Beam Commissioning Status
W49: from 30/11 to 4/12

D. Gamba for the ELENA team

- Main results
- Issues
- What is next
Main Results

- **Setup LNA.USER.HMPROD1 for GBAR production beam**
  - h=4 + bunch rotation (manual); ~100 ns FWHM beam
  - Using re-matched **optics** by ABT
  - Easily possible to **steer** the beam in the experiment with the dedicated knobs

- **GBAR observed some first (partial) beam deceleration**
  - Orbit drift observed between morning/evening on Wednesday, which was not visible elsewhere. No explanation so far.

- **Source H₂ cartridges** has been exchanged on Tuesday

- **E-cooler electron gun** cathode heated at nominal current

- **Advancements on tools for machine optimization**
  - Successfully tested prof-of-principle setup for new **extraction timing** with ~1 ms delay set on fast delays
  - Defined **knobs** and mastered **incorporation rules** for ions orbit optimization in the cooler
  - Injection oscillation analysis
  - **Scraper** measurements
  - Data taking for optics measurement from BPM **turn-by-turn data**

- **Not possible to pulse the ion switch** => no beam to LNE00/ALPHA
Old and New issues - settings

- **Time jitter of extracted beam**, two problems:
  1. ~20 ns rms jitter always present.
     - Unclear source: unstable b-train? LLRF loop settings?
  2. Erratic behavior after a “save cycle” in which extraction synchro does not seem to be fully operational.
     - Unknown reason: it might be that “save cycle” should not be done when that cycle is being played/loaded

- **RF phase loop settings** depend on the chosen **harmonic**
  - Present parameters in RF cycle editor are not enough to be able to change harmonic without LLRF expert intervention
  - **Pending internal discussion** on what the RF cycle editor should allow for

- **Power converter limits** are not easily **predictable** by LSA/cycle editor tools
  - In case of setting several GFAs at the same time (e.g. orbit bump), **if one fails**, the other might still accept the change!
  - “transactionality” is available in LSA to prevent this, but for GFAs it is **still to be deployed** and tested by EPC (January?)
Old and New issues - instrumentation

- Baseline of **LNE50.BSGW.5060** (vertical plane only) is **still jumping**
  - Investigation on Tuesday did not reveal any issue
    - No influence of **ion pump** operation below the SEM
      - (also to be observed that NEG cartridge is in between ion pump and SEM, preventing direct view between ion pump and SEM)
    - No influence of nearby **electrostatic quad** assembly
    - Also tried to close nearby **valve** and **beam stopper** – no effect
    - **Note:** on Tuesday the baseline was jumping much less than usual
- **Half moon board** on LNS(or LNI?) SEM still to be exchanged
  - (one channel is not attenuated as it should be)
  - Hardware ready
- Still working on **longitudinal pickup calibration**
  - Measurement using Low Frequency pickup in the ring to be analyses/discussed.
  - (Faulty) **attenuators** on the calibration line can easily **fool measurement**!
Old and New issues - other

- **iSeg power supplies** are still the weak point of ion switch powering
  - Ion switch itself has been **re-conditioned** up to about 31.5 kV with no breakdowns
  - Attempt to use a **newer iSeg firmware failed**
  - Attempt to **pulse FUG power supplies (1Q)** showed that we would require some additional circuit (HV resistors?) to obtain a fast discharge, presently of ~13 s.
    - Solution being explored by EPC
  - Presently, **iSeg operational as before**, but **still using FUG**.

- **Last valve** before an experiment is typically **interlocked** by TE-VSC
  - Idea of **keeping the valve close whenever an experiment is not taking beam**, especially when the zone is not closed (i.e. people working on the experiment hardware)
  - This interlock **can be** easily **bypassed by TE-VSC** in case of need, e.g. for tests during commissioning.

- **Cooling water circuit** is common among the whole AD hall and has **limited filtering capabilities**
  - On Friday, by opening some AD circuit the **conductivity increased** and the **H- source tripped** on overcurrent on the main HV circuit.
(Some) Open Questions

- **Injection** optics/orbit matching
  - Test settings of injection *transfer line quads* based on old quadscan
    - we won’t have the BTV at the moment, but could probably use LNE50 SEMs?
  - Still difficult to get stable *injection orbit reading* due to BPMs saturation
    - Being continuously improved

- Optimization of *accelerating cycle*
  - Long term plan to *prepare* for a *decelerating cycle*

- Understanding *ring optics*
  - Coupling, chromaticity, hysteresis effects

- Tests with *e-cooler*
  - *e- orbit* measurement, *H- lifetime*, *Schottky* signal

- Optimization of *LNE00* optics/steering
  - See following presentation by ABT
## Tentative Program for This Week

**Week coordinator:** Laurette

<table>
<thead>
<tr>
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<th>Main activities</th>
<th>Operator(s)</th>
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<tr>
<td><strong>Monday</strong></td>
<td>• Tests with <strong>cooler magnetic system switched on</strong></td>
<td>• Bertrand</td>
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<td>• Correction of <strong>production cycles</strong> with cooler magnets on</td>
<td>• Lajos</td>
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<td>• Idea is to <strong>keep magnetic system always on</strong> till the end of the run</td>
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<tr>
<td><strong>Tuesday</strong></td>
<td>• Machine in <strong>access</strong> (at least the morning):</td>
<td>• Bertrand</td>
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<td>• Leak detection on LNE06 line</td>
<td>• Lajos</td>
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<td></td>
<td>• Continuation of installation backout jackets LNE00…</td>
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<tr>
<td></td>
<td>• Work on SEMs (hardware/firmware)</td>
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<td></td>
<td>• <strong>Electron beam</strong> in the e-cooler</td>
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<td><strong>Wednesday</strong></td>
<td>• Switch to <strong>iSeg PCs</strong> for ion switch for pulse operation</td>
<td>• Lajos</td>
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<td></td>
<td>• <strong>LLRF/Beam acceleration</strong> tests</td>
<td>• Bruno</td>
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<td>• Beam to LNE00/<strong>ALPHA</strong></td>
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<td><strong>Thursday</strong></td>
<td>• <strong>MDs</strong></td>
<td>• Lajos</td>
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<td>• LNE00/07 <strong>optics</strong></td>
<td>• Bruno</td>
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<tr>
<td><strong>Friday</strong></td>
<td>• <strong>MDs</strong></td>
<td>• Lajos</td>
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<tr>
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<td>• LNE00/07 <strong>optics</strong></td>
<td>• Bruno</td>
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+ beam to **GBAR**; continue development of **software** and **tools** for machine control/optimization