16 October 2002

AD-HOC WORKING GROUP ON LHC EXPERIMENT-MACHINE PARAMETER AND SIGNAL EXCHANGE

Minutes of the 4th Meeting held on 9 July 2002

Present: R. Assmann, B. Dehning, K. Eggert, N. Ellis, D. Evans, W. Herr, R. Jones, D. Macina, B. Muratori, A. Smith, W. Smith, S. Tapprogge, B. Taylor, E. Tsesmelis

1. APPROVAL OF THE MINUTES

The minutes of the 3rd Meeting were approved without modification.

2. LUMINOSITY CONSIDERATIONS FOR THE LHC

(Bruno Muratori)

Bruno Muratori presented results from additional calculations on the luminous region. The calculations shown at the June meeting were refined to include:

- A bunch length increase of 30% during a 10-hour coast and assuming that the increase is linear with time.
- The intensity falls of as $N = N_0 e^{(-t / 10)}$ so that $N \sim (1 / e)$ after 10 hours.

The luminous region remains largely unchanged compared to the results shown at the June meeting for which the above two parameters were assumed to be constant. For example, 95% of the luminous region is calculated to be within ±9 cm from the IP.

Detailed results are available on afs at:

/afs/cern.ch/user/b/bmurator/public/lumi

3. THE BEAM LOSS MONITORING SYSTEM

(Bernd Dehning)

Bernd Dehning reported on the LHC Beam Loss Monitors (BLMs). The monitors form an integral component of the machine protection system and can also be used as a beam diagnostic tool to optimise tuning of the accelerator. The system will detect shower particles outside the cryostats or near the collimators to determine the coil temperature increase due to particle losses.

The primary BLM parameters and characteristics are:

- Dynamic range between 10^6 to several 10^7.
- Update rate of 1 turn (89 μs).
- A threshold scaling during beam energy changes will be implemented.
- Each BLM channel will be connected to the machine beam abort system.
- Several average loss values will be compared with the loss duration depending on the magnet quench values.

Ionisation chambers will be used as BLMs. The baseline lay-out is an N_2-filled cylinder with a surface of 80 cm^2, a length of 19 cm and a bias voltage of 800 V to 1000 V.

Information from the BLMs would be available for use by the experiments. An evaluation of the type of information from the BLMs that can be used by the experiments is to be drawn up. Such information can be used, for example, to monitor the machine background. A further discussion on whether signals or data are to be transmitted and the rate of the transmission is needed.

[Action: LHC Experiments, K. Cornelis, B. Dehning]

4. DISCUSSION ON THE BEAM POSITION MONITORS

It was reiterated that two applications of the Experiment Beam Position Monitors (BPTX) have been identified by the experiments. They may be used to monitor the phase of the clock of the two beam locally at the interaction regions, thus determining whether the Timing and Trigger Control (TTC) system is synchronised with the actual arrival of the bunch. Moreover, the monitors can be used to identify the location of the gaps in the LHC bunch train, which is considered to particularly useful during the setting up stage of the experiments.

In order to develop the read-out and exploitation of the BPTX signals, a Technical Liaison Group is to be formed between representatives from the experiments and SL/BI.

[Action: E. Tsesmelis]

5. TEVATRON – CDF/D0 EXCHANGES – A FIRST LOOK

(S. Tapprogge)

S. Tapprogge presented a preliminary review of signal and parameter exchanges between the Tevatron accelerator and the CDF & D0 experiments. He offered to collect additional information based on questions from members of this Working Group.

[Action: All]

In addition to the FNAL accelerator control systems and ACNET, the protocol used to define the transport mechanism for data acquisition and client-server communication, several hardware links are also available. Data exchanged includes the time evolution of rates and luminosity, status information and parameters, the radiation dose in the experiment silicon detectors, background rates, and halo and beam loss rates.

6. UTC TIME STANDARD

(Gary Beetham)

Gary Beetham reported on the time standard to be used at the LHC. The LHC data from the machine and experiments will have an absolute UTC time stamp, which will be derived from several GPS modules. These modules will be located centrally in the PS Complex, with auxiliary modules at each of the other accelerators and at each pit of the LHC from where a fibre may be connected to the experiments.

7. A.O.B.

According to current ideas, following the setting up of the LHC machine with single bunch beams, the accelerator will be commissioned with multiple bunch beams. Beams for commissioning the accelerator with multiple bunches will have lower than nominal beam power in order to reduce the risk of quench and damage to the machine. This will be done by running with a 75 ns bunch spacing, corresponding to 940 bunches, and about one-quarter of the nominal bunch current. Under these conditions, the peak luminosity during this commissioning phase cannot exceed 2 10^{32} cm^{-2} s^{-1}. Running with these conditions for the equivalent of 200 days could yield an integrated luminosity of ~2 fb^{-1}. After optimisation of the machine, the aim is to reach an instantaneous luminosity of 2 10^{33} cm^{-2} s^{-1} which could yield ~ 10 fb^{-1} of integrated luminosity in a 200-day equivalent run.

It should be noted that due to LHC machine staging, which includes the partial installation of the dump dilution kickers, running at 75 ns bunch spacing in order to reduce the electron cloud effect and delaying installation of the 200 MHz RF capture system, a peak luminosity of 10^{34} cm^{-2} s^{-1} is ruled out for the initial physics run.

8. NEXT MEETING

The next meeting of the working group will be held on Monday, 21 October at 16:00.

E. Tsesmelis