIR** (*N. Madysa*):

- **Activities:** Beam delivered to the PS for lifetime studies and to the SPS for the North Area. Reference measurements on NOMINAL and EARLY for 2023 run (see Slide 4). On Fri, IPM measurements to check emittance preservation along chain. Two parallel MDs: turn-by-turn optics measurements and data taking for Schottky computer vision project
- **Issues:** On Wed, left synchronization with PS was disabled after dedicated MD during PS downtime. On Thu, ZERO cycles were accidentally put into LEIR (degraded performance) and ER.QFN1030 went into a fault (reset by Piquet). On Sat, unstable LN3 source during the night shift. Still ongoing issue: adding a validation rule to the Timing app to prevent ZERO cycles put in by accident in LEIR
- **Coordinator:** R. Alemany Fernandez

Questions and comments:

- *A. Rodriguez:* Can you elaborate on the MD for the computer vision project? *N. Madysa:* It is about the LEIR autopilot project and the automatic steering of certain parameters of the machine. This was already studied last year, and this year we wanted more data and to compare how consistent the data is with 2021.
- *E. Mahner:* Since the stripping foil was changed on Tue, can you see the effect on the plot you show in Slide 4? *R. Alemany Fernandez:* We do not see the effect on the EARLY but on the NOMINAL beam because there we are accumulating seven injections, where we gain a

lot in accumulated intensity. *E. Mahner*: It would be nice to see the difference in the NOMINAL beam. *N. Madysa* agreed and explained that he wanted to show it, but it was not possible anymore because the machine was shut down, and there was a software issue with retrieving data.

r) **CLEAR** (no speaker):

- Nothing specific to report.

s) **LHC** (*D. Nisbet*):

- **AFT**: 84.1 %
- **Last week**: Many small faults. MD at the end week with higher intensities to try to quench a magnet with the induced beam at Point 7. The magnet did not quench. Some problems recovering all settings from the MD, which are to be understood during the YETS. Affected by the SPS water faults over the weekend on TT60 and BA6. Short time for access on Wed. Issue with the intensity spread during the week, which improved during the weekend (see Slide 3). Problems with the RF and one of the pickups for the phase (degraded mode). BSRT fill on Thu evening: both machine and experimental scans were carried out successfully (see Slide 4). Passing the wire scanner creates a background in CMS. One incident with a UPR intrusion: access and fire brigaded requested (see Slide 5).
- **Highlight**: Passed 40 fb^{-1} .

Questions and comments:

- *A. Rodriguez*: Can you explain further the purpose of the MD in which you tried to quench a magnet? *D. Nisbet*: This was to see where the margins are in terms of beam intensity for the future HL running. We got close to 700 kW of losses in that area and still could not quench it. Overall, it is a very good result.

3. MD requests and dedicated MDs (*B. Salvant*)

[The details of the schedule are available on the slides.](#)

- **Last week**: Short parallel MDs in LEIR, PSB, PS and SPS. Huge number of parallel MD requests this week and last week (in particular in PS). Long parallel MD in SPS: access on Wed morning to install the sonometers and a scope, BCMS beam with lower bunch length to probe MKDH, 8b4e for 1 hour on Fri to reproduce the vacuum spikes and finally access to check the traces on the scope and to see if the BIW could have perturbed the measurements. Still need to identify which equipment created the spikes.
- **Next weeks**: Plan an IPP injector MD day beginning of next year. The worrying situation with the short parallel MDs in the SPS needs to be looked at.

5. Short-term Injectors Schedule Outlook (*A. Rodriguez*)

- Very successful week for the injector complex.
- ISOLDE will continue with Winter Physics until Mon.
- AWAKE will be running the electron beam until Mon.

6. AOB

A few words to close the year (*R. Steerenberg*)

- It has been a very busy and successful year.

- TI will continue working on shift with the challenge of maintaining the electrical consumption under control.
- Acknowledgement to everyone who participated in the FOM, to the machine coordinators and to the supervisors.
- Draft schedule for 2023: Hardware and beam commissioning start in week 7, the first beam to the users in March; for the LHC, the beam commissioning will start on 27.03, and then all the beams will be stopped on 30.10.

Questions and comments:

- *E. Mahner*: We have seen the LHC reach 40 fb^{-1} , and the target was 25 fb^{-1} , was the target too low or did we run too long? *R. Steerenberg*: The availability of the machines was anticipated from the 2015 restart, and we had a much higher availability than expected. We hope to be more precise next year in the estimate. We should perhaps give a range of estimates for the luminosity.

Minutes by N. Bidault