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# Summary of the 34<sup>th</sup> FOM Meeting

Held on Tuesday 14<sup>th</sup> November 2017

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Agenda <https://indico.cern.ch/event/680209/>

1. *Follow-up of the last FOM*
2. *Status of the machines.*
3. *LHC MD4/5 beam requests*
4. *Schedule update*
5. *AOB*

## 1. Follow-up of the last FOM

**B. Mikulec** chaired the meeting.

The list of presence can be found in [Annex 0](#).

The [minutes of the 33<sup>rd</sup> FOM](#) were approved.

## 2. Status of the machines.

### Linac2 & Linac3

**R. Scrivens** reported the status of the Linacs on behalf of J.B. Lallement ([Annex 1](#)).

Linac2 had an excellent week with 100% availability. The source HV column was cleaned during the PSB stop on Friday.

There has been a radiation alarm reported at midnight and the corresponding monitor has to be checked.

The Linac3 week was also pretty good with only two source RF generator trips (10 min downtime on Monday and Sunday) and a tank2 trip that was restarted by the RF team (20 min downtime on Wednesday).

Linac3 to run until 18 December mid-day (for foil tests).

The LEIR machine co-ordinator was informed that the crane was again parked on the LEIR platform; EN/HE should check that their teams are aware not to park it in this position.

### LEIR

**M.E. Angoletta** reported on the LEIR status ([Annex 2](#)).

Not one of the best weeks for LEIR operation.

The main topic of the week was the kickers operation. LEIR operated from Monday 6th November to Thursday 9th November with two kickers (ER.KFH31 and ER.KFH32) instead of the usual three



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because ER.KFH34 went into fault and a switch needed to be changed. The idea was to wait until a PS or SPS access of a couple of hours to change the switch. During this time ER.KFH31 tripped very often, owing to the extra voltage required to compensate for the missing kicker. A short downtime (about 5 minutes) happened every time it tripped. Finally on Thursday 9 afternoon ER.KFH31 tripped one time too many and it was decided to make the access so as to change the switch on ER.KFH34. This was successfully done with a 4 h intervention; normal operation with 3 kickers was recovered. An intervention on LEIR SEMGRIDS could also be done in the shadow of this access.

On Tue 7 morning the beam was suddenly injected but immediately lost. That could be traced back to the electron current in the electron cooling system that was about 1/2 of what it was expected to be. The expert came to investigate and found a faulty power supply in the control unit, which was promptly changed. Beam was lost for a bit over 3 hours due to this problem. This underlined the need for a better diagnostic of the e-cooler system, as this is an essential system for LEIR's operation. Steps are being taken to achieve this.

On Tue 7 morning EPC removed a crate in the spare cavity (CRF43) to modify it and hopefully solve the problem of the failed remote reset. LEIR therefore remained without its spare cavity for two days.

On Wed (during the SPS MD) there was downtime due to a Linac3 fault as well as to the Btrain generation crate (dleibgen) tripping repeatedly.

The power crate for the CRF43 was reinstalled in the late afternoon and initial tests showed that the problem might now be solved. As CRF43 was only the spare cavity, not (yet) used for operation, no down time was due to this.

On Friday the LLRF team changed the pick-up used for the phase loop, to a pick-up not included in the orbit system. This will allow BI to carry out calibrations in parallel with operation (with radial loop disabled). The EARLY user was set up to operate with the new pickup.

Over the weekend there was a short downtime due to a trip of the CRF41 cavity, that was solved with a remote reset. The NOMINAL user was set up to work with the new phase PU, in view of the SPS MD on Wed 15 November.

On the MD side, it is worth mentioning the first tests of the LEIR LLRF with the new Btrain system. On Wed 8 November the communication was successfully validated and data from the new Btrain system could be successfully acquired and displayed in OASIS. The new Btrain was not yet calibrated hence it was not possible to use it on the beam. This will be hopefully achieved in a new MD this coming week.

## PSB

**S. Albright** presented the status of the PS Booster ([Annex 3](#)).

Mostly a good week for the PSB, one major fault in Ring 1, minor faults otherwise. Special beams for the LHC were delivered within specification along with the usual operational beams.

Prior to Fridays intervention there was an ongoing problem with BT1.SMV10. An ongoing drift in the acquired current required monitoring and correcting by operators. There has also been a small drift seen in BT4.SMV10 and intermittent fluctuations in the acquired current of BT2.BVT20. The fluctuations in BT2.BVT20 are less than 1%, but appear to coincide with vertical trajectory fluctuations in the transfer line from ring 1 and ring 2.

Small interventions in the BT1.SMV10 power supply temporarily returned



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the performance, requiring stops of ring 1. However, the problem was not resolved. Thursday night shift crew saw a complete failure of BT1.SMV10 followed by a fire alarm and access by the fire brigade. EPC piquet was unable to restart the septum. As the operational beams could be supplied either in degraded mode or as normal it was decided to organise the intervention on Friday morning. On Friday morning ring 2 cavities stopped pulsing for about 2 hours requiring piquet and expert intervention. The decision was taken to start the BT1.SMV10 intervention as soon as possible; beam was stopped at 08:26 and returned at 15:01. The expert found that a strip line had failed; this was replaced and appears to have solved the drift in the acquired current. A full MD schedule as usual saw successful demonstration of the white rabbit B-train, along with the usual diverse studies.

### *PSB – BT1.SMV10 problems additional presentation*

**M. Hourican** presented the problems of the BT1.SMV10 strip line failure occurred on 09.11.2017 ([Annex 4](#)).

Current stability problems since several weeks were reported. Several attempts on the EPC power converter side to solve the problem until 09.11.2017 when a fire alarm was triggered, but nothing was found. For the investigation, the beam was stopped and the firemen entered at 23:37. SMV restart resulted again in a failure and an open circuit was found. On 10.11.2017 the beam was stopped at 08:25. Access to PSB took place at 09:15 for diagnostic, which only took 30 seconds. A DIMR was created with RP (no. 7974961) and the IMPACT was created with RP (no. 102626). The intervention started at 11:30 and was finished at 13:45. The Converter tests started at 14:15 and it was released to the CCC soon after. The beam was back at 15:01.

During the first inspection, severe arcing, melted material and projection of copper and insulating materials in the immediate area was found. The working conditions were hard to replace the broken strip line. The cause of the failure was fatigue. The strip line carried about  $10^6$  times a current of about 26 kA. Fatigue of the copper flexible braid is the cause of the failure. Broken individual strands caused a gradual reduction in cross section of the current carrying connection and increased heat dissipation in the reduced area. This led to the severe electrical arcing at both sides of the braid with the inevitable mechanical failure of the central part, which went to open circuit mode. Summary and proposed follow-up:

- When there are fluctuations or drifts in the current stability the magnet connections should be investigated asap.
- Smoke alarms or fire detection indicate to the firemen specific areas to check
- Make closer inspections each shutdown (and during TS), especially in the least accessible areas.
- Efficient planning and the help of RP to compile and approve DIMR's and IMPACTs allowed for a rapid intervention.
- The accumulated collective dose was kept well below the estimate by using experienced specialists; the estimated collective dose was 400  $\mu$ Sv and the real dose 266  $\mu$ Sv.

Actions to be taken: The molten copper and other debris have been projected on to the bellows assembly. The assembly allows for remote positioning of the septum in both the vertical and angular directions. It has not been ascertained yet if molten debris has been projected between the individual bellows membranes. During YETS the assembly will be inspected more closely to



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evaluate the risks. For the moment, all adjustments of the position of the septum should be limited and only moved when absolutely necessary. Another spare of the strip line is also ordered. The presentation was closed with the acknowledgement to the RP team for their fast and efficient response, **G. Dumont** and **J-F. Gruber**. Additionally, to EPC for their efforts to keep the septum running and starting it up again. Finally, to Firstline for the fast lock out and reconnection of the power converters.

**B. Mikulec** asked if firemen didn't know the exact location of the alarm.

**M. Hourican** answered that he didn't know. He suggested that the next time the specialists should be contacted to join the firemen to give a better diagnose of the problem.

**B. Mikulec** asked if it was possible to also inspect the strip line of BT4.SMV10 at this occasion.

**M. Hourican** answered yes and that all looked okay.

**R. Steerenberg** asked where the transformers are located now and after LS2 and how long the intervention time would be in case of a transformer failure.

**M. Hourican** replied that it would be in the order of a week.

**B. Mikulec** said that this should be discussed within the LIU-PSB meeting.

## ISOLDE

**M. Lozano Benito** reported the status of ISOLDE ([Annex 5](#)).

It has been a very good week at ISOLDE.

Only a trip of a power converter with the need of a manual reset has been reported.

We have been delivering  $56\text{Cu}$  to XT03 at different energies from Wednesday night.

Only some downtime (around 6 h) due to the mentioned problems at the BOOSTER and minor interruptions due to some electrostatic element trips at GPS separator and CA0.

In parallel GLM has been taking some samples of  $64\text{Cu}$  and  $61\text{Cu}$ .

## ISOLDE Users

**K. Johnston** reported a very good week for the users at ISOLDE:

On HIE ISOLDE IS607 was taking  $59\text{Cu}$  at a variety of energies to measure the (p, alpha) reaction of this isotope for nuclear astrophysics. In parallel  $64\text{Cu}$  was taken for diffusion studies in solar cell materials and high entropy alloys.

It has been a long time since this beam was produced at ISOLDE and there some questions over whether the yield would be sufficient, but in the end the intensity and purity were excellent. The machine has been very stable and excellent data were taken on both sides and the experimental programmes are essentially complete.

## PS

**K. Hanke** reported the status of the PS ([Annex 6](#)).

A very good week for the PS with only a few problems on the PS side.



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Most of the down time was caused by trips of the POPS, which occurred regularly throughout the week. The downtime related to these trips is always about 10 min, but there was quite a number of them. There was also a broken PLC, which caused some radiation monitors to trip. Otherwise only a few resets here and there.

On Tuesday A. Beaumont deployed the new B-train measurement and White Rabbit distribution on all users. So far there are no issues with the new system.

In the second half of the week (Thursday/Friday) there were PSB problems with the vertical septum (see PSB report), which caused quite some downtime for the proton operation in the PS, but it was possible to continue with ions and make good progress. During an MD on Wednesday Xe beam could be sent to the East Area dump.

On Friday evening a number of radiation monitors tripped and the PS had to stop operation. The RP piquet had to disconnect several monitors, and to compensate for this he decreased the threshold on some of the others. This allowed us to resume operation. Then the problem could be traced down to a faulty PLC which was changed, which allowed returning to the original thresholds.

#### East Area

**B. Rae** said there was nothing special to report.

#### East Area Users

**H. Wilkens** said users were happy.

#### nToF Users

**D. Macina** said users were VERY happy. Next week there will be a new experimental setup with frequent accesses. The PS will be informed as usual.

#### AD - ELENA

**L. Joergensen** reported the status of the AD ([Annex 7](#)).

Only minor problems to report.

Monday, an AD MD took place with tests of the AD injection line for possible replacement in LS2 of quadrupole magnets with permanent magnets.

The ELENA ion source was repaired, but the beam is very unstable. Some basic setting-up was performed last week taking a pbar shift. The e-cooler installation is still scheduled for the two first weeks of December.

DI.DVT6067 trips often, but since it has a nominal current of only 1 A, it only reduces the intensity very slightly.

Tuesday morning there was a failure of the electron cooler. The water level in the collector cooling water tank was low. After an OP7 Excep, the water tank was refilled and the electron cooler was operational again. The electron cooler team request another OP7 Excep later in the week to ascertain the rate of water loss. Thursday morning, in the shadow of low beam intensity from the PS Booster,



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the access for the electron cooler was made. The BCCCA team also made an access to fine-tune the cryogenic system of the apparatus.

Over the weekend there were several faults in one of the modules of the 10 MHz system, DR.AC10-26. A reset usually solved the problem, but **A. Jibar** has now installed a monitoring system and asks that we contact him directly in case of future faults.

ELENA makes slow progress with anti-protons.

**M.E. Angoletta** said the low level RF works, but the beam is still mis-steered and the loop is not closed. There is an issue with low intensity problem, and the beam instrumentation should be checked.

#### AD Users

**H. Wilkens** said there were a few ATRAP problems.

#### SPS

**F. Velotti** reported the status of the SPS ([Annex 8](#)).

Pretty good week for the SPS with about 90% availability for FT beam. The week started with the new cycle for FT ion physics - the new extraction energy was 179 ZGeV. NA experiments reported very good feedback for this week's beam quality. The main downtime was accumulated due to an extraction kicker problem in LEIR. After repeatedly tripping for the first part of the week, due to the need to use higher voltage on 2 kickers to compensate for the one missing, on Thursday the switch was replaced and operation restarted with no further problems.

During this week, LHC had special runs. This meant for the SPS to deliver mainly INDIVs for the high beta\* run. Also, the special supercycle for VdM and BSRT calibration was prepared. This comprised nominal INDIV, VdM special INDIV and low emittance INDIV. Physics at 2.5 TeV was then started during the weekend. Friday ATLAS and CMS achieved (on average) 50 fb<sup>-1</sup>.

The dedicated MD block was very dense - partially stripped Xe beam, dynamic bump for slow extraction (TED was locked out and TT20 was switched to proton mode for the MD duration) and high intensity LHC beams (Q20 and Q22 optics).

On Thursday, the powering test of TT41 (AWAKE beamline) was successfully carried out. Also, the AWAKE beam was prepared to be used for Thursday evening for the BGI MD. As a side product, the AWAKE cycle is now ready.

#### North Area

**B. Rae** said that it was a very good week. Very quick change of energy so the beam was back at five to users.

#### North Area Users

**H. Wilkens** said that the users were very happy with the rapid change in energy.

#### AWAKE



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There was no report.

#### CLEAR

**D. Gamba** reported on the CLEAR status ([Annex 9](#)).

The interventions were mainly for the optimisation of photo-injector LASER alignment.

The machine configurations were successfully set up for irradiation tests.

There is still slow process in upgrading the controls system (thanks to CO for their patience and support). Presently the beam is set up for irradiation tests for users from ESA and TRAD.

The resuming of the plasma-lens experiment is planned for the second half of the week.

#### Linac4

**G. Guidoboni** reported the status of the Linac4 ([Annex 10](#)).

Linac4 was running fine with a few trips from RF and source.

The first ppm operation of Linac4 took place after the modification of some watchdog properties.

The source was fully running non-ppm

The access last Friday ended with a successful cesiation process.

One MD was done for testing wire scanner electronics for ESS and one MD for stripping foil and BTV at the stripping foil test-stand. Also, a first test of the Laser Emittance Meter was accomplished.

There are a few remaining beam instrumentation issues to be followed up.

#### TI

**J. Nielsen** said there was nothing worth mentioning apart from the electrical perturbation on Sunday.

#### LHC

**J. Wenninger** reported on the LHC status ([Annex 11](#)).

The first part of the week saw the final days of operation with 8b4e BCS at 6.5 TeV. Wednesday was devoted to the setup for the high beta\* run at 400 GeV. Beam setup of the 2.51 TeV cycle with a fast ramp began Friday afternoon.

Major fault of the week: A cryo stop of 24 hours following a cooling water tower in point 8

Tuesday midday and a 6 hour stop due to the PSB recombination septum stripline on Friday.

Friday and Saturday was devoted to the setup and validation of the 2.51 TeV cycle and VdM scan, which was completed by Sunday morning. Intensity ramp-up for the 2.51 TeV physics period on Sunday with a 524 and 1200b fills. Sunday evening was perturbed by a voltage drop on the EDF lines.

Plan: Operation at 2.51 TeV with long fills of around 24 hours.



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### 3. LHC MD4/5 beam requests

**H. Bartosik** presented the LHC MD4/5 beam requests ([Annex 12](#)).

Mostly standard beams are requested, but some cycles that haven't been used for a while should be revived and checked (e.g. LHC50).

**H. Wilkens** asked if the North Area would be affected a lot and that the dedicated filling should be minimized during the LHC MD week 48.

**H. Bartosik** said that everything would be tried to minimise the impact on the North Area.

**R. Steerenberg** pointed out that there is now a special column available in the file (freq inj column) mentioning whether it is expected to have frequent injections or not during each MD.

### 4. Schedule update.

**B. Mikulec** presented the new version of the [injector schedule](#) (version 1.7).

**S. Montesano** has requested a shift of the UA9 run since the present planning was incompatible with the availability of experts.

**H. Wilkens** agreed on behalf of the North Area physics users that the UA9 run would be moved to the 12<sup>th</sup> of December after the COLDEX run.

**B. Mikulec** asked when AWAKE would start, but there was no representative.

**R. Steerenberg** agreed to change the schedule accordingly.

**R. Steerenberg** said the 2018 LHC schedule will be presented and approved at the LMC meeting tomorrow; the 2018 Injector schedule will then be circulated among key people and presented at the next FOM prior to approval at the IEFM.

**H. Bartosik** confirmed that there would be no MD tomorrow.

### 5. AOB

No AOB's.

**Next Meeting: Tuesday 21<sup>th</sup> November 2017.**

Minutes reported by [S. Hirlaender](#) on 15<sup>th</sup> November.