

Summary Notes: 10th Meeting of Sub Working Group on the Commissioning of the Machine Protection System, Wednesday 12th December 2007

Present: Reyes Alemany, Ralph Assmann, Bernd Dehning, Fernandez, Brennan Goddard, Andre Gomez, Magali Gruwe, Eva Barbara Holzer, Verena Kain, Alick Macpherson, Laurette Ponce, Bruno Puccio, Stefano Redaelli, Rudiger Schmidt, Mariusz Sapinski, Jan Uythoven, Jorg Wenniger, Markus Zerlauth.

CC: Roger Bailey, Mike Lamont, Walter Venturini

MTF Structure for MPS – Alick Macpherson

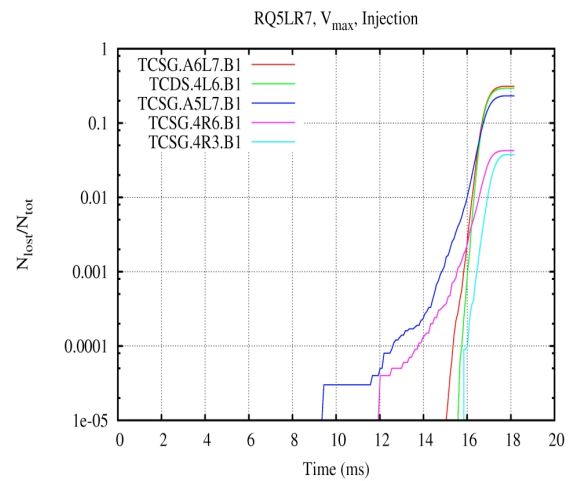
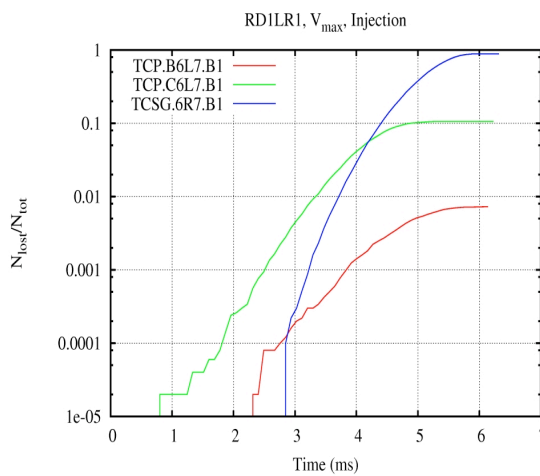
- Alick gave a brief description of the proposed MTF structure to be used for MP. The structure is a layered structure rather than the flat structure normally used in MTF. This layered structure is needed due to the large number of MPS steps in the MPS profile, and the large number (18) of systems that interact with the BIS.
 - The MPS aspects of the commissioning of the individual systems will be added in the MTF structure of the specific equipment. Reports will be generated to obtain a global view of the MPS commissioning
 - The layered structure is given here, and only applies to the MPS aspects of a systems MTF structure. ie the Installation and IST steps in a system's profile remain in the flat format.
 - The layered MTF format will be ready for testing by MPS in mid January, and should be released by end of January.
 - Brennan raised the issue of consistency and synchronization between the MPS procedures and the Beam commissioning procedures. At present there is nothing within MTF to ensure consistency and synchronisation, but it is now being discussed with the MTF team.
 - Ralph proposed to contact Thomas Weiler to check what has been generated in MTF for the collimation system
 - In January the MTF team will present the MTF changes being implemented for MPS.
- Alick mentioned the MPSC procedures in EDMS will be stored in the "OP area"

Collimator settings

Ralph mentioned that the collimator settings will be determined in the coming weeks. He was requested to summarise the results in the MPS Comm. WG.

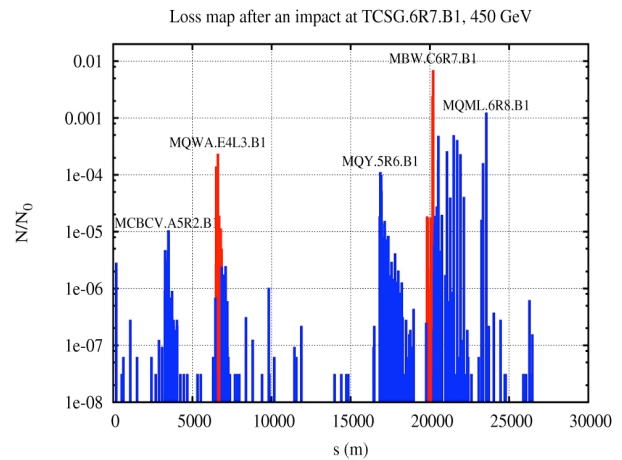
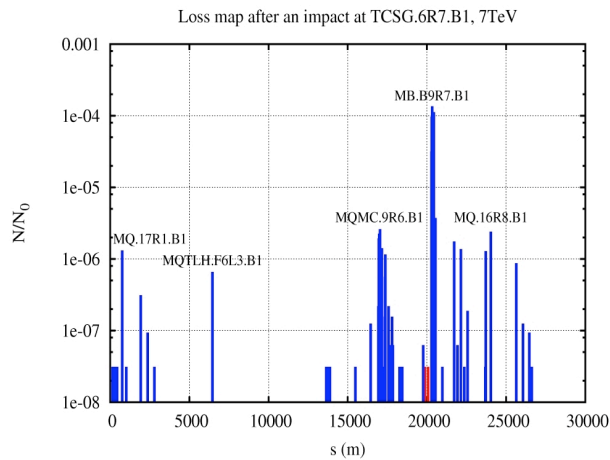
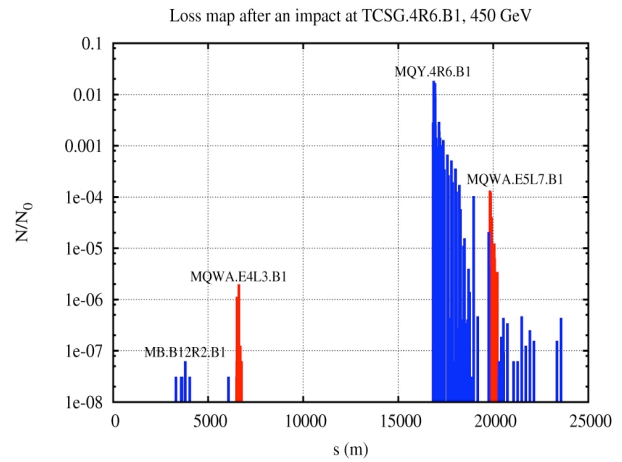
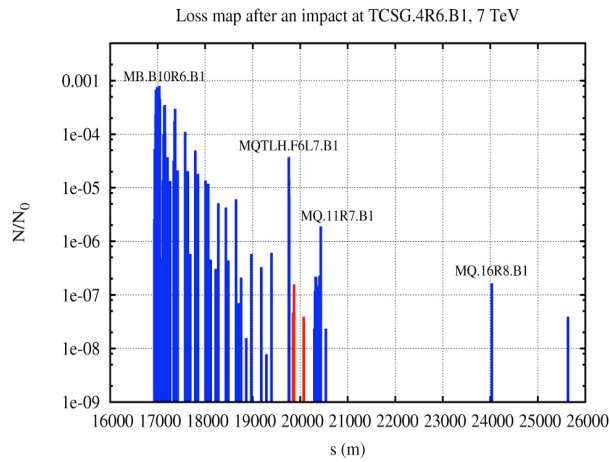
Loss Maps - Andres Gomez

- Andres presented his loss map calculations for losses on primary and secondary collimators
- While the loss maps on primary collimators seemed to follow the primary cleaning efficiency, some clarification is needed to explain the structure of the loss maps as a function of the impact parameter.
- Some concern was raised over the number of turns in the loss map simulations. Andres stated that he typically simulates ~ 5 turns, as very few particles appeared to be lost after more than 5 turns
 - Ralph pointed out that the collimation group typically simulates for 200 turns, as particles, after being perturbed, can have their orbit offsets diminished for a number of turns, and only later develop large orbit excursions.



- The worst case fractional losses (shown above) gives the losses from primary tracks. It was pointed out that more detail is needed here as an estimate of the fast losses are needed in order to understand the setting of the BLM thresholds. The BLM threshold can be set at 10^6 particles lost per turn (equivalent to 10^{-8} of nominal intensity).

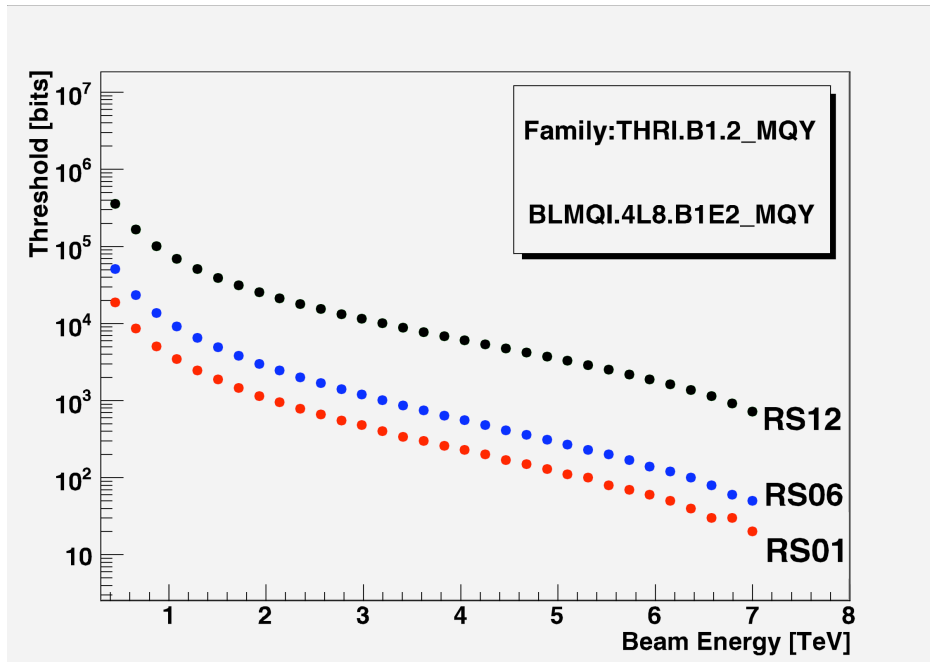
- For impacts in IR7, the plot below was given to show losses around the ring. This is shown only for beam one, and shows that losses are primarily at Pt6 and the end of the arc.



- Questions were raised concerning the loss pattern that would be expected for the following scenarios
 - A power cut at IR7
 - A ramp of the beam without the RF
 - This should be a slow loss that is picked up by the MPS.

Operational Scenario of the BLM – Laurette Pounce

- Laurette outlined the present baseline for BLM operation, and her talk can be found here.
- First it was pointed out that that for each of the 12 integration time scales of the BLM, there are 32 energy steps (from 450GeV to 7TeV).
 - The 32 energy steps is defined by the specification that the quench level be mapped out to within n%
 - Number of threshold: $32 * 12 * 4000 = 1536000$



- The seed for these parameterisation curves is the expected quench level at 7TeV.
- **Procedure for setting the BLM thresholds.**
 - For a given BLM, or family of BLMs, the procedure is as follows:
 - Use the seed value to generate the 32*12 points corresponding to the quench level parameterisation for that BLM or family of BLMs
 - Define the Master thresholds by applying a constant factor C to the quench level parameterisation. This Master table of thresholds is defined as the reference table for that BLM or family of BLM's, and is the table that is placed in the LSA database, and is backed up and protected. It will be impossible to set the BLM threshold above the value defined in the Master Table.
 - From the master tables, applied tables are generated, and these are the tables that are transmitted via MCS to the front end CPU. An applied table is generated from the Master table by multiplying by a factor F. Note that $0 < F < 1$.
 - With this baseline, the value of C has not yet been fixed, but C=5 was proposed.
 - The value of the Master table is such that it is always less than a conservative damage level. It is proposed that this conservative damage level be set at the Safe Beam Flag intensity for each given time range is taken.
 - It is foreseen that the operations team will be permitted to adjust the BLM thresholds of a given family BLM thresholds, which by definition will always stay below the levels defined in the Master table.
- **The BLM family structure.**
 - At present the BLMs are grouped by family, with ~239 BLM families in the present baseline. The family structure is given here.

- MPSC Concerns:
 - Does the present family structure prohibit localised adjustment of thresholds? ie can operations adjust individual members of a family?
 - Are the BLM families divided by point, or do they include the entire ring?
 - Can the BLM group implement Master tables for each BLM, and then do the family grouping as needed via software?
 - Can master tables be stored at the front end, so that then only the factors necessary to convert to an applied table need be transmitted.
- **BLM response to these concerns:**
 - **Present Baseline: Applied tables loaded into the front end from LSA data base. Limited number of families.**
 - This is implemented and tested. It is Based on an initial recommendation from the MPS WG, and has the BLM management of thresholds was done by families.
 - Note: 3 months was required for testing of the threshold loading to ensure the required reliability.
 - **Possible modification to present baseline: Significantly increase the number of BLM families.**
 - In order to allow for a high granularity of monitors, it may be possible to essentially assign each monitor to its own family.
 - BLM Response: This may be possible in terms of the BLM present implementation, but there may be issues related to the LSA database, given the substantial increase in number of master tables.
 - **Action:** Bernd to check and confirm the database issues related to a large number of BLM families (ie >> 239).
 - **Modification that is either difficult or impossible in the available time frame.**
 - The proposal was made to have the Master tables for each monitor pre-loaded into the front end, and then simply load the conversion factors F_i . This is deemed to be either difficult or impossible in the available time frame.
 - Reason: the FPGA on the DAB card does not support multiplication, and the front end CPU has been optimised for real time operation and reprogramming would take significant effort
 - **Conclusion:** This is not an option for the BLM system
- It is agreed that all BLM thresholds must be managed by MCS, but some clarity is required as it was stated that the BLM Operator App is to be a part of LSA, but the BLM Expert App is not. If this is the case, it must be confirmed that the threshold settings integrity is maintained.

- It was noted that having independent access to threshold settings builds in reliability to the system
- Comparison to the Master table comes on top of this. This will need to be checked periodically, like before injection.

AOB

- Next MPSC meeting
 - The BLM discussion will continue ...
 - Bernd will report back on the database issues pertaining to a significant increase in the number of BLM families.
 - Bernd Will present a summary of BLM operation at DESY, with attention given to loss locations and the lessons learnt
 - Similarly Ralph will make a summary of the experience from the Tevatron
- Details of the next meeting
 - **Date: 19th December**
 - **Time: 10:00 - 12:00**
 - **Room: Adams - 864**