

## BLM THRESHOLDS WORKING GROUP - MINUTES

BLMTWG #82 Meeting 09.04.2021 - <https://indico.cern.ch/event/1015738/>

**Chairs:** A.Lechner, B.Salvachua

**Participants:** A.Lechner, H.Damerau, G-H.Hemelsoet, C.Hernalsteens, L.Medina, S.Morales, B.Salvachua, H.Timko, D.Wollmann, C.Wiesner

### 1. Overview of (HL-)LHC Injection Losses Studies, Luis Medina

L.Medina presents a study on the losses at injection energy, 450 GeV, expected in future LHC and HL-LHC runs. He explains that the main problem at (HL-)LHC injection are the potential RF power limitations due to a higher beam intensity and beam loading. A reduced RF injection voltage lowers the power demand but yields higher losses. Some studies have been done to find the optimum injection voltage and provide additional guidelines for changes to BLM thresholds.

These studies include lower RF injection voltage tests held during 2018 MDs and operation as well as simulations to reproduce average and bunch-by-bunch LHC capture and flat-bottom losses observed in Run 2. When lowering the RF injection voltage from 6 MV to 4 MV it is observed that:

- The start-of-ramp losses are increased, especially in IP3. The lifetime drops to around 1h in the beginning of the ramp.
- The relative satellite population (BSRL) at arrival to flat-top is not degraded.
- The SPS-LHC transfer losses are around 0.20% for B1 and slightly higher for B2.
- There is an average loss rate of 0.05%/min (twice in the bunch head and tail).

The LHC and HL-LHC simulation estimates are to be updated with an improved model. Some preliminary conclusions are:

- The simulations show that LHC and HL-LHC injection losses are close to the thresholds for large injection errors and reduced injection voltage.
- It could be necessary to install two extra cavities per beam for HL-LHC if 7-8 MV are needed.
- If BLM thresholds can be increased, then the injection voltage could be lowered and the present RF power might be sufficient.

**B.Salvachua** comments on the plots in slide 7 and would like to have a list of the monitors and RSs corresponding to the outliers in Beam 1. **H.Timko** adds that it is not yet understood if the difference between the Beam 1 and Beam 2 losses come from the LHC or the SPS. **A.Lechner** would also like to know why some values for the maximum losses are low but still the maximum signal to ratio is high. It could be due to different RSs.

**B.Salvachua** comments on the plots in slide 8 indicating that the losses should not be above 0.5%, and the RF injection voltage should be adjusted to that value.

**H.Timko** comments that MDs will be needed at the beginning of Run 3 and the second year of the Run, with more intensity that will provide better measurements to determine

if there is some margin in the RF power or not.

## 2. Demo BLM Thresholds GUI, Georges-Henry Hemelsoet

G-H.Hemelsoet shows how the BLM Thresholds GUI works. The GUI can be accessed through the Application Launcher of BI and the CCM.

The GUI allows to see all the threshold families and make changes to them. New threshold families can also be created. The changes on the master thresholds are first done on the “stage” database and then on the “final” database which is used to generate the master table and the hardware settings.

The committing and reports section of the GUI is still under work. This will generate a report when going from the stage to the final database which includes all the changes done. There are also other functionalities to be implemented in the GUI, such as adding BLM channels to a threshold family.

**A.Lechner** asks if this information will be synchronized to the Layout database. **B.Salvachua** explains that the BLM information is distributed between the Layout database and Infor EAM. The correct path is to implement the changes first on the Layout database or Infor EAM and later synchronize with LSA. In principle, it should not be needed in the future to synchronize when there is a change in the thresholds. However, the Layout database was changed to a new server, and some properties are moved to Infor EAM, so the correct way to proceed if there is a change in the thresholds during the Run is still under discussion. **G-H.Hemelsoet** points out that the changes can only be driven to the BLM crates when there is no beam.

**A.Lechner** comments that it would be useful to see a list of the BLMs belonging to a family. **G-H.Hemelsoet** will add this functionality.

**A.Lechner** comments on the need to have a consistent tracking of the changes. **B.Salvachua** clarifies that in the specifications it was requested to Controls to get the values of the thresholds at any timestamp. **A.Lechner** adds that there should be a list of the changes done and the motivations for these changes. **B.Salvachua** and **G-H.Hemelsoet** agree that this could be implemented but is not a priority now. The main priority is to fix the bugs in the GUI, and the rest could be seen after the beam test in September.

The roles to change the master thresholds will be given in principle to B.Salvachua and C.Zamantzas (SY-BI-BL). BE-OP-LHC section will be able to change the monitor factors as a solution not to block operation in case B.Salvachua and C.Zamantzas could not be reached.

## 3. AOB

There will be a follow up meeting on the LHC injection losses, but it is not urgent for the start up next year. The focus now is on the BLMs in IP7 and the TCTs, but the injection losses should be considered for the collimators in IP3.