

# Accelerator Complex Status

## End week 48 (Monday 3 December 2018)

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### TI (Ronan Ledru)

Details: <https://wikis.cern.ch/display/TIOP/2018/12/03/TI+Summary%2C+Week+48>

### CLEAR (Kyrre Sjobaek)

in week 48 the main activities at CLEAR were as follows:

#### **Monday 26/11**

- Short access in the morning, restart around noon
- First beam with Plasma lens backed by a tripple Marx bank that goes up about 800 A. Ran first with argon, then helium. No indications of pinching or unexpected nonlinearities.
- Beam spot about 60x60 um.
- Some problems with MKS11

#### **Tuesday 27/11**

- Access in the morning to repair Marx bank
- MKS11 lower allowed voltage setting was reduced from 15 to 10 kV in order for operators to condition past the 14 kV "trip point".
- Clear view of the expected thermal nonlinearity in helium.
- Evening: Installed half-size (500 um diameter) capillary for higher gradient.

#### **Wednesday 28/11**

- Morning: Beam for tests of THz-based beam diagnostics equipment using short and asymmetric bunches.
- Afternoon: New beam setup, fine-tuning gun phase in order to make it longitudinally symmetric. Achieved better beam quality, about 35x35 um beam spot on PLE according to OTR.
- Evening: Tests of new small capillary. Easy to pass through, however discover that it is significantly tilted vertically. Also find about 6/7th of the expected gradient.

#### **Thursday 29/11**

- Morning: Access to re-align the capillary in the in-vacuum holder and reinstall & pump. Also a visit from Alberto Bacci / INFN Milano, work on the THz table, and tests of two new Bassler cameras.
- Afternoon: Beam on, quickly full aperture, and after some orbit tweaking we achieve full aperture AND full deflection range on downstream screen.
- Tests with Argon again reveal a smaller gradient, which may be due to the capillary being a bit larger than 500 um.
- Tests with Helium revealed only the expected nonlinearity.
- Tests with Neon will be continued tomorrow

#### **Friday 30/11**

- Morning : Access to try and increase marx bank current by removing replacing output resistors with smaller ones. Found little effect.
- Afternoon: Detailed beam setup, including moving the laser pointing slightly in order to increase beam quality. Achieved a 1x1 um emittance but low charge beam, perfect for our purposes. Beam spot on mini-OTR was less than 40x40, however we suspect that this measurement was limited by its resolution.

- Quick full-current gradient scan in Argon
- Gradient- and timing scans in Neon in order to better characterize this gas, at 800- and 600 A, as well as some checks at lower pressure.
- Gradient and timing scans in Nitrogen at 600A.

To conclude the PLE studies, we did not find any clear indications of pinch effects, even though we were well above the Bennet limit. A possible reason is that the pinches do need some time to develop, and that the current does not stay high enough for long enough. This is good and bad - on one hand it pushes the limit of when pinches become a problem further out; on the other hand we did not find this effect in any gas. However we did get a lot of very promising data about what looks like nonlinearities due to thermal distribution, including in a new gas and at different current levels and capillary radii.

Throughout the campaign the machine was generally performing very well and stable (with the exception of some problems with MKS11), as did the triple Marx bank. Once correctly aligned, we did not have any problems threading through the 0.5 mm diameter capillary.

### LINAC3 ():

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### LEIR (Simon Hirlander):

LEIR had an eventful and good week. The by LHC demanded intensity was reliably delivered till the end of the physics.

The principal issue of the week was the complete performance loss on Wednesday (28th of November) after a reboot of the timing system.

The new Btrain system lost the reference for the B-field due to the reboot. Without knowing the root of the problems, it was possible by applying a strong energy correction in tank 2 and 3 (Linac3) and adjusting the electron cooler gun voltage, to get sufficient intensity to run the automatized Powell alignment and to recover within less than one hour to the target intensity and send the beam to LHC. After the oven refill on Thursday (29th of November) the system was set to the old B-train system, and it was tried to restore the performance with the previous settings (before the reboot) without success. LEIR was again, mostly automatically - using Powell, optimized and runs currently using the old B-train. No significant performance drops were observed till the end of the physics run, and Powell restored the target performance automatically if needed over the weekend. In the night from Sunday to Monday (2nd-3rd of December) the performance of the source of Linac3 was decreasing, which was shadowed by problems in the PS (PFW), and only seen very late, which did not allow to make the final quench test in LHC in the morning. After a retuning of the source, the performance of LEIR was immediately recovered by small optimizations.

On the HW side, there were inspections with BPMs in the transfer line and in EI, to test the upgrade to the new HF system. During the source refill, there was an access

to re-cable the former tune kicker (ER.KQF12) as a pickup and connected the signals to the control room in order to test whether it could be used for a bunch-by-bunch intensity measurement.

On the MD side, there were cooling studies were performed to investigate the impact of different transverse electron-beam-shapes of the e-cooler.

A not entirely successful trial to set up the fast ramp eight injection cycle was made. Complete compensation of the stray fields of PS was successfully demonstrated. Finally, an automatic energy distribution correction was tested.

### **ISOLDE (Alberto Rodriguez):**

It has been a very good and calm week at ISOLDE. We have been delivering several molecular radioactive beams ( $^{22}\text{Ra}^{19}\text{F}$ ) from a pre-irradiated target installed in the HRS frontend to the CRIS experimental station during most of the week. This is the last experiment of the Physics campaign and it will finish tomorrow morning. There were no problems with the accelerator.

### **PS ():**

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### **SPS ():**

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### **LHC (Stefano Redaelli & David Nisbet):**

LHC: Ion operation was interrupted for 12 hours on Tuesday for a crystal MD. On Thursday the source was refilled and the ion beam was only interrupted for around 8 hours. Most of this time could be bridged with a 100 ns spacing fill for ALICE vdms and a CMS length scale calibration. The last physics fill of Run 2 was dumped Sunday 2nd December at 17:10 and followed by MDs on the Optics. Unfortunately due to issues in the injectors the planned BFPP beam induced quench test could not be done. The magnet training therefore was started earlier.