

Minutes PSB Upgrade WG Meeting 2nd July 2015

Participants: W. Bartmann, E. Benedetto, J. Coupard, L. De Mallac, J. Devine, G.P. Di Giovanni, R. Froeschl, G.M. Georgiev, D. Grenier, E. Grenier-Boley, M. Haase, D. Hay, J. Hansen, B. Mikulec, S. Moccia, A. Newborough, F.-X. Nuiry, A. Perillo Marcone, J. Tan, W. Weterings.

Agenda (<https://indico.cern.ch/event/404906/>):

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1. Approval of Minutes

- The minutes of the last LIU-PSB WG meeting #151, available [here](#), are approved.
- The minutes of the last LIU-PSB WG meeting #152, available [here](#), are approved.

2. Communications

- **HL-LHC/LIU Event:**
 - The tentative day is the 15th October 2015.
- **ECR:**
 - The system to treat the ECRs will change. It was noticed that several times people are not attending the meeting even though they are concerned by the ECR.
 - The ECR will be sent for engineering check first and only then submitted for approval. This hopefully will increase the attendance at the LIU-PLI meetings.

3. Follow-up of Open Actions

- All WP-holders are reminded to verify that their group requests for EN-EL have been propagated to G.M. Georgiev.
- Next week there will be a follow-up of the open actions of the beam instrumentation (BI) group organized by M. Meddahi:
 - J. Tan replied that he is preparing the talk.
 - B. Mikulec asked about the **SRR for the new wire scanners**. An access was foreseen during the last technical stop to investigate the area, but the visit was not done. The worry is about parts of different elements sticking out, which could complicate the integration. In particular these details are never shown in drawings. **An investigation of the area is mandatory**. B. Mikulec suggested to perform it during the next technical stop on 2nd September 2015.
 - B. Mikulec asked about the need for **spares for the H0/H- current monitor to align with magnets spares**. W. Weterings mentioned that 8 BSW4 magnets will be

manufactured, **4 operational and 4 spares, hence 8 monitors would be needed from the BI group.** J. Tan will clarify this offline with W. Weterings and J. Borburgh.

- B. Mikulec on "Review the integration of the BI.SMV position measurement plates." → The integration has been reviewed, all issues sorted out. The slits will be installed for the incoming beam and not for the out-going beam. The vacuum pipes downstream BI.SMV10 are not aligned and installing the slits in that area would require redesigning this area.
Action closed
- S. Moccia on "Check if the TT2 cooling system could be separated from the PSB one" → S. Moccia replied that the load for the estimated TT2 needs to be confirmed by D. Bodart. A meeting to clarify this is planned for next week. **S. Moccia confirmed that the current baseline foresees TT2 to remain part of the PSB cooling station and that the work is accounted for in the recent budget baseline released few weeks ago.**
- M. Haase on "Check the integration with G.M. Georgiev and D. Hay and verify the feasibility of the proposed rack layout of the Finemet cavities" → G.M. Georgiev mentioned that a good technical solution seems to be possible, but it has to be clarified next week with the integration group working for EN-EL.
- M. Haase reported that concerning the integration of the racks in BRF2/BAT a solution has been found for the access to the racks for the RF power supply tuning. The metal structure will be mounted during the next YETS. Then the platform will be re-worked during LS2. The budget should be partly covered by the LIU-PSB one. The rest is to be sorted out. D. Hay mentioned that generally another round of integration is required.
- D. Hay reported that he needed some additional information for the work for EN-STI from D. Grenier and A. Perillo-Marcone. He already informed them via email with the details of the request.
- F. Boattini, G.M. Georgiev, A. Newborough on "Define a proposal for the technical implementation of the water or solid cooled cables connecting the MPS and the PSB reference magnet" → A. Newborough will meet F. Boattini this upcoming Friday to discuss this issue.

4. Requests to EN-EL for LIU-PSB

- G.M. Georgiev presented an updated version of the cabling requests received, see [here](#)[↗]:
 - Not much to report with respect to the last week.
 - G.M. Georgiev met with the representative for the beam interlock control (BIC) and they are working on the DEC/DIC.
 - G.M. Georgiev plans to meet with S. Pittet to finalize the requests from the power group (TE-EPC-LPC).
 - Concerning the BLMs (C. Zamantzas), only the DEC is missing.

5. Status of the Beam Intercepting Devices for the 2.0 GeV Upgrade

- D. Grenier, E. Grenier-Boley and F.-X. Nuiiry reported about the status of the beam intercepting devices for the 2.0 GeV upgrade, see [here](#)[↗].
- **H0/H- Dumps:**

- **8 dumps will be manufactured: 4 to be operational and 4 spares.**
 - W. Weterings remarked that this is compatible with the number of BSW4 produced, so it means that the BI group will need to prepare 8 monitors, as already discussed during the review of the open actions.
 - The design has been completed (from EN-MME), and the drawings have been validated to start the production.
 - The titanium dump was sent back due to some non-conformities found, but the new version should arrive soon.
 - The screens have to be produced by the BI group.
 - Work about controls concerning EN-STI (temperature, etc, etc) is ongoing:
 - G.M. Georgiev asked if there would be cables to be pulled. D. Grenier replied that this was the case and that the DEC has already been submitted.
 - **The expected delivery date to TE-ABT for integration is October 2015.**
- **Head & Tail Dumps:**
 - **6 dumps will be manufactured: 2 to be operational and 4 spares:**
 - B. Mikulec asked why 4 spares. → W. Weterings replied that there will be 3 tanks with 2 dumps each: 1 tank operational, 1 tank as a spare and 1 tank as a "hot" spare.
 - Design completed by EN-MME, drawings have to be signed soon to start production.
 - Prototype to validate the design already done and approved by the EN-STI group.
 - The graphite dump is already at CERN.
 - Screens to be produced by the BI group.
 - Work about controls concerning EN-STI (temperature, etc, etc) is ongoing.
 - **The expected delivery date to TE-ABT for integration is October 2015.**
- **Beam Stoppers:**
 - The beam stoppers are BI.STP-FA, BI.STP-SW and BTP.STP10.
 - **General issue with lacks of documentation**
 - **The compatibility with the 160 MeV/2 GeV beam operation has still to be checked. → Open Action**
 - A fellow is hopefully going to start in October 2015 to take care of this work.
 - The functional specifications of the beam stoppers are under preparation.
 - **BI.STP-FA** is a dump based on 3 graphite cylinders and the beam crosses at most 6 layers of graphite. It is currently used for 50 MeV operation. **To be studied if it can sustain 160 MeV beam operation.**
 - **BI.STP-SW** is a dump made of stainless steel, long 600 mm. It is currently used for 50 MeV operations. **To be studied if it can sustain 160 MeV beam operation.**
 - **BTP.STP10** is a dump made of 2 stainless steel cylinders, long 1100 (2 x 550) mm. It is currently used for 1.4 GeV operation. **To be studied if it can sustain 2.0 GeV beam operation.**
 - R. Froeschl asked how many shots the beam stopper was going to be designed for. E. Grenier-Boley replied that it is usually 4 shots.
 - B. Mikulec asked about the status of the documents to certify the beam dumps/stoppers.
 - J. Coupard explained that certificates for the beam stoppers/dumps have been requested by a safety audit already for Linac4 and that the request applies for other machines as well.
 - B. Mikulec will put D. Grenier and E. Grenier-Boley in contact with A. Funken to understand the deadline, get the appropriate templates and figure out how to link the certificates to the safety files.

- B. Mikulec raised the issue that **in the current baseline no modification of the beam stopper is scheduled nor budgeted.**
 - B. Mikulec asked for a deadline for the investigation work on the beam stoppers to be performed. D. Grenier proposed end-2016. A. Perillo-Marccone mentioned that this will depend if the fellow can be hired.
 - **B. Mikulec suggested to prioritize the work for BI.STP-FA, BI.STP-SW in view of a possible Linac4 connection at the end 2016.**
 - B. Mikulec asked what would be the time needed to construct a beam stopper compatible with the new energy of Linac4 and LIU-PSB, in case the current ones are found not to be compatible:
 - E. Grenier-Boley replied that as a **temporary solution one could re-use spare dumps used in the EAST area.**
 - **In case a new beam stopper is to be designed and produced, this may take 2 or 3 years. It would not be ready for the end-2016 deadline.**
 - R. Froeschl mentioned that one needs to be careful in re-adapting a dump, as several parameters have to be taken into account. B. Mikulec proposed to R. Froeschl to provide input to the EN-STI group concerning the operations of the dump at 160 MeV. R. Froeschl replied that he would need information about the beam sizes. C. Bracco and A. Lombardi should have this information.
 - S. Moccia asked which was the material for the cooling system for the dump. D. Grenier replied that it was stainless steel.

Assigned to	Due date	Description
D.Grenier	2016-06-01	Report about the status of the beam stopper certification for the 160 MeV/2 GeV operations.

- **PSB Absorber/Scraper:**
 - The idea is to replace the window beam scope (WBS) with a new absorber to be placed in period 8 instead of the DBSH/V8L4 kicker.
 - New scrapers will be longer (130 mm instead of 47 mm) to be compatible with an energy ranging between 160-200 MeV, with the possibility of also getting hit by a 2.0 GeV beam.
 - Ideally one would not have fixed masks, but movable masks (16 independent axis):
 - The material would be graphite.
 - **The SRR should be ready in November 2015.**
 - **The targeted delivery date is during LS2, sometimes in 2019.**
 - B. Mikulec commented that unfortunately, for budget reasons, movable masks seem out of question. **The alternative could be to have two fixed masks for two different aperture settings, a small and a large version.**
 - **A. Perillo-Marccone suggested to have the large aperture always installed and the possibility to insert/remove the smaller mask.**
 - J. Hansen remarked to be careful with declaring that enough space is available by removing the kicker DBSH/V8L4, as one needs to account for the manifold pumps, bellows and, in general, about all the issues related to vacuum.

- R. Froeschl asked for how many particles should the beam scraper be designed to absorb. E. Benedetto replied that the current hypothesis is 5% of the ISOLDE-type beams:
 - R. Froeschl commented that this was about 2.5 times worse than for the injection dump.
 - D. Grenier asked if one should consider shielding. This should be part of the study.
 - G.M. Georgiev reminded that if cables have to be pulled and racks installed, a preliminary estimation should be provided to him to check the feasibility and organize the work.

6. Alternative Solution for the Vacuum Window at the Exit of BTM and Experience with the Beam Dump Temperature Measurements.

- A. Perillo-Marccone reported about the status of the studies for the vacuum window at the exit of BTM and experience with the beam dump temperature measurements, see [here](#).
- **Vacuum Window at the Exit of BTM;**
 - The path of the beam from the BTM vacuum window to the dump is through a pipe of 5/6 m in air.
 - The current window is fine for the time being, and it is a thin foil of 0.05 mm of stainless steel.
 - **With the upgraded kinetic energy of 2.0 GeV simulations showed that the current window would reach peaks of high temperature of 300 C.**
 - **Additionally the stress is considered to be high, therefore the current window is not adapted to the beam energy and intensities expected after LS2.**
 - Different options for the material are being studied:
 - Beryllium (1.85 g/cm³).
 - Aluminum (2.7 g/cm³).
 - Titanium alloy Ti-6Al-4V (4.4 g/cm³).
 - Glassy Carbon (1.4 g/cm³).
 - As first step the energy density deposited by the beam was investigated with FLUKA simulations:
 - The highest energy deposit is found for Ti-6Al-4V, while the minimum is for glassy carbon. On the other hand, this is not the only parameter to consider. More studies will follow about repetition rate, thermal conductivity, etc, etc.
 - The next steps are:
 - Thermo-mechanical simulations → Prepare the design proposal → Have RP group validating the design → Prepare the detailed design → Manufacture and installation.
 - B. Mikulec asked about the timeline. A. Perillo-Marccone replied that there was an issue with man-power. The most difficult part would be the **design and simulations, but they should not be too long. One can reasonably expect them to be completed by the end of 2016.**
 - **The target is to be ready for LS2.**
 - The window is not a standard one. It is particularly large, which makes its design challenging.
- **PSB Dump Current Performance:**
 - Before installation the dump was instrumented with 24 sensors. At each point two redundant sensors of different type.
 - 6 sensors around the pipe to measure the air flow rate coming out of the cavity.

- **The temperature recorded between September 2014 and July 2015 shows some variation with maximum peaks of about 40 degC, which is still on the low side, as the dump is designed to sustain up to 200 degC.**
- The current estimated beam power is well below the designed 13 kW, while currently it has been estimated at about 0.38 kW.
- The dump is designed to sustain 2.0 GeV operation during commissioning, i.e. 50% of the cycle going to the dump, which is far from the current operational conditions.
- Comparing the beam intensity with the recorded temperature, it was found that the measured rate of temperature increasing over time was matching the simulations.
- **The air flow was found to be higher than anticipated (2200 m³/h), which helps the cooling process.**
- The temperature measured by the PT100 sensors is slightly different from the temperature measured with the thermo-couplers. On the other hand, the temperature increase is still too low and this difference may well be within below the noise level of the instruments. So more data would be needed to better assess the situation.
- Some more information could be extracted, but at first look everything looks fine.
- Further work will consist of:
 - Observe periods with high dumping rates (high intensity). → if an extended period of several hours with most of the beam going to the dump is foreseen, it would be good to notify A. Perillo-Marccone so he could monitor the temperature evolution.
 - Estimate beam power being dumped.
 - Monitor temperatures.
 - Thermal simulations to cross-check and benchmark models.
- **As a remark, the temperature of the air going into the dump cavity was measured to be about 30 C, while it was expected to be about 20 C.**
 - While it could be an issue with the sensor, S. Moccia replied that A. Perillo-Marccone should please notify the CV operation group about that. The contact person is S. Deleval.

7. AOB

- The next meeting is tentatively scheduled for the 16th July 2015.
- B. Mikulec reported about a possible issue flagged by J. Hansen about the aperture at the entry of BSW1. MME and others worked to increase the vacuum pipe diameter just upstream of this ceramic ring from 60 to 62 mm, while downstream it is planned to remain at 60 mm:
 - W. Weterings mentioned that C. Bracco investigated this issue already and the 60 mm was found to be the optimum solution, as it was not possible to go closer to the septum coil. By increasing the diameter to 62 mm the situation would not change much, since this would only give more aperture at the outside, where it is not required.
- **S. Moccia reported that he met with R. Froeschl to discuss the current ventilation system. The conclusion is that the current configuration could be kept. A remaining issue to discuss are smoke tests.**
- Concerning the issue about stopping the ventilation during a foil exchange procedure, S. Moccia proposed to perform a test to understand better the implications of stopping the ventilation and the needs for the group exchanging the foils.