MPP meeting 8 April 2011

Original agenda:

- MP test for collimators (A. Rossi).
- Worst case scenario simulations for (special) TOTEM runs (Y. Inntjore Levinsen).
- Direct BLM to LBDS – Proposed system setup, threshold and LBDS connection (E. B. Holzer, E. Carlier).
- AOB (all).

Present:

A.Macpherson (BE/OP), B.Todd (TE/MPE), B.Dehning (BE/BI), E.Nebot del Busto (BE/BI), E.Carlier (TE/ABT), J.Uythoven (TE/ABT), J.Wenninger (BE/OP), J.Blanco Sancho (TE/MPE), L.Ponce (BE/OP), M.Zerlauth (TE/MPE), M.Solfaroli (BE/OP), S.Wagner (TE/MPE), S.Redaelli (BE/OP), N.Bacchetta (PH/UCM), R.Jacobsson (PH/LBC), S.Wenig (PH/ADO), T.Baer (BE/OP), A. Rossi (BE/ABP), P.Fassnacht (PH/ADO), Y. Levinsen (BE/ABP), M.Deile (PH/TOT).

Minutes:

MP test for collimators (Adriana Rossi)

Adriana introduced the LHC collimation system, the collimator's instrumentation and mechanics, control system, machine protection and the software schema.

Concerning the position limits of the collimators, **Adriana** pointed out that the ramp & squeeze limits are calculated by **Bruce** (BE/ABP) and the Energy and beta* by **Stefano** (BE/OP).

Stefano remarked that the test verifying that the beam dump is activated for every limit are re-done after every long shutdown and after any significant change in the software.

Markus asked how the signals are spitted for the collimators connected to more than one BIC. **Stefano** explained that there are different outputs of the crates; there is different logic for injection or circulating beam.

Adriana commented that all test done for every collimator and per BIC connection are dumped into EMDS and MTF documentation is filled. The machine checkout entries at the Machine Protection web

page are also complemented. **Markus** commented that MTF documentation is equipment oriented therefore it might not be applicable to other systems.

Stefano explained that test on collimators can be launched on parallel on several BICs but no more than one collimator per BIC; it takes 5-10 minutes per collimator.

On Sunday 3-Apr-2011 the 400V distribution power was lost and the collimator settings at P7 were lost as posted on the Logbook. **Stefano** corrected that the settings were never lost but that after a power cut, the collimator's jaws are auto-retracted. Therefore the tilt table needs to be verified. In addition timing network was lost as well, implying the lost of the resolver's counters. A 100um error can be tolerated. The LVDT cannot be trusted to the 40um range. **Adriana** commented that **Ralph** plans to replace the current UPS with new ones that last longer.

Markus asked if the beta* limits are working. **Stefano** answered that the logic is functional and the connection to the BIC has been validated but they are not active yet because there are some bugs. They are waiting for a pilot beam to activate them.

Worst case scenario simulations for (special) TOTEM runs (Y. Inntjore Levinsen)

Yngve presented the simulation's results for the dump kicker prefire failure scenario (beam2). After a prefire of a dump kicker in P6, some protons will impact onto the roman pots of TOTEM in P5 then particles are track using SixTrack until they are lost on aperture. TOTEM roman pots have a $3\pi/2$ phase advance from the kickers.

Note: All the plots with the aperture losses presented on the study don't include collimators.

Roman pots are modeled as 5cm thick copper blocks at 6 sigma. From the simulations: 28% of incident protons have an inelastic interaction with the RP, the remaining 72% is lost mainly at IP7. **Yngve** pointed that modeling the RP as 0.5cm copper thick block gives a 3.8% inelastic interaction ratio, and this is probably more realistic.

Yngve commented that the study needs more statistics andvthe results would be more realistic if he would have had the distribution of protons after the interaction with the RP. This distribution could be provided by Federico using FLUKA/GEANT4. The shower of particles from the inelastic interactions could be tracked too if provided. It was commented that this distribution can be taken from old BLM simulations made by **Robert** using *40m* optics of the machine.

It was discussed that in case of beam hitting the middle of the RP window it could melt it. **Markus** explained that for the special TOTEM runs the TCDQ, TCDS collimators are set closer to beam, therefore we are more protected against asynchronous dumps.

Direct BLM to LBDS – Proposed system setup, threshold and LBDS connection (E. B. Holzer, E. Carlier).

Barbara explained the details of the BLM Direct Dump (BLMDD) monitors: hardware, dynamic range and connection to the LBDS. BLMDD are monitors (SEM) that are not connected through the BIS to the LBDS but instead they are directly connected to the LBDS, precisely to the Triggering and Synchronization Unit (TSU) of it.

The BLMDD monitors are placed on the left of IP6 and next to the TCSG and TCDQ. The connection schema of the BLMDD to the TSU consists of a first stage with a noise reduction filter, followed by an amplification stage and finally a comparator with a threshold voltage to trigger the dump. This voltage threshold can only be modified on the tunnel and the idea behind it is that it must be below an asynchronous beam dump but high enough to detect high losses on the region.

Barbara said that the idea is to test it with a battery directly connected to the system in order to simulate the trigger signal, as it was done in the past. This cannot be done now because the LBDS is in the BIS loop and so in not only the LBDS but the whole BIS must be armed.

Barbara proposed to impact a 450GeV beam of 1E11-2E12 Gy/protons on to a TCDQ (**Chiara Bracco** MPP review) to test the BLMDD interface with the LBDS. This is not possible as 1E10 protons is the maximum intensity of the probe beam. **Jorg** proposed to inject and make a bump on the region so we will be sure they are the only system triggering. **Etienne** pointed that LBDS system only timestamps with precision the first two triggering events therefore it would be difficult to see the BLMDD event.

An annex to this presentation “Calculation of direct dump IC monitor thresholds” is available on the folder of this MPP meeting.

Etienne presented two possible methods to implement the BLMDD- LBDS connection to the. The first one, previously commented, is a synchronous method via the TSU. It uses the dedicated intensity loops of the TSU to trigger the dump. The dump will be synchronous with the abort gap. The second method uses a connection to the retriggering units therefore the dump will be asynchronous. This method is redundant to the normal triggering path.

AOB:

Alick asked for more information about two alignment problems that were flagged in the BIS IPOC. **Ben** said that there were two separate problems, firstly the timing cards were updated, and the subsequent fec reboot left the UTC offset by one second in one fec, this error manifested itself as a timing alignment error in the BIS IPOC. The second alignment error was raised by the BIS IPOC in the next fill, this was due to the TCDQ triggering the redundant channels A and B with a large difference in time (> 300us). **Ben** concluded by saying that for the first case discussions are ongoing in the MI section to determine

whether the addition of a further “PM-3” type event would be a good idea to check the BIC timing alignment on demand, for the second case, it is correct that the BIS IPOC issues an error.