LARGE HADRON COLLIDER COMMITTEE

Minutes of the ninety-second meeting held on
Wednesday and Thursday, 20-21 February 2008

OPEN SESSION

1. LHC Status Report: Lyn Evans
2. ALICE Status Report: Juergen Schukraft
3. CMS Status Report: Tejinder Virdee
4. RD42 Status Report: Harris Kagan

CLOSED SESSION:


* part-time
** for item 6

Apologies: F. Forti, M. Mangano

1. PROCEDURE
   The minutes of the ninety-first LHCC meeting (LHCC 2007-030 / LHCC 91) and the report from the LCG Comprehensive Review (LHCC-2007-031 / LHCC-G-138) were approved.

2. REPORT FROM THE CHIEF SCIENTIFIC OFFICER
   The Chief Scientific Officer (CSO) reported on general issues related to the LHC. With the approval of LINAC4, new initiatives to improve the performance of the LHC are starting to be implemented. He also mentioned the strengthening of the Fellowship programme in PH Department in order to support the LHC exploitation phase. Preparations are on-going for the April meetings of the Resource Review Boards, including the second meeting of the Computing Resources Scrutiny Group. In an effort to provide a sustainable GRID infrastructure for the LHC exploitation phase, the European Grid Initiative (EGI) has been launched to succeed Enabling Grids for e-Science in Europe EGEE-III and has already been pre-funded by the European Union Framework Programme 7 (FP7).

3. REPORT ON THE ATLAS MINI-REVIEW
   The LHCC heard a report on the first ATLAS Mini-Review, concentrating on the status of the installation of sub-detectors, progress with commissioning and
preparations for first beam and for first physics. The Inner Detector (ID), End-Cap Toroid (ECT) magnets and Calorimeters (LAr and Tile) are the sub-detectors having an impact presently on the overall ATLAS schedule of installation and commissioning.

### ID Installation and Commissioning

The ID includes four sub-systems: Pixels (0.8x10^8 channels), Semiconductor Tracker (SCT) (6x10^6 channels), Transition Radiation Tracker (TRT) (4x10^5 channels), and Common ID items.

The TRT has made steady progress and is the most advanced part of ID. The commissioning is close to completion. The TRT is partially equipped with final production Read-Out Drivers (RODs) for which 45% for the barrel and 40% for the End-cap A are in place. The TRT PP2 patch panels are not thermally neutral and heat up the Resistive Plate Chambers (RPCs) due to hot air flow, resulting lifetime issues for the RPCs. A solution of installing a blanket to confine the air is being considered. Signals and noise levels of the TRT are under study. The TRT low voltage power supplies (Wiener Maraton) had two cooling water leak incidents due to material failure and are being replaced.

The SCT has been signed off, including the end-caps. Measurements show a good noise performance. There are two leaky cooling loops identified in the End-cap SCT ECC (disk N9), one of which is acceptable for LHC operation. There are 13 non-functioning SCT modules, but this rate is considered acceptable. The LHCC considers that it is important to make a global alignment of ID sub-detectors (except for the Pixel Detector) during the forthcoming M6 commissioning period.

The Pixel sign-off is the most critical issue. It is difficult to restore the accumulated delay estimated as two weeks. Close exchange of information with the LHC machine on the respective schedules will be needed in early April 2008 to ensure that the ATLAS experiment can take prudent decisions regarding the programme and schedule for its Pixel Detector check out.

### Muon System Installation & Commissioning

Installation and commissioning of the Muon System is advancing well. Installation of the Small Wheels is close to completion. There are no major concerns. However, there are some issues to be resolved. In particular, the RPC gas recirculation system filter has problems similar to those of CMS and both detector groups are working on a common solution; 80 RPC gas inlet connectors have been broken off and 43 of them already repaired; the RPC commissioning rate should be doubled and this can be achieved by re-allocating resources from the completed installation stage to the commissioning effort; the Thin Gap Chamber (TGC) power supply installation is delayed due to a power supply production failure rate of ~10% and this installation is now being managed together with the installation of the EO.

### ECT and Calorimeter Commissioning

Due to several reasons, including an accident during the first ECT test and the delay with the Pixel Detector commissioning, the ATLAS Toroid Magnet final commissioning plans have been reconsidered and postponed to start in May 2008. The ECT tests have been partially fulfilled to 50% (ECT-A) and to 75% (ECT-B) of nominal field. The combined magnet tests will be either completed or terminated when the LHC starts up with first beam. All the magnets are working well and there are no concerns except that the final test could be shortened by the LHC start-up with first beam.

The Calorimeter commissioning is going well. The LAr exhaust pipe was damaged by the ECT accident, but the inner pipe was not affected, the cryostat was emptied of LAr
but kept cold, and the in situ repair to the outer pipe was completed successfully. The LAr cryogenic system is functioning well and the commissioning of the electronics is approaching completion. Sources of noise have either been fixed or are under investigation. A concern is related to long-term operation of low voltage power supplies and a new vendor is being sought. The commissioning of the Tile Calorimeter is expected to be complete by April 2008 and no major concerns were reported.

The present schedule to complete the Calorimeter commissioning is tight. Weekly meetings are organised in order to detail the remaining schedule. The overall Calorimeter completion plan is reasonable but it could have an impact on the final commissioning of the Pixel Detector. Information on any changes to the LHC machine schedule would be required early enough by ATLAS in order to plan their remaining commissioning work.

Preparations for the First LHC Run and Physics

The corresponding activity is related to calibration and alignment, run coordination, overall commissioning in the framework of M5 and M6 runs, Full Dress Rehearsals (FDRs), data quality monitoring and other work.

An exhaustive list of procedures for the calibration and alignment of the ATLAS detector are being developed. The procedures include online electronic calibrations and offline calibration/alignments based on dedicated calibration data streams. At LHC start-up the ‘offline’ procedures will probably run at the Calibration and Analysis Facility (CAF) with dedicated queues and later moved to the Tier-0 centre, with some level of human intervention probably being required at the beginning. Two main categories are distinguished: tasks to be run in between LHC fills and tasks to provide new constants/parameters within 24/48h prior to prompt reconstruction. Definition and implementation of dedicated data streams are well-advanced and tested in FDR-1. Considerable progress has been made in understanding the calibration/alignment problems and in implementing the needed software algorithms, and this has been partially exercised during the FDR-1. Additional work to fully understand all details, including the residual weak modes in the ID alignment, should be done. The global ATLAS procedure for obtaining calibration and alignment within 24h is becoming clearer. This procedure is highly non-trivial and manpower intensive. The LHCC recommends reducing the overall complexity, at least during the early physics data-taking phase, by incorporating a number of measures such as implementing standard procedures among sub-systems, avoiding shipping data to the Tier-1 and Tier-2 centres, starting with the essential calibration/alignment parameters, and minimizing/combining data streams.

The organization of the run coordination is well-defined and it prescribes detailed procedures for shift participants. The shift leader obligations are not yet fully understood and require further clarification.

The M5 run was very efficient for the combined commissioning and for involving many ATLAS sub-detectors, including RPCs, Monitored Drift Tube (MDT) muon chambers, TGCs and the LAr and Tile Calorimeters. M6 is important for involving the remaining ATLAS parts in a combined commissioning and for moving towards LHC beam operation. ATLAS readiness for first LHC beam is well-planned, and includes a global cosmic run starting two months before LHC start-up with beam.

The Data Quality (DQ) Group is working since 2007 using the common ATHENA Monitoring Framework, and is developing a Web display of offline histograms. The Data Flow is well-designed for both online and offline Data Quality Assessments. The online DQ was tested and developed at various commissioning run weeks in 2007. The basic tools are available and reliable, its usage by detector experts is growing, and only
a few more additions needed. The offline DQ has passed the first real test at the recent FDR-1. Some more tools are required, such as status database tools, or to be improved, such as the display. A new structure of Status Flags has been developed. A list of Meta Data has been prepared and the corresponding implementation for Status Flags definition, for TAG database preparation, for Web services and for other tools of DQ monitoring has been developed.

The present status of Data Quality Monitoring (DQM) is at the stage of development and will provide tools for setting-up and testing the DQ machinery. A shift of focus from using those tools to establishing full DQ chain from the low-level up to DQ status flags is needed. The Committee encourages the detector and combined performance experts to work on a selection of useful histograms and useful checks. Technical solutions are being studied for world-wide remote monitoring.

The principal goals of the FDRs are the following: a) to provide a realistic end-to-end test of the computing model from online to analysis at the Tier-2 centres, b) to test the triggers and database infrastructure, and c) to exercise the calibration and alignment. Two FDR phases, with each FDR phase running for one week are planned: FDR-1, simulating data corresponding to $L \approx 10^{31}$ cm$^{-2}$s$^{-1}$, and FDR-2, simulating data corresponding to $L \approx 10^{33}$ cm$^{-2}$s$^{-1}$. For FDR-1, the simulated data-taking took place during 4-8 February 2008, with data distribution and analysis still ongoing. FDR-2 is scheduled for May 2008.

Already, FDR-1 has resulted in very valuable experience for general operations, alignment, and particularly for DQM, and the end-to-end calibration workflow, at least for selected tasks. Most of these targets have been reached so far, although the shake-down of software components turned out to be more work than expected, and the resulting event sample was smaller than planned for. The full complexity of a large number of concurrent alignment and calibration tasks has not yet been faced and many workflows remain untested. The FDR-2 will be the last opportunity to test these before LHC data-taking and should also be used to exercise the final production infrastructure at the CAF. The physics analysis part needs to be strengthened since the involvement of about 20 analysis users as in FDR-1 is not sufficient to simulate real “chaotic” analysis traffic.

**Overall Conclusion**

The LHCC notes that the major ATLAS detector parts, except for the Pixel Detector, are close to completing their commissioning and the preparation for the first LHC run and physics is well-advanced. The Committee considers that it is realistic to expect ATLAS to have an initial working detector for the start of LHC operation in 2008.

### 4. REPORT ON THE LHCb MINI-REVIEW

The LHCC heard a report on the first LHCb Mini-review, concentrating on the status of the installation of sub-detectors, progress with commissioning and preparations for first beam and for first physics.

**Installation of Sub-detectors**

Installation is essentially completed for the majority of all sub-detectors and their commissioning is well-underway. Commissioning of the dipole magnet and experimental beam pipe is complete. A beryllium experimental beam pipe is being prepared to take the place of the installed vacuum chamber whose quality has been questioned due to the use of vacuum varnish.

Installation of both VELO halves was completed in November 2007 and commissioning of the detectors and the cooling system is in progress. The goal is to test the VELO with the beam pipe under vacuum in March 2008. R&D for the replacement of the RF foil, which developed a leak between the beam pipe vacuum
and secondary vacuum, is ongoing. The leak is considered to be very small and, therefore, is not expected to cause short-term operating problems for LHCb or the LHC machine.

For the Trigger Tracker (TT) and Inner Tracker (IT) all service boxes and cables are installed and installation of the ladders into the already-installed detector boxes is underway and is expected to be completed by mid March 2008. For both systems the C$_6$F$_{14}$ cooling system has been successfully tested.

All three stations of the Outer Tracker (OT) are mounted on 12 C-frames and are fully equipped with detectors. The position of all stations has been adjusted and surveyed. About 80% of the detectors are equipped with electronics and the rest will be installed in April 2008. The gas system has become fully operational recently and its commissioning is ongoing. Installation of scintillator planes enable data taking of cosmic events, and which have been used to study the performance of the detector and to exercise online tools. Concerning the observed ageing effects, one complete F-module has been built at NIKHEF using Tra-Bond glue. This new glue replaces the Araldite, which previously had been identified in a test set-up as being responsible for the observed ageing of the OT modules. Ageing tests of this new module have started and it is encouraging that after 100 hours of irradiation no signs of ageing have been observed. For a definitive answer these tests will have to be continued. In parallel, in situ heating of the already installed modules has started. Subsequent ageing tests of two of these heat-treated modules are however inconclusive since one of them still suffers from a significant gain loss after irradiation. The LHCC notes that the issue of the OT ageing remains a serious concern.

Good progress was reported in the area of RICH installation. The gas enclosure of RICH-1 has been leak tested and all mirrors are installed. The Aerogel radiator is ready for installation and the upper Hybrid Photo Diode (HPD) box has been installed. The lower box is expected to be ready by early April 2008. Outstanding items are the quartz windows and the photon funnel, which required a new design and for which the schedule for completion has become very tight. RICH-2 has been successfully operated for several months and commissioning takes place as part of the global commissioning. Of the 288 HPDs of RICH-2, already 17 had to be replaced due to vacuum problems and a further 8 start to show a similar behavior. The symptom is an increase of Si-bias current during ramping of the high voltage starting at a value around 3 kV with a sudden drop at around 13 kV, which can be reproduced under laboratory conditions and is consistent with the onset of a glow discharge. Investigations on understanding the origin of the problem are ongoing. The LHCC notes that since the growing number of tubes that are affected may indicate an intrinsic defect of this type of detector, this problem is a major concern.

Commissioning of both LHCb calorimeters is progressing well and useful cosmic data have been taken triggered by a coincidence from signals of the Electromagnetic (ECAL) and the Hadronic (HCAL) calorimeters.

The installation of the chambers of the muon stations M2-M5, including the gas system, high voltage hardware and electronics, is almost complete and tests are progressing well. For station M1 the support walls and part of auxiliary systems like gas or low voltage cables have been installed. The goal is to have at least a small fraction of the M1 chambers installed when the experiment will be closed.

Hardware installation of the L0 system with the exception of the L0 pile-up unit (L0PU) is complete and commissioning of the system will be completed by the end of February 2008. The subsequent months will be used for extensive reliability tests.

The hardware foreseen for the 2008 set-up of the online system has been installed with the exception of 200 farm nodes for which delivery is expected for the end of April 2008. Data have routinely been written to the online storage system and online monitoring tools are in place.

A survey of strategic points of the whole detector system has been performed during a magnet test. Significant movement at the level of 1 mm was observed for the RICH-1...
shield and gas vessel, and which required a modification of the fixation system. The repair of the mixed water pipes that suffered from leaks at several welds was successful but led to a delay of the restart of the commissioning after the Christmas break by 2.5 weeks. Further interference with the ongoing commissioning has to be expected from a recently detected problem in the cooling system of the Maraton power supplies. About 90 of these units will have to be sent back in several batches to the manufacturer for repair.

Commissioning

The strategy for the coming months is to have regular commissioning weeks devoted to the operation of the experiment with all its components together and with all the experts being available to solve problems as they arise. In the remaining weeks emphasis will be shifted to finalizing the hardware work. During the first of these commissioning weeks in February 2008 many systems already participated in a common run and there is a clear plan to gradually include the missing detectors with the aim to be ready for first beam in the preferred direction (Beam 1), which will be used to do the fine alignment of the entire detector. Discussions among machine experts and the experiments have started on early start-up scenarios. The LHCC took note of ideas on alternative bunch filling schemes that have the potential to fulfill the needs of all experiments to get useful proton-proton data in this early phase of LHC operation. The LHCC encourages such studies provided they do not compromise the progress of the machine commissioning.

Computing

The LHCb computing Grid is based on the DIRAC system that provides high-level generic and LHCb-specific services. Most components of the most-recent version of this system, DIRAC3, are ready, integrated and tested. A full rehearsal started in February 2008 within the framework of the Combined Computing Readiness Challenge 2008 (CCRC08) with the goal to reach full functionality by the end of March 2008 and to be ready for the second phase of the challenge in May 2008. For LHCb the challenge comprises uploading data from the online system to the Tier-0 centre storage (CERN Castor) using the DIRAC framework and distribution of the raw data to the six external Tier-1 centres using the gLite file transfer system. Furthermore, the raw data will be reconstructed at the Tier-0 and Tier-1 centres and stored on so-called rDSTs. Data access makes use of version 2.2 of the Storage Resource Manager (SRM v2.2). In May 2008, stripping of the reconstructed data will be exercised. Initial data transfer tests from the pit to the Tier-0 centre at a sustained nominal rate of 60 MB/s followed by the migration of the data to tape and the transfers from the Tier-0 to the Tier-1 centres were successful. The LHCC notes that the real challenge of simultaneous data transfer from all 4 experiments at nominal rate and simultaneous data reconstruction still lies ahead.

Physics Software

LHCb software for physics is based on the Gaudi framework, which combines application packages for event generation, detector simulation, reconstruction and for physics analysis. Progress was reported in the area of tracking where a new tracking framework has been developed that forms the basis for all pattern recognition algorithms and is used both in the High Level Trigger (HLT) and the offline reconstruction. Significant improvements in the track-fit speed, where the reconstruction time per track could be reduced from 30 ms to 10 ms, and the track-fit momentum resolution were recently achieved. Studies of the performance of special tracking algorithms adapted for the use of the very first data show that the tracking can be made robust against initial misalignments of VELO, IT and OT at levels that can be expected under realistic assumptions. In order to obtain sufficiently precise starting values, a survey task force was established in the fall of last year. Similarly, studies have been performed in the area of particle identification where it was demonstrated that a statistics of 10^7 minimum bias events can be used to cross calibrate the various detector types. In the area of Monte Carlo simulation, the aim is to have a validated GEANT4 version ready by May 2008 that will be used for comparisons with LHC data
and will allow fine adjustments of the detector description in the simulation. It was reported that adapting the LHCb software to new GEANT releases sometimes proves to be time-consuming because of the newly-introduced unwanted features in the new releases.

Preparation for First Physics

The low luminosity start-up period of the LHC will likely contain a phase when the machine is operated with only few colliding low intensity bunches resulting in an initial luminosity of the order of \(10^{29}\) cm\(^{-2}\) s\(^{-1}\). However, even in such a scenario triggering the LHCb readout system at a rate of 2 kHz on the filled bunches would result in a rate of \(\sim 300\) Hz non-empty minimum bias events. This corresponds to about \(10^8\) events that could be recorded in about 100 hours of data-taking. Employing the L0-trigger would even reduce the required time to approximately 15 hours. An early data sample of this size would not only be ideal to check and commission both levels of the trigger system and to test the computing model with real data but would also calibrate all detector components. First physics papers based on these data, e.g. on inclusive particle production, studies of charmonium and open charm production and measurements of charm and beauty production cross-sections can be envisaged. Real B-physics with exclusive decays would need minimum bias event samples well in excess of \(10^8\) events and thus will require the availability of an operational and well-understood HLT. Sensitivity studies based on the results of Data Challenge 2004 (DC04) indicate that for many measurements based on \(B_s\) or untagged \(B^0/B^+\) decays, only a few 0.1 fb\(^{-1}\) are necessary to yield results that can compete or even improve on measurements expected from the Tevatron and the B-factories.

Replacement of VELO Modules

During normal data-taking the modules of the VELO detector will be operated very close to the beam and thus are expected to receive a substantial radiation dose. In the VELO Technical Design Report it was demonstrated that with an estimated equivalent neutron flux of \(0.5-1.3 \times 10^{14}\) \(n_{eq}\) cm\(^{-2}\) per year of data-taking at the LHCb design luminosity of \(2 \times 10^{32}\) cm\(^{-2}\) s\(^{-1}\) the depletion voltage in some areas of the detector will exceed 500 V after a data-taking period of roughly 3 years. Since the maximum bias voltage that can be tolerated in the supply chain is 500 V, the efficiency of the VELO modules would start to be compromised from then on. In a memorandum submitted to the Chief Scientific Officer and distributed to the LHCC in November 2007, the LHCb Collaboration expressed its intention to immediately start with the construction of new modules in order to benefit from the experience and infrastructure that is still available at the production site in Liverpool. Following this plan would put the Collaboration into a position to have replacement modules ready about 3 years after start of construction. The LHCC notes that although it would be desirable to gain some experience with the behavior of the modules under LHC beam conditions before taking such a decision, it seems prudent to start with the production already now because deferring the decision to a later stage would lead to an even longer construction time and thus to extra delays. In order to avoid a situation in which the experiment would not have available a fully-operational VELO detector in a phase when the LHC is expected to deliver the design luminosity, the LHCC, therefore, endorses the plan to immediately start construction of the VELO replacement modules.

Overall Conclusion

The LHCC notes that the major LHCb detector parts are close to completing their commissioning and the preparation for the first LHC run and physics is well-advanced. The Committee considers that it is realistic to expect LHCb to have an initial working detector for the start of LHC operation in 2008.

5. REPORT ON THE LHC ACCELERATOR AND INJECTOR UPGRADES

The Committee heard a report from L. Evans on the LHC accelerator and injector upgrades. The first phase of these upgrades has the objectives of focusing the LHC beams down to \(\beta^*=0.25\) m. at the ATLAS and CMS interaction points and of ensuring
a reliable operation of the LHC at double the nominal operating luminosity by the physics run in 2013. The work on the LHC accelerator involves upgrading the ATLAS and CMS insertions and in particular includes a) replacing the present inner triplet quadrupole magnets with wider-aperture quadrupoles based on the NbTi cables used for the LHC dipole magnets cooled to 1.9 K, b) upgrading the D1 separation dipoles, TAS absorbers and any other equipment required to ensure compatibility with the new inner triplet aperture and c) possible modifications of additional insertion magnets, such as D2 to D4, and introduction of other equipment in these insertions to the extent of available resources. The upgrade to the LHC injector complex will be staged and includes the construction of the new accelerators – LINAC4, Superconducting Proton Linac (SPL) and the PS2 – to replace the existing LINAC2, PS Booster and PS, respectively. The realization of the new LHC injector complex is expected to improve the reliability of the LHC operation and also to remove the present main performance limitation due to excessive incoherent space charge tune spreads because of the high beam brightness required. The current planning has LINAC4 ready for the LHC physics run in 2012 and the SPL and PS2 for that of 2017.

The LHCC considers that the above plan is reasonable. Further understanding on whether the LHC experiments have the ability to handle the projected increased instantaneous luminosities should be continued and LHC operational experience would be of assistance here. In order to gauge the extent to which the physics studies would profit from the increased LHC luminosity, the Committee will schedule a presentation on the physics case for such upgrades at its next Open Session.

6. REPORT ON THE LHC EXPERIMENT UPGRADES

The LHCC heard a report from L. Linssen and S. Stapnes on developments regarding the LHC experiment upgrades since the previous meeting of the Committee. The detector upgrade projects in both ATLAS and CMS work as an integral part of the respective collaboration activities and most groups already have an involvement or are about to get involved. Common projects across the LHC experiments are also starting and are expected to get a significant boost with the newly-available CERN R&D funding. Furthermore, the LHCC took note of the two European Union proposals, one focusing on project development and planning while the second concentrates on the infrastructure needed to carry out the R&D and prototype testing. The LHCC took note of the request for the LHCC to a) become involved with the official recognition of the LHC upgrade project, b) ensure coherence in project development across the experiments and c) involve the ATLAS and CMS internal review committees in the corresponding LHCC review process for the LHC upgrade.

7. REPORT FROM THE ALICE REFEREES

The LHCC heard a report from the ALICE referees, concentrating on the first Global Cosmic Run, the status of the ALICE sub-systems and a report on the ALICE schedule.

The referees reported on the first ALICE Global Cosmic Run. The successful exercise took place over a two-week period in December 2007 and included data-taking runs with multiple detectors and with the use of the Central Trigger Processor, Event Builder and data recording. Due to missing auxiliary systems, participation of all available sub-detectors was not possible and while the dipole magnet was operated at full field, the solenoid magnet was available only in January 2008. Both magnets have now been commissioned with their final control systems. The second ALICE Global Cosmic Run is scheduled to start in February 2008 and is expected to have an increased participation of the ALICE sub-systems.

The LHCC heard a report on the status of the ALICE sub-systems. Installation of the compensator magnets and their platform, and installation and cabling of the MINIFRAME services-carrying structure have been completed. Installation of Time-of-Flight (TOF) modules is advancing well and the installation of the Inner Tracking System (ITS) proceeded smoothly. The LHCC noted some critical issues. Condensation on the Photon Spectrometer (PHOS) was the result of insufficient air
tightness resulting in the need to re-design the PHOS enclosure. In the meantime, only one PHOS module will be operated during the initial LHC running period and that will be at room temperature rather than at the design -25 °C. A gas leak in the Transition Radiation Detector (TRD) wire chambers was detected, warranting a repair. Of the four supermodules that have been built from a total of eighteen required, two have already been repaired and will be installed shortly while the two which are already installed will be removed following the first LHC run for mending. Noise on Stations 3, 4 and 5 of the Muon Tracking System have been identified and are under investigation. Finally, a modification is being put in place to protect the MANAS read-out electronics of the Photon Multiplier Detector (PMD) from sparking. This results in a reduced number of PMD detector modules and electronics installed in time for the first LHC run in 2008.

The Committee took note of the ALICE schedule. The initial ALICE detector is expected to be ready by 21 May 2008 after having gone through a number of detector stand-alone commissioning and global commissioning runs, allowing ALICE to exercise its complete Trigger/DAQ system.

8. REPORT FROM THE CMS REFEREES

The LHCC heard a report from the CMS referees, concentrating on the status of the CMS sub-systems, on progress in the computing and on the revised CMS schedule.

The referees reported on the progress on the CMS sub-systems. Installation of the experimental beam pipe and of the detector services and infrastructure is advancing well and essentially all the detector read-out electronics are in hand. The barrel and forward Pixel Detectors are expected to be available in time for their ready-for-installation milestone. The LHC noted that the schedules for the End-cap Electromagnetic Calorimeter (EE) have slipped considerably since the previous meeting of the Committee. A three-month delay has been picked up due to the longer-than-expected time taken to re-design and manufacture the new cooling blocks. Modules of the new cooling blocks are being installed in Dee-1 and Dee-2 and work as expected and extra resources are being allocated to meet the revised schedule. Cooling blocks for Dee-3 and Dee-4 will be available and the critical path will go through the gluing of the VPT read-out modules. For all Dees, additional resources are being allocated in order to meet the revised EE schedule. An EE Task Force has been created to oversee the EE on a project basis. Good progress on the Preshower (ES) modules has been reported in recent months and the detailed ES schedule is still under evaluation. Studies are on-going to investigate the unexpectedly large noise seen on the Hybrid Photo Diodes (HPDs) of the Hadron Calorimeter during the CMS Magnet Test and Cosmic Challenge.

The LHCC also heard a report on the CMS computing. The CMS computer infrastructure is operational and well-managed. The lessons learnt from the Computing, Software and Analysis 2007 (CSA07) challenge are being implemented in an effort to improve performance and stability of operations. The CMS plans for Common Computing Readiness Challenge 2008 (CCRC08) are reasonable and the LHCC looks forward to see the CCRC08 running with all experiments simultaneously.

The LHCC noted that the CMS plans and organization for the commissioning and analysis phases are sound. The organization includes an impressive roster of young but experienced physicists.

The Committee heard a report on the CMS schedule. The objective of CMS is to commission the solenoid magnet and the initial detector set-up underground and to take beam as soon as it becomes available as of mid-June 2008.

9. REPORT FROM THE TOTEM REFEREE

Production of the Cathode Strip Chambers (CSCs) for the T1 Telescope is well-underway. Except for one chamber type out of ten, production is expected to be complete by spring 2008. Improvements to the grounding scheme of the Gas Electron Multiplier (GEM) detectors are being implemented to remedy the larger-than-expected
noise observed last year. The LHCC noted the potential interference between the installation of the TOTEM telescopes and the CMS sub-detectors and asks for clarification of procedures and protocols for the installation. All Roman Pot Stations have been installed and the cabling is in progress. The units for the movement remote control have been delivered to TOTEM after a several-month delay and are being integrated into the Roman Pot system. The first silicon sensors for the Roman Pots have been completely assembled and will be tested with cosmics. The availability of the read-out electronics is late and most of the detector electronics is now either in the prototype or test phase and work has been distributed amongst several institutes.

10. **REPORT FROM THE LCG REFEREES**

The LHCC heard a report from the LCG referees, concentrating on the status of the middleware, developments at the Tier-1 centres and preparations for the Common Computing Readiness Challenge 2008 (CCRC08).

The combined CCRC08 exercise with the participation of all experiments is to demonstrate the readiness of the World-wide LCG (WLCG) infrastructure before the start of data-taking at a scale comparable to that during LHC operation in 2008. Preparations for the CCRC08 are well-underway and the benefits of the CCRC08 are already showing up in the preparatory phase. As the time remaining to prepare for the CCRC08 is tight, work is focusing on the most important issues and visible efforts are being implemented to improve the co-ordination and follow-up of procedures in case of problems. The experiments are on schedule to participate in the CCRC08 and the Tier-1 centres are approaching readiness for the CCRC08 and for the subsequent LHC data.

Good progress was reported on the middleware. Deployment of the Storage Resource Manager Version 2.2 (SRM v2.2) is approaching completion and transparent mass storage metrics are under preparation. Much of this effort is, however, taking place just prior to the SRM being required and care must be taken to ensure that the systems are available for the CCRC08.

11. **TEST BEAMS**

The newly-appointed SPS and PS Co-ordinator, E. Perez, reported on preparations for the 2008 test beam activities. The SPS and PS User Schedules are being prepared and will be released soon. No conflicts have been identified and all requests were able to be satisfied. Physics is scheduled to start on 19 May at the PS and on 29 May at the SPS, running in both cases until 10 November. The accelerators of the PS Complex and SPS might continue as LHC injectors until 15 December 2008. This schedule was approved by the Research Board in November 2007. She also outlined the plans for an upgraded Gamma Irradiation Facility (GIF) to succeed the present facility.

12. **REPORT FROM THE LHC PROGRAMME CO-ORDINATOR**

The LHCC heard a report from the LHC Programme Co-ordinator (LPC), M. Ferro-Luzzi. He reported that a one-week workshop is being organized by the AB Department and will be held at CERN on 3-7 March 2008. The workshop will focus on LHC beam commissioning and the transition from LHC hardware commissioning. A joint machine-experiment Workshop on Experimental Conditions and Beam-induced Detector Background will be held at CERN on 3-4 April 2008. This workshop will review the experience on such matters at the Tevatron, RHIC and HERA colliders, assess what can be expected at the LHC, evaluate the requirements from the experiments and agree on further work in order to optimize the LHC running conditions. Finally, he reported on the LHC general schedule and on the newly-proposed LHC filling schemes.

13. **DISCUSSION ON LHCC PROCEEDINGS FOR 2008 AND BEYOND**

The LHCC reviewed the proceedings of the deliberations for the newly-instigated Committee format with the inclusion of the Mini-Reviews. These reviews will remain topical rather than comprehensive and thus will focus on issues of immediate importance and relevance.
14. REFEREES
The LHCC referee teams are as follows:
ALICE: M. Gonin, J. Haba (Co-ordinator)
ATLAS: F. Forti, V. Kekelidze (Co-ordinator), R. Mankel, P. Mato
CMS: S. de Jong, M. Martinez-Perez, S. Smith (Co-ordinator), R. Yoshida
LHCb: S. Dalla Torre, C. Niebuhr, B. Peyaud (Co-ordinator)
TOTEM: S. Dalla Torre
MOEDAL: B. Peyaud
LHCf: M. Mangano, C. Niebuhr
RD39: S. de Jong
RD42: V. Kekelidze
RD50: R. Yoshida
LCG: F. Forti (Co-ordinator), R. Mankel, M. Martinez-Perez

15. The LHCC received the following documents:
   • Minutes of the 91st meeting of LHCC held on Wednesday and Thursday
     21-22 November 2007 (CERN/LHCC 2007-030 LHCC91)
   • LCG Project Comprehensive Review Report (CERN/LHCC 2007-031-G138)

16. DATES FOR LHCC MEETINGS
Dates for 2008:
7-8 May
2-3 July
24-25 September
19-20 November