

Minutes PSB Upgrade WG Meeting 26th November 2015

Participants: J. Abelleira, W. Bartmann, J. Borburgh, J. Devine, G.P. Di Giovanni, A. Findlay, V. Forte, R. Froeschl, G.M. Georgiev, D. Grenier, G. Guidoboni, M. Haase, K. Hanke, J. Hansen, C. Martin, B. Mikulec, S. Moccia, A. Newborough, M. Paoluzzi, S. Pittet, D. Steyaert, J. Tan, W. Weterings

Agenda (<https://indico.cern.ch/event/462263/>):

- [1. Approval of Minutes](#)
- [2. Communications](#)
- [3. Follow-up of Open Actions](#)
- [4. Status of the PSB Extraction and Recombination Septa and Kickers](#)
- [5. AOB](#)

1. Approval of Minutes

- The minutes of the last LIU-PSB WG meeting #163, available [here](#), have been approved.

2. Communications

- **Party for the End of the Year:**
 - The date is fixed for the 10th December 2015 at 13.00 and the room is 37-R-022.
- **Budget Rebaseline:**
 - **The current baseline is going to be closed at the beginning of December.**
 - After its closure, the WP-holders will be asked to start working on the rebaselining of their WP.
 - G.M. Georgiev reported that for the **procurement of the cables the EN-EL Group would like to work with 2 budget codes (BC):**
 - The first BC is needed for controls cables. This BC would be fed by the BCs of the users requesting cables. The amount each user has to provide is based on an estimation done by the EN-EL Group, according to the received requests, i.e. DIC, DEC, DIR. All users validate the amount via email and, after that, the project leader sends a memorandum that the money will be transferred to EN-EL-CF BC. This approach eases the work and at the same time allows to save money.
 - The second BC is needed for DC cables. The DC cables have always been paid by the project. They are not included in any work package.
 - **K. Hanke asked if this money was previously foreseen or if this is a new request. G.M. Georgiev said that this was not budgeted. K. Hanke replied that this topic needs to be followed up with the LIU management to see what can be done, as the cost-to-completion of the project cannot be changed anymore.**
- **IPAC 2016:**
 - Several abstracts concerning the LIU-PSB project have been already submitted for IPAC 2016, see [here](#).
 - If someone would like to submit an abstract discussing items within the LIU-PSB project, he/she is requested to provide it to K. Hanke by the end of the week.

3. Follow-up of Open Actions

- J. Tan on "Make sure that the SRR or ECR to reserve space for SEM Grids for turn-by-turn measurements in ring 3 are submitted." → The ECR has been submitted, <https://edms.cern.ch/document/1506932/0.2>, and it is currently under approval. **Action Closed**
- J. Tan on "Make sure that the ECR to reserve space for the wire scanner is submitted." → The ECR has been submitted, <https://edms.cern.ch/document/1506932/0.2>, and it is currently under approval. **Action Closed**
- C. Zamantzas/J. Tan on "Make sure that the SRR or ECR for BLM for the PSB and transfer lines is submitted. The SRR or ECR should include FLAT ionization chambers and ionization chambers to replace ACEMs." → J. Tan reported that he has no news about the status of the document and he will follow up on it.
- F. Roncarolo/J. Tan on "Prepare a document for approval about the specifications for the H0/H- current monitor electronics." → J. Tan reported that some details are still under discussion, so some additional time is needed before launching the approval process.
- S. Burger/J. Tan on "Submit the ECR for BI.BTV30." → J. Tan reported that the installation of the BI.BTV30 is described in the ECR of the BI.SMV10, <https://edms.cern.ch/document/1561343/0.1>. The original plan was to have the ECR issued in the shadow of the BI.SMV10 one. Nevertheless, after some discussion with M. Hourican, it was agreed that the BI.BTV30 will have a dedicated ECR.
- B. Holzer/J. Tan on "Provide specifications for the wire-scanners" → J. Tan reported that B. Holzer should have a first draft ready by the end of the year.
- J. Belleman/J. Tan on "Demonstrate 200 µm resolution for low intensity beam for the turn-by-turn measurement system. Demonstrate reliable operation with new firmware/software. Electronics to be ready for deployment in EYETS 16-17." → B. Mikulec reported that there will be a meeting next week to review the results of the MD data and plan the following steps. Despite the great effort in the last weeks, **the target of commissioning reliable operations with the new turn-by-turn electronics for low intensity beam was not reached and a close follow-up is now needed.**
- D. Hay on "Prepare and submit an ECR to describe the proposed new rack layout in BR2/BAT." → The ECR has been submitted, <https://edms.cern.ch/document/1560692/0.1>, and it is currently under approval. **Action Closed**
- A. Findlay on "Make sure that the ECR to clean-up the PSB from the unused pick-ups for is submitted." → The clean-up of the pick-ups will be described in the ECR needed for the Finemet cavities. **Action Closed**
- D. Aguglia on "Approve document with the functional specifications of the power converters for BSW magnets for both the LIU-PSB and the Half-Sector Test in Linac4 addressing the open issues from v0.2" → Currently the document has been rejected by Y. Muttoni and J. Borburgh. D. Aguglia is preparing a new version addressing all the comments. The new version will be circulated to the people who commented and it is accepted, then Y. Muttoni

and J. Borburgh could modify their comments and the document could be released without another round of approval.

- R. Froeschl on "Evaluate the possibility to remove part of the shielding to allow the installation of the new magnets BTM.BHZ10 and BTP.QNO20 for the upgrade of the BT/BTM/BTP lines." → R. Froeschl reported that he did not receive the information about the amount of material to be removed from J.M. Lacroix. A. Newborough added that J.M. Lacroix mentioned in one of the recent ICL meetings that he is waiting for the integration of the building to be completed before sending the information to R. Froeschl. K. Hanke mentioned that A. Lopez-Hernandez proposed to have an access of the area during the YETS 2015/2016 to investigate the area concerned and he supports the proposal.

4. Status of the PSB Extraction and Recombination Septa and Kickers

- J. Borburgh presented the status of the hardware of the PSB extraction septa and kickers, see [here](#).

SUMMARY:

- The current PSB extraction kickers (**BEr.KFA14L1**) are **compliant with 2 GeV beam operation. As no spare is available, a new improved set of kickers will be prepared.**
- The PSB extraction septa (**BEr.SMH**) need minor work to reinforce the electrical connections and the hydraulics, otherwise it is compliant with 2 GeV beam operation. **One of the spare tanks (2 septa) has been already prepared and is ready to be installed during the EYETS. Parts for upgrading the remaining tanks have been procured.**
- The recombination septa (**BT1,4.SMV10 and BT2.SMV20**) are requested to have longer magnetic length, but will maintain the current apertures. **The manufacture of the mechanical parts is ongoing and on schedule.** Installation is expected during LS2, and likely not before. Nevertheless, the preparation of the SMV10 magnets is more advanced and there is a possibility to install them during the EYETS.
- The recombination kickers (**BT2,3.KFA10**) **are outside the requested specifications for the rise time. A new kicker will be built. The design phase is on critical path now.**
- The recombination kicker (**BT.KFA20**) **dynamic performance is unclear, but the required beam deflection is within reach with present system.**
- **It is crucial to perform precise measurements on kickers in BT line to determine what needs to be improved to respect rise time specification. The measurements are planned for the upcoming YETS 2015/2016. → Open Actions**

Assigned to	Due date	Description
L.Sermeus, J.Borburgh	2016-01-15	Report about the preliminary results of the measurements campaign on the rise time of the recombination kickers and their impact on the new kicker design.

Assigned to	Due date	Description
L.Sermeus, J.Borburgh	2016-06-30	Provide the functional specifications of the new recombination kickers including the results of the measurements campaign performed during YETS 2015/2016.

[Hide Detailed Description](#)

- The presentation covered the status of the hardware of the kickers and septa in the PSB extraction area and recombination lines.
- **BEr.SMH:**
 - The system is composed by four septum magnets, one per ring, placed in the 2 tanks, i.e. 2 magnets per tank.
 - **The current magnets are robust enough to handle the 2 GeV proton beam, including an increase of 2 mrad in deflection angle, requested for additional steering.**
 - The main work was done to reinforce the electrical connection and hydraulics (increase the cooling capacity) inside the tanks.
 - **The requested changes have been already done on the hotspare tank which is ready to be installed during the EYETS.**
 - **For the other tank, the parts have been procured and will be ready to be installed on the tank exchanged during the EYETS, after the appropriate cool-down time.**
- **BEr.KFA14L1:**
 - The system is composed by 16 magnets, 4 per ring, in 1 tank.
 - **Currently there is no spare available for this system.**
 - **The magnets have been refurbished in 2000 for the 1.4 GeV beam energy upgrade, and the poor quality original ferrite blocks have been replaced by C shaped ones of 8C11 type.**
 - The nominal voltage at 2 GeV is 55 kV, with the maximum by design being 60 kV.
 - The functional specification covering rise time and ripple requirements have been released, see [here](#).
 - The system measured in laboratory shows linear response (no saturation) and the **rise time is assumed to be within specification.**
 - **A spare will be built as part of the LIU planning:**
 - Profit from the occasion to re-design and build an improved full spare, using slightly bigger ferrite which should push the saturation level above the standard values, lower the beam impedance and improve the magnet impedance matching.
 - **Ready by end of LS2**
- **BT1,4.SMV10:**
 - The current system is composed by 2 magnets installed in 2 independent tanks.
 - **Increase of magnetic length to 1225 mm, which means increase magnet physical length to 1300 mm.**
 - **Preserve the current aperture (60.4 h x 102 v), as it was shown that an increase in the gap was not justified, see [here](#).**

- **Six magnets will be built: two operational and four additional spares, 2 operational, 2 as hot-spares and 2 for the cool downtime before refurbishing them, as the magnets are generally radioactively hot.**
- The ECRs (for the diagnostic equipment to be moved out of the tank and for the installation of the magnets) have been released.
- The document about the functional specification has been released. Only missing the engineering specification.
- The design is completed and the procurement has started. **The first 2 magnets could be ready by the end of 2016. This depends on the available resources within the ABT group.**
- Assuming the 2 septa are ready by the EYETS, they could be installed during the extended end-of-the-year technical stop.
- **One has to keep in mind that the new magnets are different from the current ones. By tuning the power supply for the 1.4 GeV equivalent they could be used for the current operations. And in case they fail one could put back the old magnets.**
- **These magnets have a lifetime of about 5-6 years, so they are regularly replaced every 5 years.**
- If 2 magnets are installed during the EYETS, a tentative planning would be to have 2 operational spares to be ready for Q2 2017 and the remaining 2 spares for Q3 2019.
- **BT2,3.KFA10:**
 - The system is composed by 4 magnets, 2 per ring, installed in 1 vacuum tank.
 - **The glued ferrite C cores are of unknown type (and hence the magnetic dynamic performance, i.e. rise time, are currently unknown) and no spare is currently available.**
 - The nominal voltage at 2 GeV is 55 kV, with the maximum by design being 60 kV.
 - The functional specification covering rise time and ripple requirements have been released, see [here](#).
 - **There is a plan to measure the system performance in the tunnel, as they have been currently measured to be out of the expected specifications. This measurement campaign is crucial for the advancement of the hardware construction: Without knowing the limit of the current magnets it is difficult to judge what to improve.**
 - The current available measurement matches the simulation with the old ferrite (4L1).
 - **Simulation shows that by using ferrite of the type 8C11 the rise time could be reduced to about 100 ns. The rise time has been currently measured to be around 120 ns.**
 - Additionally, the measurements to be performed in the tunnel will be done with an improved vertical resolution oscilloscope.
 - **The LIU planning foresees to build a new full spare with its vacuum tank:**
 - The design and parts procurement should be done in 2016. → **the measurement of the current system are needed as an input for the design.**
 - The new kicker should be built in 2017 and installed during LS2. The replaced module will be upgraded to the new design as serve as a spare.
 - **The design phase is on critical path now: About 6 months are left to sort out the design and make sure that the schedule deadlines are met.**
 - K. Hanke asked if there is something that the LIU-PSB project management could do in order to support the magnet construction. J. Borburgh replied that the current bottleneck is the limitation in

the available manpower within the ABT group for all the tasks assigned.

- **BT2.SMV20:**
 - Same magnet type as the BT1,4.SMV10.
 - **Three magnets will be built: One operational, 1 to act as hot spare and 1 for cool down-time.**
 - The design is finalised and the procurement of the parts already started.
 - The current planning is staggered with respect to the one of BT1,4.SMV10: Two magnets should be constructed in 2017 and ready for installation in LS2. The additional spare magnets should be available for Q3 2019.
- **BT.KFA20:**
 - The system is composed by 2 magnets in 1 vacuum tank.
 - **The magnets were refurbished in 2000 and modern ferrite type was installed, of the type CMD5005 which is equivalent 8C11.**
 - **A fully operational spare is available in the laboratory.**
 - The nominal voltage at 2 GeV is 36.5 kV, and the maximum available voltage is 37 kV. **The required Bdl should be achieved for the 2 GeV operation, but not a lot of margin is left.**
 - For this magnets a **slightly different electrical circuit (with respect to the BT2,3.KFA10) is implemented:**
 - Since the magnets are not short circuited as for the BT2,3.KFA10, **it is not simple to measure the current of the magnet as it is sitting on high voltage.**
 - **For the upcoming YETS, the ABT group requested to open the vacuum and insert a measurement coil, pump the system down, pulse the magnet to measure the system performance.**
 - **It is crucial to do precise measurements on the system in order to determine what needs to be done on this magnet. The rise of the system is currently unknown.**
 - **B. Mikulec confirmed that this measurement is indeed part of the planning for the EYETS prepared by D. Hay.**
 - After an internal review for the ABT group it was decided to look again at the optics and check if some margin can be gained for the system with some additional optimization or quantifying the effect of running at lower voltage for the different beam types.
 - The design of a new magnet was never part of the LIU planning, so resources need to be allocated in case the measurement will show that the rise time is not sufficient.
- G.P. Di Giovanni asked if a summary of the measurements could be reported at the meeting scheduled for the 19th January 2016, planned to discuss the latest version of the BT-BTP optics. J. Borburgh said it should be possible for L. Sermeus to report about them.
- B. Mikulec and K. Hanke invited J. Borburgh to make sure a written report about the measurement is done and posted in EDMS. J. Borburgh replied that this is in the planning and of course if one needs to write functional specifications about the recombination kickers, the current performance will have to be described as well.
- V. Forte asked why the beam based measurements on the rise time were not conclusive. W. Bartmann replied that the bunch length at the extraction of the PSB is too long to properly resolve the kicker rise time. V. Forte asked if it was tried to reduce the bunch length using a double harmonic bunch, instead of the standard single harmonic. W. Bartmann replied that this was discussed with A. Findlay and the problem with that was mostly about the

reproducibility of the bunches longitudinal specifications due to effects like bunch-by-bunch oscillations, etc.

5. AOB

- The next meeting is tentatively scheduled for the 10th December 2015.
- K. Hanke reported that Linac4 commissioning team have successfully accelerated a H⁻ beam to 50 MeV.
- **W. Weterings reported that there are issues with the fabrication of the support structure for the injection region as the Transport Group mentioned that with the current design it will not be possible to install the structure. There are issues to move the structure across busbars adjacent to the injection region. The structure should be constructed now so this is a showstopper which needs to be followed up closely.**
- J. Hansen reported that more investigations about the pumping of the new fast wire scanner seem to show that it should be fine to have a common manifold for the horizontal ones, while it is not obvious for the vertical ones. The Vacuum Group is currently looking into a possible solution