MPP meeting 21 October 2011

Original agenda:

- Injection Losses vs operational availability in 2011 - Injection team
- Status and potential gain of ongoing mitigation measures (shielding, MSE/MST,...) - Injection team
- Limiting BLM monitors – what could be gained without sunglasses? - B.Holzer
- Possible safety issues with proposed implementation of BLM sunglasses – J.Emery
- AOB

Present:

B. Dehning (BE/BI), S. Wenig (PH/ADO), W. Bartmann (TE/ABT), S. Wagner (TE/MPE), A. Di Mauro (PH/ALICE), M. Koratzinos (TE/MPE), M. Zerlauth (TE/MPE), E.B. Holzer (BE/BI), V. Kain (BE/OP), A. Lechner (EN/STI), T. Baer (BE/OP), J. Wenninger (BE/OP), M. Hempel (TE/MPE), R. Schmidt (TE/MPE), G. Papotti (BE/OP), L. Jensen (BE/BI), L. Ponce (BE/OP), A. Nordt (BE/BI), C Bracco (TE/ABT), N. Bacchetta (PH/CMS), R. Jacobsson (PH/LHCB) and J. Blanco Sancho (TE/MPE).

Minutes:

Injection losses vs Operational Availability (V. Kain)

Verena presented the injection constrains, introduced the status of the LHC injection and analysed the dumps due to injection losses.

Verena commented that there is only 1 setup a year for the reference orbit in the transfer lines and this is implies that the center or the collimators is no the orbit.

Verena said that there is a very good injection quality but it is not stable (transfer line trajectories too unstable in the horizontal plane). Since mid July there have been fourteen beam 1 dumps and six beam 2 dumps. In order to avoid dump after high injection losses they start steering the line. This takes from ~ 30 min to 2 h (requires several shots). LHC orbit and TL orbit have drifted apart. This is killing the availability.

Ti2 instabilities are coming from the septum pulse. EPC is putting a lot of work to solve it. The idea is to change the PC to a 24kA with low inductance. TI8 instabilities come from ripple in SPS point 4 extraction kicker.

Markus asked if there are further plans to reduce scraping in the transfer lines. Too much scraping increases activation plus the injectors needs to give more beam.

Markus concluded that the problem is the reproducibility of steering. And BLMs sunglasses are not going to solve it.

List for Sunglass BLMs (W. Bartmann)

Wolfgang presented the status of injection loss mitigation. Injection losses can be grouped into three main categories: over-injection and MKI failure, transfer line showers and uncaptured beam. Ti2 and Ti8 shielding didn't work as expected from simulations. Ruediger: TCDI shielding can be further optimized? Ti8 no and Ti2 maybe. Annika proposed to shield the BLMs.

A more aggressive SPS scraping to reduce transfer line showers will activate SPS equipment. It was proposed to scrape the beam in a bump. In this way the irradiated area will be localized. For long term plans a fellow is working on LSS4. Joerg said that the activation problem is only being moved from one place to another. He was also worried about the electronics behind the bump. He proposed to do the bump towards the floor.

Opening TCDI gaps has no effect on the triplets. They are not affected by protons in the TCDI because they are too far away. A factor of 4 can be gain in the BLMs by going from 4.5 to 5 sigma. In the TCDI the dominant part is the uncaptured beam.

Moving/Adding TCDI collimator based on results of studies by E. Gianfelice. Joerg pointed that this will not be for LS1 but for LS2. Here the biggest problem is keeping the phase advance.

MSE flat top current peak to peak reduced from 22A to 9A. Experts have realized that the ripple phase changes from extraction to extraction. Stabilizing it will further improve the quality of extracted beam.

RF team is working to improve beam capture by increasing nominal voltage from 3.5MV to 6MV and blowing up longitudinal emittance to reach 1.2ns bunches.

A factor of 9 in TDI losses is gained with injection and abort gap cleaning.

Finally Wolfgang showed a list of mitigation techniques and its potential future gain. He said that SPS scraping will be worse for future larger emittances as you touch the beam core. Verena commented that it is expected to have larger emittances but less populated on the tails and so for a 3.5um with Gaussian profile it will not be a problem.

Concerning the opening gap of the TCDIs, Ruediger commented if in the long term TCDIs will have a BPM button. Joerg answered that the idea was rejected for LS1 due to lack of money. Another reason was that they will not give a very high accuracy. Joerg said that the ~50um accuracy will be sufficient.

The TCDI alignment it is currently done beam based (1MD). Transfer line and ring are not aligned; either you inject in the middle of a collimator and then induce injection oscillations or you create losses at TCDI.

Injection and abort gap cleaning will affect luminosity. Kickers don't have an infinite fast ramp for cleaning so you always have uncaptured beam. Making the pulse wider will impact luminosity.

Betatron BPMs and Diamond BLM will monitor tails, but there is no gain in losses.

Limiting BLM monitors – What could be gained without sunglasses (Eva Barbara Holzer)

Barbara compared the effects of filters and LICs and presented a list of BLMs with losses above 10% of threshold that could be equipped with filters or replaced by LICs.

Mike asked why there is such a big difference between the time constant of non-filter IC (0.3ms) and the ones with a small filter (2ms). Barbara answered that the difference is due to longer cables. The 0.3ms number comes from an average of all BLMs with short cables. That number was calculated by Mariuzs; it represents the time constant of an instantaneous loss measured in a BLM with a short cable.

Barbara commented that all LICs are at CERN and they are going to be tested.

Markus: why there is a factor 3 (Applied threshold) over a factor 5 (MF). It is to give some operational margin. Also with a MF 1 some BLMs. Bern: for the BLM MQX how much do you reduced the thresholds? Barbara: a factor 5-10 depends on the noise. This applies to all Running Sums as It is the MF.

Ruediger pointed out that the objective is to get gains some margin and asked what kind of operational margin is wanted? Markus: a factor 5 is ok for Brennan and me. Then we are speaking about 5-10 monitors. The problematic ones are on the injection regions not on the MQX.

Markus commented that using a LIC is preferable than filters as they give faster signal. On the other hand, they can give some noise at 4.5TeV.

Ruediger asked if the BLMs would be replaced or new ones would be installed. Bernd: replaced. Markus: this will give for the next years all the monitors at 20% dump level.

Laurette: will a magnet quench? Ruediger answered that is not worried about quenching a magnet at injection. For the moment we don't know the margin we have and if happens it will be used for calibration.

BLM electronics failure mode cases for the selected proposal on LHCBLM sunglasses (Jonathan Emery)

Jonathan presented the hardware and software changes that involves implementing the second proposal for the BLM sunglasses. Solution number two implies using LIC detectors and modifying the CS firmware.

The first unused energy level on for the detectors will be used to set the relaxed thresholds. The combiner card will be modified to receive the injection trigger and send it to the BLETCS during a fixed time. The energy that is published will reflect the energy level. Therefore if it gets stuck it can be detected by SIS.

Jonathan commented that the good thing about this solution is that after injection a lower set of thresholds can be used for the circulating beam at 450GeV. Barbara pointed out that they are not sunglasses as it is possible to measure losses (if they are below saturation).

Jonathan presented the critical functionalities to implement in CS firmware. CS firmware is frozen since 23-02-2010. A new version requires a new validation. Markus: what is the extend of the changes? How dangerous? Can be done before Xmas or on LS1? Jonathan: after a 1st validation it requires experience in operation.

Markus commented that it might be possible to go to solution 1 as there are only 10 monitors affected and the reduction factor needed is smaller. The threshold working group has to clean up the list of monitors and decide the thresholds.