11 December 2002

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

Minutes of the 6th Meeting held on 18 November 2002

Present: R. Assmann, V. Avati, P. Baudrenghien, K. Cornelis, K. Eggert, N. Ellis, K. Gill, P. Grafström, W. Herr, M. Huhtinen, R. Jones, J-P. Koutchouk, D. Macina, A. Macpherson, R. Schmidt, A. Smith, W. Smith, P. Strubin, E. Tsesmelis

1. APPROVAL OF THE MINUTES

The minutes of the 5th Meeting were approved without modification.

2. CHOICE OF CROSSING ANGLE PLANES

(R. Assmann)

Ralph Assmann presented the status of the discussions concerning the beam crossing at the LHC.

He reported that the LHC Commissioning Committee (LCC) had discussed this topic at its meeting on 6 November 2002 (http://lhc.web.cern.ch/lhc/lcc/lcc.htm) and made the following observations:

- Results from new energy deposition simulations for the triplets show no significant difference between crossing planes.
- The horizontal-vertical alternate crossing scheme at IP1 and IP5 was shown to be required for compensating long-range beam-beam effects.
- Due to the difficulties in procurring the marguerite-shaped beam screens and the tight schedule for the screen installation in the LHC, the race-track beam screen has been adopted as the baseline.
- However, the marguerite beam screen will continue to be investigated and, if deemed necessary, could be installed after initial running and in time for the nominal LHC operation conditions. The installation time is estimated to be about 6 months, i.e. it would just fit within a normal LHC shutdown period.
- A wire compensation scheme is being developed to potentially help compensate long-range beam-beam effects. Although it is not part of the LHC baseline, it is can be installed during a normal LHC shutdown period.

3. ENERGY DEPOSITION IN THE TRIPLET MAGNETS

(Daniela Macina)

Daniela Macina reported on the recent results from Nikolai Mokhov concerning the power density in the triplet magnets for horizontal and vertical crossing angles.

The new results show that the peak power deposition for a crossing angle in the vertical plane is approximately equal to that for a crossing angle in the horizontal plane. In both cases the simulations yield a peak power deposition of between 0.4 mW/g and 0.45 mW/g, with the only difference between the two cases being the location of the peak power deposition. In the case of a vertical crossing plane, the peak losses occur near the entrance of the Q2a magnet, while for a horizontal crossing plane they occur near the exit of the Q2b magnet. Moreover, new estimates of the triplet quench limits, derived from thermal models, indicate a maximum tolerable loss of 1.6 mW/g, which is higher than the previously estimated 1.2 mW/g. Together with the estimates for the peak power deposition in the triplets, this yields a safety margin of between 3.5 and 4, which is approximately compatible with the required general safety margin of 4 set for the arc dipole magnets.

A number of issues requiring further clarification were brought up at recent meetings of LEMIC and the LCC. The primary concerns are with the estimated error on the peak power density in the coils and the sensitivity to the physics model used to generate interactions at 14 TeV centre-of-mass energies, the estimated inner triplet quench limits and the detailed lay-out and geometry of the triplets. N. Mokhov has provided additional information on these points that may be found in the accompanying annexes.

4. FUNCTIONAL SPECIFICATION: MEASUREMENT OF THE LUMINOSITY AND BACKGROUNDS AT THE LHC

(Ralph Assmann & J.-P. Koutchouck)

R. Assman and J.-P. Koutchouk reported on the functional specification for the measurement of luminosity and backgrounds at the LHC.

The functional specification defines the requirements for the measurement of collision parameters, such as the relative luminosity and background rates at the four LHC interaction points. The measurements involve the following beam observables:

- the relative luminosity, and
- the backgrounds to the experiments

and the following derived parameters:

- the beam crossing angle, and
- the transverse and longitudinal offsets of the vertex.

It is assumed that the experiments will measure their own absolute luminosity. However, standardised, simple, fast and robust machine instrumentation will be required to set up and optimise the machine for physics and to compare operating conditions from run-to-run by measuring relative collision rates.

Moreover, experience at other colliders has shown that standardised background monitors are useful. Development of diamond detectors and their installation around the beampipe close to the IPs may be used for such measurements. A presentation on this work will be given at the next meeting of the WG.

Ralph and Jean-Pierre also presented the various beam and machine operating conditions under which these measurements will be made. These include the commissioning phase as well as the initial, nominal and ultimate running periods.

The following points were made during the ensuing discussion:

- The TOTEM dedicated runs will be made at zero beam crossing angle. The quoted possibility to measure the crossing-angle with the beam instrumentation to an accuracy of ± 6 μrad could significantly reduce the acceptance of the TOTEM Roman Pots and hence of the total cross-section measurement. Such an uncertainty might also have implications for the other experiments, and the other collaborations are invited to evaluate the effect of this uncertainty.

- Further discussion is required to detail the differences in the machine instrumentation requirements for the proton and ion running.

- The fast and robust exchange of the measured information between the machine and the experiments needs to be ensured. To this end, a presentation from the LHC Data Interchange Working Group (LDIWG), which has been mandated to set up such communication links, will be given at the next meeting of the WG. In the meantime, the final report from the initial phase of the LDIWG, giving a list of information to be exchanged together with the expected bandwidth, may be found in the annexes to these minutes.

5. A.O.B.

The 1st LHC Machine-Experiments Joint Workshop on Luminosity Measurements at the LHC will be held on Monday, 9 December.

Future meetings of the WG will be held on the following Mondays starting at **16:00** in the **Conference Room Bat. 14-4-030**.

Provisional Dates for 2003 Meetings:

27 January
3 March
7 April
26 May
7 July
18 August
13 October
1 December