

Minutes PSB Upgrade WG Meeting 12th March 2015

Participants: J. Abelleira, D. Aguglia, A. Beaumont, E. Benedetto, J. Betz, T. Birtwistle, F. Boattini, J. Borburgh, C. Bovet, M. Buzio, L. De Mallac, G.P. Di Giovanni, A. Findlay, Y. Gaillard, D. Grenier, M. Haase, D. Hay, A. Lopez-Hernandez, R. Froeschl, K. Hanke, B. Mikulec, S. Moccia, A. Newborough, S. Pittet, J. Tan.

Agenda (<https://indico.cern.ch/event/379402/>):

- [1. Approval of Minutes](#)
- [2. Communications](#)
- [3. Follow-up of Open Actions](#)
- [4. POPS-B](#)
- [5. AOB](#)

1. Approval of Minutes

- The minutes of the last LIU-PSB WG meeting #143, available [here](#), were approved.
- The minutes of the last LIU-PSB WG meeting #141, available [here](#), were approved:
 - J. Tan modified the presentation by updating the planning for the items needed for the Linac4 connection, the deadline of which has been now set to end 2016.
 - The updated presentation is available [here](#) and defines the baseline for the beam instrumentation (BI) group.

2. Communications

- **LIU Cost & Spending Review:**
 - Thanks to everybody for providing input for B. Mikulec's talk, which she presented on behalf of the LIU-PSB.
 - The link to the Indico page of the review is available [here](#).
 - The review was not a technical one, but mainly focused on planning, cost and manpower.
 - All technical choices are considered to be well defined.
 - The reviewers identified possible issues in the manpower shortage and in the planning being tight.
 - **A critical issue is the spending profile of the work-packages (WP):**
 - **Currently only a few percent of the planned budget have been spent: every WP holder should make sure to spend the money in their budget according to planning.**
 - **It would not be possible to go to another review with a discrepancy between planned and spent money as the one currently present in the project. A similar situation will result in a budget cut for the project.**
 - The reviewers appreciated that no LIU-PSB activities could be suppressed, and in particular that all beam instrumentation items must be completed.
 - J. Coupard and D. Hay are now working on a planning for LS2, including cabling activities.

3. Follow-up of Open Actions

- D. Aguglia on "Approve document with the functional specifications of the rack space for both the LIU-PSB and the Half-Sector test in Linac4." → D. Aguglia reported that the document is ready and in EDMS (# 1495860). Minor corrections will be implemented in the next days and then the document will be circulated for approval. After that, the action will be closed.
- WP holders on "Verify that all the requests from your group for EN-MME have been propagated." → K. Hanke reported that he did not receive additional information from the WP holders. **EN-MME will not consider anything that has not been officially requested.**
- WP holders on "Verify that all the requests from your group for EN-EL have been propagated. The list with the requests has to be sent to G.Minchev Georgiev." → D. Hay proposed to have G. Minchev Georgiev summarizing the requests received at one of the next LIU-PSB WG meetings. B. Mikulec mentioned that the EN-EL would prefer to receive a global request from a single contact person.
- R. Froeschl on "Cross-check from a RP point of view with simulations the material proposals for the vacuum window at the exit of BTM." → R. Froeschl reported that he met with A. Perillo and M. Delonca and several solutions for the material were identified. A. Perillo and M. Delonca are working on the optimum design for each material (heating, vacuum pressure, etc, etc) and once the designs are finalized, R. Froeschl will evaluate the radiation impact with simulations.

4. POPS-B

- F. Boattini presented a review of the POPS-B: The new MPS for the PS Booster 2 GeV LIU project, see [here](#).

Main Issues to Follow-Up:

- **This project is one of the LIU-PSB cost drivers (16 MCHF): It is crucial to make sure that the allocated money is spent timely.**
- **The routing for the cables needed for the dummy load is to be officially requested.**
- **F. Boattini should make sure the planning for the commissioning of the PCs during LS2 is discussed/agreed with J. Coupard.**
- **The technical documentation (currently getting prepared) should circulate for approval within the LIU-PSB group.**

SUMMARY:

- **The project is composed of 3 work-units for a total budget of about 16 MCHF:**
 - Construction of building 245 to host the new main power supply (MPS): ~3.4 MCHF.
 - Realization of the MPS high power converters (MPC): ~12 MCHF.
 - Realization of the quadrupole, injector and extraction trims: ~0.6 MCHF.
- Complicated **structure of the new power converters (PC) of quadrupole and dipole magnets:**
 - **BDL:** PCs already exist, so no modification is needed.
 - **Quadrupole Strip:** Covered by the LIU PSB injection.
 - **MPC is to be designed:**
 - 3 MPCs will be in place: one for the outer rings (1-4), one for the inner rings (2-3) and one as a spare for either of the two.
 - A switching system outside each MPC is needed to allow for an easy change between MPCs or to work on a dummy node needed for testing and commissioning.

- **Quadrupole Trim:** Both for focusing and defocusing magnets. A solution has been currently identified in the APOLO_2S (2S means 2 PCs in series).
 - **Extraction Bending Magnet:** This is a special magnet which needs a different trim. Two solutions have been currently identified in the COMET_2P/APOLO (2P means 2 PCs in parallel).
 - **Injection Bending Magnet:** This is a special magnet which needs a different trim. The COMET is supposed to be the solution.
- **Building 245 latest modifications:**
 - The building is divided into two main parts:
 - One part built with a metallic structure, to host the PCs.
 - A second part built with concrete to host the storage capacitors, and both the electrical and cooling systems.
 - A new reference magnet will be installed in the basement of the part built with concrete (to sustain the magnet weight).
 - Close to the reference magnet, the electronic crates for the B-train will be installed.
 - Status: The Finance Committee (FC) will be held in a week. A French company has already been preselected → Work foreseen to be started in April 2015.
 - **Still waiting for the construction permit from the mayor of Preveessin Moens:**
 - Bettina Mikulec asked how long this procedure generally take.
 - A. Lopez-Hernandez replied that in general it takes 3 months, but the letter was submitted in December 2014.
- **Switch-over system:**
 - **Complex system which is needed to allow for reverting to the old MPS in case of major failure of the new MPS.**
 - Several differences between the old and new MPS. For instance in the old MPS all magnets, all windings are connected in series.
 - **All the switch cables will be redirected to a dedicated cabinet for easy access and switch.** With this switch the magnets can be also grounded, i.e. grounding will be much simpler.
 - Since there will be new injection/extraction bending magnets, it is important to know if their special trim is to be preserved even when switching back to the old system:
 - **A. Newborough confirmed that the two magnets should be used in either configuration, so their trim is to be preserved.**
- **Testing load:**
 - The idea is to have a dummy load with the same inductance as the PSB to do extensive tests of the MPS and gain experience.
 - **The current POPS dummy load will be used:**
 - It consists of 10 spare magnets connected in series and represent more or less the inductance of half of the PSB.
 - **Cables long ~300 m should be pulled from B245 to B367.**
 - **B. Mikulec asked if the routing of the cable has been defined. F. Boattini replied that possible paths have been identified with P. Lelong, but there is no official request yet.**
 - B. Mikulec remarked that the request should be done timely as it takes more than 6 months for the DIC. F. Boattini added that the specifications are ready and J.-C. Guillaume was contacted. The preliminary integration work will be started soon.

- **A modification of the dummy load cooling circuit will be done**, which will make the use of the dummy load for commissioning the POPS-B more flexible and independent from the maintenance plans of the PS cooling system.
- **POPS-B MPC Design:**
 - New 2 GeV cycle requires 47% higher (total) voltage, 25% higher peak current and 10% higher rms current.
 - Possibility of asymmetric double cycle (with ~900 ms separation peak-to-peak) is considered in the design.
 - For the design some margin has been considered, e.g. the maximum current (voltage) was considered to be 6000 A (3000 V) instead of 5500 A (2500 V).
 - Voltage measurements on present cycle flat-top shows 10 V peak ripple mainly at 300 Hz and 600 Hz:
 - In order to cope with this effect, for each string a requirement of $\Delta V \sim 2.5$ V rms would give additional improvement and this choice is part of the baseline of the design of the new MPS.
 - **Status:**
 - Market survey sent out for both MPC and storage capacitors.
 - The IT will start in April/May 2015 and the financial committee will be done in December 2015.
 - B. Mikulec asked when the biggest spending is foreseen. F. Boattini replied that the biggest spending is foreseen for this year.
 - B. Mikulec added this does not seem the case with the schedule presented. F. Boattini added that indeed this are the latest data and the project is late of about 2 months.
 - K. Hanke stressed the importance of making sure the money is spent in 2015.
 - K. Hanke commented that with the experience accumulated with debugging problems with the POPS, one should try to have the POPS-B using the same components and design. That is the reason why a low risk has been always assigned to this project. F. Boattini agreed, but added that while this is a desirable approach, not all the choices made for POPS would be compatible with the performance required to the POPS-B. So, for some parts, the choices will be specific to POPS-B.
 - **Trim for quadrupole magnets:**
 - Simulation studies presented by A. Newborough for the main dipole magnets showed that in order to reduce the the field difference between the inner and outer rings, laminated steel plates should be inserted to cope with the different saturation of the coils.
 - **The focusing quadrupole magnets (QFO) trims should be then within the upper limit (~450 A) for the current proposed solution for the QFO, APOLO_2S.**
 - This is the current assumption for the MPS, and A. Newborough confirmed that indeed the plan is to install the laminated steel plates.
 - **Trim for the injection and extraction dipole magnets:**
 - For the injection and extraction dipole magnets, due to the different coil configuration to allow space for the vacuum chambers, there is a slight difference in field to that of the normal magnets.
 - The laminated side plates will be installed on the normal magnets, but not on the special magnets, so the difference must be compensated with the new PCs.
 - Several configurations proposed with 2, 4 and 8 PCs.

- TE/EPC are in favour of option with 4 PCs. More PCs would make the space allocation complicated. And this is part of the baseline design for the POPS-B.
 - A. Newborough added the option with 4 PCs would be the preferred one.
- **Project Management:**
 - The vast majority of components will be provided by the different suppliers.
 - CERN will be responsible for the storage capacitors and the input transformers and the cooling of the PCs, as these items are the most demanding in terms of maintenance requirements.
- **Project Planning:**
 - B245 is expected to be finished by summer 2016. Once ready, the work to install overhead crane, LV switchgear will start.
 - The next couple of YETS will be used to advance work on cooling and ventilation.
 - Also cabling will be worked out during the 2016/2017 and 2017/2018 YETS.
 - 18 kV circuit breaker to be installed end 2015. Not clear if it will require a general power cut.
 - The installation of the PCs will be done in the second half of 2017.
 - **The commissioning of the PCs with dummy load will start at the beginning of 2018:**
 - 6 months are required to commission 1 MPC with the dummy load.
 - As soon as LS2 starts, there should be the possibility to perform test on the PSB magnets.
 - K. Hanke asked F. Boattini to make sure the planning for LS2 is agreed with J. Coupard who is arranging the schedule.
 - **The deadline for the commissioning of the PCs is end September 2019:**
 - During the last part of the commissioning of LS2, the MPC will be connected to the PSB for couple of months of testing.
- **Budget:**
 - Several budget codes used.
 - It seems that there was no money allocated in the latest baseline for the cooling and ventilation of the dummy load.
 - K. Hanke reported about an email exchange with M. Obrecht and the cooling of the dummy load should be part of the new baseline. In fact, by looking in [APT](#) for the LIU-PSB WP 13, WU 98401, one could see the comment "Including Cooling for Dummy".
- **Documentation:**
 - TDR ready and published.
 - Preparing an engineering change request (ECR) for the POPS-B.
 - A technical note about power cabling is being prepared.
 - Functional specifications for cooling and ventilation is getting prepared.
 - **T. Birtwistle recommended to have both technical notes circulating for approval within the LIU-PSB group.** They should be sent to G.P. Di Giovanni who will handle the approval process.
- K. Hanke reported about a conversation with S. Gilardoni and H. Damerau, who asked the PSB could deliver protons at 2.07 GeV at extraction:
 - The official answer given by K. Hanke was that the PSB will deliver protons at 2.00 GeV at extraction.

- F. Boattini said that for the POPS-B some margin is included, but it is not obvious this margin would be enough for an energy of 2.07 GeV.
- A. Newborough added that the 2.07 GeV would be complicated for the magnets, as it already quite challenging to design magnets that can work at both 1.4 GeV and 2.0 GeV.

5. AOB

- The next meeting is tentatively scheduled for the 26th March 2015.
- D. Hay circulated a template to the WG members, to help **detailing the LIU upgrade work activities**. All WP holders are please requested to fill the template and send it back to D. Hay. → **Open action**.
 - K. Hanke recommended to D. Hay to summarized at one of the upcoming LIU-PSB WG meeting about the activities reported to him.

Assigned to	Due date	Description
W.P.Holders	2015-03-31	Fill the template about the LIU upgrade work activities, and send it back to D. Hay.