JointMB&UE@LHC

The following document combines the minutes of the first joint MB&UE@LHC meeting held at CERN on August 14, 2009 with the minutes of the planning meeting held at CERN on November 10, 2009. The planning meeting included Michaelangelo Mangano plus representatives from all four experiments (ATLAS, CMS, ALICE, LHCb).

***** JointMB&UE@LHC *****

Since the first joint meeting in August the four experiments (ATLAS, CMS, ALICE, LHCb) have officially endorsed the joint MB&UE@LHC effort and appointed their representatives. Together with Michaelangelo Mangano these representatives will convene the working group.

***** The Scope of JointMB&UE@LHC *****

We agreed that the joint MB&UE@LHC forum would include "min-bias" and "underlying event" studies as well as QCD Monte-Carlo model tuning and that the effort would include some selected theorists/phenomenologists as will as experimenters.

***** The Next JointMB&UE@LHC Meeting *****

(1) We agreed to hold another joint MB&UE@LHC meeting at CERN on Monday & Tuesday March 1-2, 2010.
(2) In an effort to get the right people at the next meeting, we agreed to ask the Standard Model, QCD, and Monte-Carlo Generator conveners of the four experiments to each identify up to 10 key people to attend the meetings and play an active role in activity of the working group. In addition we would invite some theorists/phenomenologists.
(3) The format of the next meeting is yet to be decided (*i.e.* one day or two, closed or open, etc.). We do not want the next meeting to be too large and we would like to be able to have an environment where we can constructive interactions. We agreed to think about this more before making a decision.

***** Action Items *****

We agreed to try and decide some items via E-mail before the next joint MB&UE@LHC in March. The things we would like to agree upon within the next few weeks are shown in red. Items that we can discuss more at the meeting in March and decide upon at that time are in black.

***** Reference QCD Monte-Carlo Model Tune (Perugia 0)*****

(1) We discussed possibly selecting a "reference tune", to perform common studies (*e.g.* determination of relative trigger efficiencies for single, double diffractive and non-diffractive events), and to make comparisons at the detector level of the early data. It was suggested that perhaps we could generate a common set of generator level events that we could all use to put through our detector simulations. This would save time and allow us to check on an event by event basis the impact of triggers by the different experiments, as a way of assessing the different experiments sensitivity to the various "min-bias" components (SD, DD, HC). In addition to the "reference tune" each collaboration, of course, would also use many other tunes of their choice.

(2) Rick Field, Torbjorn Sjostrand, and Peter Skands strongly recommend that we select the **PYTHIA 6.42 tune pyS320 (Perugia 0)**. It is run by setting the pytune number to 320 (*i.e.* MSTP(5)=320) and since it uses the new parton shower model you must use CALL PYEVNW instead of CALL PYEVNT. This new tune is very similar to Tune DW, but uses the new parton shower model and the new UE model.

***** JointMB&UE@LHC WEBsite *****

It has been suggested that we maintain a WEBsite to document the activities of the working group. The site could contain a "glossary of terminology" to define better the jargon that we use (*i.e.* MPI, pile-up, hard core, etc.). This would help in communicating with each other. If you approve this item, please send other suggestions of things to include.

**** Reference Plots ****

We identified a few "reference plots" (listed below) that could allow an early characterization of the properties of the UE and MB events. These "reference plots" are not meant to necessarily be the "state of the art" plots. Of course, each experiment will make many other (and in some cases better) plots. Also, in the next meeting in March we can add additional "reference plots". Rick Field has agreed to make predictions at the particle level (*i.e.* generator level) for all the selected "reference plots" using Tune S320 (*reference tune*) and Tune DW at 900 GeV and 7 TeV (within the next few weeks).

Suggested MB Reference Plots (with Min-Bias Trigger):

(MB1) dNchg/dη for PTmin = 0.5 GeV/c and PTmin = 0.9 GeV/c over the largest eta range covered by your experiment. We decided to do this for SD+DD+HC (what you see) and also to correct to just HC using the "reference" Monte-Carlo tune. Note that η is the true η, not detector-η. We also talked about also producing plots that require at least one charged particle per event in the plot (i.e. not including zeros). In addition, we discussed using true rapidity, y, instead of pseudorapidity, η (*i.e.* dNchg/dy). Since y depends on the mass of the particles, at the detector level, one would have to assume all the particles are pions. At the next meeting, we may we may want to add dNchg/dy to our list of "reference plots".

(MB2) dNchg/dPT for $|\eta| < 1$ and for a region that overlaps with LHCb (to be determined). We decided to do this for SD+DD+HC (what you see) and also to correct to just HC using the "reference" Monte-Carlo tune. For those experiments that can measure very small p_T, we may want to add $(1/p_T)$ dNchg/dPT to the list (*i.e.* dNchg/dP_T^2)

(MB3) Charged particle multiplicity distribution for PTmin = 0.5 GeV/c and PTmin = 0.9 GeV/c for $|\eta| < 1$ and for a region that overlaps with LHCb (to be determined).

Suggested UE Reference Plots (with Min-Bias Trigger):

(UE1) Average Nchg and average PTsum in the "toward", "away", "transverse" region as defined by the leading charged particle, PTmax, and as defined by the leading charged particle jet, chgjet#1, (**anti-KT algorithm, d = 0.5**) with PTmin = 0.5 GeV/c and PTmin = 0.9 GeV/c and $|\eta| < 1$ (range covered by CDF). The average Nchg and average PTsum in the "toward", "away", "transverse" region would be plotted versus the PT of the object that was used to define the three regions (*i.e.* PTmax or PT(chgjet#1)).