

Monday, 20 March 2023

ACCELERATORS COMPLEX STATUS

SUMMARY OF WEEK 11 - 2023

TECHNICAL INFRASTRUCTURE

Facility Coordinator: *Ronan Ledru*

- **Statistics:**

Number of alarms: 5'500

Number of phone calls: 1035 (incoming: 659 outgoing: 376)

Number of ODM created: 135

- **General facility status**

- Tue. 14.03: Electrical glitch on the 400kV line between Chaffard and Grand ile 1 -17% during 90ms. Beam lost in CPS
- Sparks and smoke from an Electric towing tractor in SPS Fire Brigade, EN-EL and HSE on site to secure the area and fix the problem
- WinCCOA for CV down. The machine cs-ccr-cvlaser1 was turned off without a reason. After manual restart, WinCC OA projects were not able to restart by themselves

- **Issues last week**

- WinCCOA for CV down without a reason.

- **Plans for next week**

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- **Access / Intervention request:** No

If yes:

- Duration: hours
- Preferred start date / start time: Date / time

LINAC 4

Machine Coordinator: *Alessandra Lombardi*

AFT Availability: 93.6%

- **General machine status**

- 10 Hours of downtime due to RF problems, detailed below. Since Thursday, the ion source is a bit unstable with a pulse-to-pulse jitter as high as 1.2% vs the

normal 0.5%. HSL agreed to lower the gas progressively, which seems to reduce the pulse-to-pulse jitter. Further investigation into the cesium and gas system is planned for Monday. No impact on operation, just keeping an eye on parameter's drift.

- PIMS 11-12 issue on 15 March: By chance a smoking cable for the PIMS 11-12 klystron focus #2 in the PLC rack was found. The klystron had to be stopped for urgent repair before more damage was made. The restart was tricky. An RF cable temporarily removed for the repair work was tightened too weak. This led to a factor 10 lower cavity voltage and triggered multipactor in the PIMS 11 cavity while the PIMS 12 cavity worked as desired. Once the lost gain was understood, the root cause could be identified, a good RF contact restored and beam operation re-established. 9 hours downtime in total.
 - The origin of the smoking cable issue was very likely a loose cable connection from the original installation in Linac4 about 7 years ago. During the YETS 2023-2024 all critical cables/connections will be checked (klystron focus, PLC ethernet, Debuncher coaxial line).
 - **Issues last week**
 - PIMS 11-12 issue on 15 March: a smoking cable for the PIMS 11-12 klystron focus #2 in the PLC rack was found. The origin of the smoking cable issue was very likely a loose cable connection from the original installation in Linac4 about 7 years ago.
 - **Plans for next week**
 - Further investigation into the cesium and gas system is planned for Monday. No impact on operation, just keeping an eye on parameter's drift.
 - **Access / Intervention request:** No
- If yes:
- Duration: hours
 - Preferred start date / start time: Date / time

PS BOOSTER

Machine Coordinator: *Simon Albright*

AFT Availability: -%

- **General machine status**
 - The first complete week of providing beam to the PS has gone very well
 - The PSB profited from the Linac4 downtime on Wednesday to allow for some interventions: There was a regular check of BSW1L1. An amplifier for Ring 1 Sector 7 was replaced, we now have all amplifiers operational again. A check on the BR34.BHZ311 interlock did not reveal any problems, a deeper investigation will wait for the next technical stop

- Further optimisations have been made to the extraction steering
- A new TOF-like cycle that operates on all 4 rings has been prepared, which will be used for beam dynamics studies and further optimisations of the extraction steering
- The 1.4 GeV, 1.7 GeV and staggered beams were all sent to the ISOGPS target station and reference measurements were taken
- An updated version of the LIU wirescanner application has been released, which simplifies taking and recording measurements
- **Issues last week**
 - A problem with PLCs used by the HL-RF system disrupted operation on Monday night. Thanks to the hard work of the piquets, a temporary solution allowed operation to continue overnight with a fix implemented by experts on Tuesday.
 - There are ongoing difficulties with the tomoscope, which can make measurements difficult. A new system is currently being installed and will be available soon.
 - The transaction problem with the BLKSWs appears to be due to a timing problem, a solution is under investigation
- **Plans for next week**
 - ...
- **Access / Intervention request:** No
 If yes:
 - Duration: hours
 - Preferred start date / start time: Date / time

ISOLDE

Machine Supervisor: *name*

AFT Availability: %

- **General machine status**
 - A very good week for ISOLDE, we advanced well. Special thanks to Gian Piero and the PSB team!
 - GPS:
 - Last week stable beam preparations – reference files done for all beamlines
 - On Thursday several LIST target coupling tests were carried out after which the SEMGRID target was put onto the Front End and first setting up by the PSB team of the different GPS proton beams started over night (a day ahead of schedule).

- The SEMGRID tests finished on Sunday and we are preparing to swap the SEMGRID target to the HRS Front End for the remaining tests of the different HRS proton beams.
- Again this will be a day ahead of schedule and the saved time will be used to send a high current (max 2uA) proton beam for ~8 hrs during Monday-night to the GPS beam dump which (as the HRS beam dump) have been equipped with thermocouples. These tests are in the frame of the Beam Dump Replacement Study (Ana-Paula Bernardes) and will give insight on the heat distribution within the dumps – useful information for the requirements of the new dumps.
- HRS:
- Last week also stable beam preparations – reference files to be done for all beamlines. So far the separator and ISCOOL (RFQ) are being done in parallel with the GPS SEMGRID tests. Some strange stable beam behavior we are presently tackling and trying to understand. This will continue until Tuesday when we swap for the SEMGRID target.
- All in all a good week for ISOLDE. Advancing well towards physics.
- **Issues last week**
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- **Plans for next week**
 - -
- **Access / Intervention request:** No
If yes:
 - Duration: hours
 - Preferred start date / start time: Date / time

PS

Machine Coordinator: *Denis Cotte*

AFT Availability: -%

- **General machine status**
 - A good week of beam commissioning for the PS machine punctuated by the first beam sent to the SPS machine on Friday (as planned).
 - LHCINDIV accelerated and extracted at $1.3E11$ ppb with reasonable bunch shape and length.
 - o On this beam, the synchronization loop is dependent on the previous cycle programmed in the superCycle.(under investigation)
 - o At the end of the week hardware problems on a 80 MHz cavity 89 (amplifier) and on a 40 MHz cavity 77 (fire on the power supply) required access (2x2h) in the machine for repair.

- o The PS can provide the beam even without these two cavities, the intervention will be scheduled during the realignment of the SPS machine this week.
- LHC25ns72b standard accelerated, split, bunch rotated and extracted up to 1.8×10^{11} ppb.
- BCMS beam with 48 bunches version tested up to 2×10^{11} ppb
- SFTPRO/MTE commissioned until 1.25×10^{13} ppp with barrier bucket.
- o A core only version provided to SPS on Friday and all along the weekend.
- o On Friday, we discovered that horizontal emittance was too high on this beam, and it has been corrected mainly with injection optimization.
- TOF accelerated and extracted at 8.5×10^{12} p to D3 dump with bunch rotation and a bunch length around the requested 28ns.
- Very first setup of EAST and AD beam during the weekend.
- Successful test of injection SEMFIL turn-by-turn matching measurements in the shadow of the SPS DSO on Tuesday.
- Kick response in the BT-BTP-PS Ring. One of the many YASP configuration gave an inverted corrector BTP.DHZ40 and was corrected.
- Unification of Booster to PS trajectories for all beams already in place.
- Some measurements with BGI82H were made during the weekend.
- **Issues last week**
 - KFA71
 - o Modules 9 and 11 were not operational at the beginning of the week.
 - o Recurrent trips of module 12 all along the week.
 - o Asynchronous pulses of KFA71 during acceleration on different users.
 - o At the end of the week, 11 of the 12 modules of KFA71 were operational
 - C10MHz
 - o Several times this week, the installation of a new beam dropped down all the 10MHz PS cavities and required some time to restart them. The problem is being investigated by RF experts.
 - C40/80MHz
 - o As already mentioned earlier, a long access is needed to repair C40-77 and C80-89.
- **Plans for next week**
 - ...
- **Access / Intervention request:** No

If yes:

- Duration: hours
- Preferred start date / start time: Date / time

PS - EAST AREA

Experimental Area Coordinator: *name*

AFT Availability: %

- **General machine status**
 - Summary / explanation.
- **Issues last week**
 - Issues that caused downtime. Emphasise issues that require follow-up.
- **Plans for next week**
 - Plans for next week. Emphasise those that impact physics.
- **Access / Intervention request:** Yes / No

If yes:

- Duration: hours
- Preferred start date / start time: Date / time

PS – NTOF

Experimental Area Coordinator: *name*

AFT Availability: %

- **General machine status**
 - Summary / explanation.
- **Issues last week**
 - Issues that caused downtime. Emphasise issues that require follow-up.
- **Plans for next week**
 - Plans for next week. Emphasise those that impact physics.
- **Foreseen beam stop:** Yes / No

If yes:

- Duration: hours
- Start date / start time: Date / time

AD – ELENA

Machine Supervisor: *name*

AFT Availability: -%

- **General machine status**
 - On Tuesday 14/03, a water leak has been discovered on the AD quadrupole QFC54 (a special half quadrupole used as strong focusing bending magnet). After discussion with all specialists, it is not possible to operate, even in degraded mode, without cooling in this magnet and the leak cannot be repaired in situ. We do not have a spare magnet but a spare coil, which has been validated by MSC.
 - Decision has been taken to go for the repair of the magnet which imply taking it out of the ring and refurbish the magnet in MSC workshop. This magnet is in the injection region which implies that we will have to vent once more the injection kicker which just went out of a bake-out.
 - First time estimate of the induced delay is 6 weeks minimum, meaning that beam commissioning in AD would start mid-June, with a possible restart of physics end of June assuming a very aggressive beam commissioning of the 2 machines in 2 weeks. Summary / explanation.
- **Issues last week**
 - Water leak on the AD quadrupole QFC54
- **Plans for next week**
 - ...
- **Access / Intervention request:** Yes

If yes:

 - Duration: hours
 - Preferred start date / start time: tbd

SPS

Machine Coordinator: *Stephane Cettour Cave*

AFT Availability: -%

- **General machine status**
 - HWC (Hardware commissioning)
 - SMD12 transformer replaced and now the MPS working in normal configuration
 - Hardware compensation done on SFTPRO
 - The reaction time of the dump tested with MPS tripping
 - Injection BIS and Ring BIS tested
 - DSO completed North Extraction and North Transfer

- DSO partially completed SPS ring
- Need to test RF and table of crab cavity in BA6 when they will be ready
- Replaced thyatron switch on generator 2 of the MKP
- ZS, leak on 3M circuit (need access on Tuesday morning to check if solved)
- It miss the commissioning cavities 800 MHz
- During a visit I found pieces of concrete falling from the SPS tunnel structure in position 13260
- The tunnel vault structure has many cracks and should be checked by an expert
- Link with photos and movie
- <https://cernbox.cern.ch/s/AnJexQFWJRBrJGdSummary> / explanation.
- Beam commissioning
- the start-up with beam was very efficient and very fast thanks to everyone who made it happen this way
- Friday morning at 7H00 LHCINDIV and MTE core beam injected in SPS
- Indiv beam was quickly injected and accelerated to 450GeV
- Commissioning TT10 ALPS
- Energy matching done
- Ready for BBA (Beam Based Alignment)
- Fine setting up on transverse and longitudinal parameters started on the WE
- MTE core beam was injected and accelerated, passed through the transition and finally accelerated to 400 GeV
- Commissioning TT10 ALPS
- Energy matching done like the LHC beam at “fixed frequency transfer” 199.948 MHz
- Ready for BBA (Beam Based Alignment)
- Fine setting up on transverse and longitudinal parameters started on the WE
- Indiv beam on MD2 (optic Q26), MD3 (optic Q20) ready for the kick response
- kick response measurement done
- Measurement checked and they are fine
- MTE core beam on MD4 ready for aperture measurement
- Aperture measurement done on H and V plane
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- **Issues last week**

- Firmware update for ALPS TT10 on Tuesday morning call (Manuel Barros Marin)
- Check if the TT10 ALPS working on all users and we need to see 5 turn of MTE beam
- Wire scan measured always SFTPRO1 need to check
- Follow the kick response
- corrector MDH32007 gain (need to replace the corrector in future)
- corrector MDH51832 but for this one it's normal.
- **Plans for next week**
 - Commissioning Cavities 800 MHz (Try to plan Tuesday morning)
 - The structure of the tunnel vault has a lot of cracks and needs to be surveyed
 - Access Tuesday morning
 - BA2 leak on 3M circuit (Antoine Prost)
 - BA1 scrapper lubrication (Edouard Grenier-Boley)
 - BA1 structure cracks cleaning concrete and expert (Serge Di Luca)
 - Ring Access geometer team alignment (Patrick Bestman)
 - DSO test: need to test RF and table of crab cavity in BA6 when they will be ready
- **Access / Intervention request:** Yes

If yes:

 - Duration: hours
 - Preferred start date / start time: Tuesday 21 March morning

SPS – NORTH AREA

Experimental Area Coordinator: *name*

AFT Availability: %

- **General machine status**
 - Summary / explanation.
- **Issues last week**
 - Issues that caused downtime. Emphasise issues that require follow-up.
- **Plans for next week**
 - Plans for next week. Emphasise those that impact physics.
- **Access / Intervention request:** Yes / No

If yes:

 - Duration: hours

- Preferred start date / start time: Date / time

SPS – AWAKE

Experimental Area Coordinator: *name*

AFT Availability: %

- **General machine status**
 - Started electron beam commissioning.
 - Electron beam commissioning:
 - - RF conditioning not completely finished, still occasional sparks observed. Should continue to warm up slowly
 - - EPC intervention enabled power supplies for electron beam correctors 430016 (old) and 412353 (newly installed)
 - - New issue: current reading in power supply RCBIV.412347 is stuck. Possibly a stuck ADC, not reacting to Reset
 - - Quantum Efficiency of new photocathode measured to be > 10%, consistent with the 15% measured at production, 2 years ago
 - - Electron beam produced by new photocathode has comparable emittance for the same charge (1 mm mrad for 200 pC) as old photocathode
 - Diagnostics commissioning:
 - - Switched on Streak Cameras and propagated laser marker and He:Ne laser on streaks
 - - Quantified effect of inserting/extracting BTV412353 screen on measured electron beam position: $\pm 10\mu\text{m}$ (X) and $\pm 50\mu\text{m}$ (Y). This was occasionally observed since last year, known to BI, and is now quantified. Cannot use this type of rotating BTV screen to align beams. Actuator (IN/OUT) screen on BTV412354 is not affected, so we will shift alignment to this type of BTVs.
 - Access system issue (Thursday): several doors inside TAG41 become blocked. Access System intervention required to replace malfunctioning card, followed by patrol by SPS OP
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 - Residual issues from past weeks:
 - - Calibration signal not working on any Electron BPMs, BI contacted manufacturer (TRIUMF). Not a showstopper since we have verified that beam position measurements are OK
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- **Issues last week**
 - current reading in power supply RCBIV.412347 is stuck.

- several doors inside TAG41 become blocked. Access System intervention required to replace malfunctioning card, followed by patrol by SPS OP
- Calibration signal not working on any Electron BPMs
- **Plans for next week**
 - Continue electron beam commissioning (test orthogonal steering with new magnet), install new BTV screen close to exit of Discharge Plasma Source in preparation for May run
- **Foreseen beam stop:** NA
If yes:
 - Duration: hours
 - Start date / start time: Date / time

SPS – HIRADMAT

Experimental Area Coordinator: *name*

AFT Availability: %

- **General machine status**
 - Summary / explanation.
- **Issues last week**
 - Issues that caused downtime. Emphasise issues that require follow-up.
- **Plans for next week**
 - Plans for next week. Emphasise those that impact physics.

LINAC3

Machine Coordinator: *name*

AFT Availability: %

- **General machine status**
 - Summary / explanation.
- **Issues last week**
 - Issues that caused downtime. Emphasise issues that require follow-up.
- **Plans for next week**
 - Plans for next week. Emphasise those that impact physics.
- **Access / Intervention request:** Yes / No
If yes:
 - Duration: hours

- Preferred start date / start time: Date / time

LEIR

Machine Supervisor: *name*

AFT Availability: %

- **General machine status**
 - Summary / explanation.
- **Issues last week**
 - Issues that caused downtime. Emphasise issues that require follow-up.
- **Plans for next week**
 - Plans for next week. Emphasise those that impact physics.
- **Access / Intervention request:** Yes / No

If yes:

 - Duration: hours
 - Preferred start date / start time: Date / time

CLEAR

Machine Coordinator: *name*

AFT Availability: %

- **General machine status**
 - Summary / explanation.
- **Issues last week**
 - Issues that caused downtime. Emphasise issues that require follow-up.
- **Plans for next week**
 - Plans for next week. Emphasise those that impact physics.

LHC

Machine Coordinator: *Jorg Wenninger*

AFT Availability: -%

- **General machine status**
 - Powering tests are progressing well for the circuits that are available, 6008 main dipoles circuits reached already 6.8 TeV without training quench. Some high

current circuits (RB, RQ, IPQ and IPD) in sectors 23 and 81 are not yet ready for powering.

- On the checkout front machine many individual tests of HW and SW completed. The collimation system is almost ready. The machine experiments data exchange and experiments interlock signals were tested successfully. The injection kickers MKI2 and MKI8 were pulsed in remote.
 - **Issues last week**
 - Progress was slowed down by numerous accesses that took place every working day.
 - **Plans for next week**
 - Powering tests to complete, expected Tuesday evening / Wednesday morning.
 - Checkout starting on 22.03.
 - Beam to the TI2 and TI8 downstream TEDs on 24.03.
 - Possible first beam on 25/26.03, depending on advancement of checkout.
 - **Foreseen beam stop:** No
- If yes:
- Duration: hours
 - Start date / start time: Date / time