17 October 2003

LHC EXPERIMENT-ACCELERATOR DATA EXCHANGE WORKING GROUP (LEADE)

Minutes of the 12th Meeting held on 18 August, 2003

Present: P. Baudrenghien, P. Collier, D. Evans, K. Gill, P. Graftstrom, C. Ilgner, R. Jacobsson, R. Jones, D. Macina, A. Smith, W. Smith, E. Tsesmelis, T. Wengler

1. MATTERS ARISING

The minutes of the 11th LEADE meeting were approved with the following modification: in Section 2, the luminosity in Phase 1 should read 6×10^{31} cm^{-2} s^{-1} and the number of bunches in Phase 3 is 2808.

The Working Group noted the comments from the experiments on the specification for the Beam Synchronous Timing Receiver Interface for the Beam Observation System. The current baseline has the boards running on LINUX and not on LynxOS, and the experiments are requested to investigate possibilities to incorporate the LINUX operating system. Moreover, it was noted that the mezzanine boards are currently being produced by the EP Pool and are intended to work with any VME-64 backplane.

Comments were also received for the specification regarding the LHC Luminosity Monitor (Luminometer). W. Smith reiterated the need for the luminometer to make measurements on a bunch-to-bunch basis. Moreover, P. Grafström suggested that a presentation be given in a future LEADE meeting providing preliminary strategies on the procedure and accuracy of the luminometer calibration. Finally, D. Macina reminded the Working Group that absorbers for the luminometer are not in place IR2 and IR8 and should be put in the plan.

Action: P. Grafström, D. Macina

For proton running, the experiments confirmed that measurement of the satellite intensity down to the percent level was acceptable, thus not requiring any upgrade to the instrumentation in the SPS. The case for heavy-ion running needs to be re-visited as it is difficult to measure the relatively low intensity ion beam.

G. Beetham informed the Working Group via e-mail that installation of experiment-machine interface racks in the underground experimental areas was presented to the Operation of AB Controls Meeting and to the AB/CO Steering Board. It was confirmed that 2 racks are requested per experimental area and details of their composition is being followed up.

Action: G. Beetham

2. PROTON & ION-BUNCH DISPOSITION AT THE LHC
(P. Collier)

P. Collier presented the proton and ion bunch disposition in the LHC, SPS and PS machines.

He reminded the Working Group of the basic LHC parameters. The harmonic numbers (h) of the LHC are:

h=35640 at 400 MHz
h=17820 at 200 MHz
h= 3564 at 40 MHz.

Bunch separations, that are a multiple of 25 ns, can be produced as follows:

- 25 ns: routine
- 50 ns: done
- 75 ns: trials in progress
- 100 ns: exists on paper (for ions).

In addition, single LHC bunches can be delivered.

The SPS harmonic numbers (h) are:

h=4620 at 200 MHz
h= 924 at 40 MHz (25 ns, 924*27/7=3564).

The SPS can take several injections from the PS, but is limited to four for proton operations due to intensity constraints.

Limitations to filling the LHC include those from the beam dump gap, injection kicker rise-time, SPS injection kicker rise-time, LHC injection kicker flat-top length, the collision point offset at IP8, the 4-fold rotational symmetry and the need to minimise Pacman bunches.

P. Collier presented the following filling schemes:

- 25 ns with 2808 bunches per ring at IP1 and IP5, 2736 bunches per ring at IP2 and 2632 bunches per ring at IP8.

- 75 ns scheme planned for early operation to minimise beam power and to avoid electron cloud problems. This bunch spacing provides the largest spacing naturally giving collisions in LHCb.

- 43-bunch scheme for TOTEM/initial physics beam. It will use single bunches from the PS giving equally-spaced bunches around the machine, but no collisions in LHCb. In the case of the proposed scheme, there are however no

collisions in LHCb. This can be cured by moving some of the bunches in one ring by 75 ns.

- 100 ns scheme for heavy ions (592 bunches per ring) – quite complicated, with never more than 4 bunches in a row.

- 62-bunch scheme for ions or protons, designed as a simple start-up scheme, avoiding complications in the injectors. This scheme consists of 4 long trains with 16 (14) bunches spaced by 1.35 μs bunches in the trains.

There is a clear need that LHC broadcasts a signal containing the information on the bunch pattern, on which any experiment/equipment can synchronize. In all communications "bunch 1" means the first bunch after the dump gap.

Its likely that many other schemes will be invented during the lifetime of the LHC.

A paper on these issues will soon be published and available to LEADE.

3. BPTX READ-OUT BASED ON ALICE T0 DETECTOR ELECTRONICS

(D. Evans)

D. Evans presented the ALICE T0 detector electronics in view of their potential use for the read-out of the BPTX.

The T0 is a triggering detector for the ALICE Level-0 trigger, asymmetrically placed around IP2, consisting of 2 arrays of 12 PMTs with quartz radiators. Providing times and energies, the system is capable of delivering precise timing (50 ps) which leads to a vertex reconstruction accuracy of 7.5 mm. The Technical Design Report for the detector will be submitted by the end of 2003.

Prototype electronics for the T0 are available, with a cost per channel in the order of CHF 20, indicating that such electronics can be procured for the BPTX at relatively low cost. The electronics alone have a timing resolution of (~25 ps), corresponding to a vertex resolution of ~4 mm.

The ORTEC 9307 system ("pico-TIMING™" Discriminator) module will house the electronics. The module can withstand burst rates up to 100 MHz, has an operating temperature range of 0-50°C and accepts input pulse widths from 400 ps to 5 ns. The time slewing (walk) is less than +50 ps for signal amplitudes from –50 mV to –5V.

Further work includes clarifying some information from the BPTX, such as what is the physical form of the pulses. A presentation will be given at a future meeting of LEADE.

Action: D. Evans

In parallel, work is continuing to evaluate the use of a digital scope for the read-out.

Remaining Provisional Dates for 2003 Meetings:

27 October
10 November
15 December

C. Ilgner/ E. Tsesmelis