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Status of the LHCb Experiment

The LHCb Collaboration

1) Collaboration Matters

Alasdair Smith from CERN began his function as Resource Coordinator. Tatsuya Nakada from CERN and the University of Lausanne has been reappointed as spokesperson for the next three years.

2) LHCb-light Optimization

Concentrated effort is being made in order to reduce the material budget of the detector. Modifications to the VELO, RICH-1 designs and the tracking system layout are being made. New tracking algorithms are being developed so that all the tracking stations in the magnet can be removed without losing the track finding efficiency. A Technical Design Report (TDR) describing the optimised detector (LHCb-light) including necessary technical modifications to VELO and RICH-1 will be submitted by the end of 2002. It will also contain the expected physics performance.

3) Experimental Area

The civil engineering work to reinforce the headwall is in progress and expected to be finished by June 2002. The fixed part of the radiation shield has been installed.

4) The LHCb detector

4-1) Magnet

Part of the Al conductor has been delivered and the construction of the first pancake of the coil has started. Iron samples for the yoke have arrived at CERN for testing the magnetic properties. Orders for the power supply have been placed.

4-2) Beam Pipe

A baseline design for the beam pipe has been defined and optimization of details is being done. The LHC Vacuum Group is preparing for the test of the Al exit window of the VELO vacuum tank. Characteristics of the Be-Al alloy will be tested by the manufacturer.

4-3) VELO

The TDR of the LHCb VELO was approved by the Research Board in November 2001. Engineering design of the vacuum tank housing the Si detector is in progress and a review by the LHC machine groups is planned in May. The specifications of the silicon sensors are being finalized for the pre-production. Prototypes for the readout chip are now available with both DMILL and 0.25 μm CMOS technologies and their performance is being evaluated.

4-4) RICH

The engineering design of the RICH-2 detector is now complete and the design was reviewed in March 2002. The design of the RICH-1 is being modified to accommodate the requirements from the LHCb-light detector. The first 80mm HPD, with encapsulated

ALICE-LHCb (10MHz) pixel chip, was delivered by DEP to CERN and tests have started A revised design of the pixel chip that fulfils the LHCb requirements was submitted for production. The chips have been delivered and are being tested at CERN.

4-5) Inner Tracker

For the Silicon Inner Tracker, the length and the pitch of the readout strip must be made as large as possible in order to reduce the number of readout channels. An intensive R&D programme has been launched to test various sensors with different strip dimensions. Work for the mechanical design of the system has started including further investigation of suitable material for the support structure.

4-6) Outer Tracker

The Outer Tracker TDR was approved in February 2002. Detailed engineering design of the tracker modules is being made. Irradiation tests of various prototype chambers do not show any degradation of performance after accumulating the charges expected in four years of operation. The tests will continue. A new TDC chip with 0.25 μm CMOS technology will be submitted in May 2002.

4-7) Calorimeter System

Series production of ECAL and HCAL has started. The ECAL assembly has reached its expected production rate of 10 modules per day, and a total of 490 modules (out of 3300) have been produced. The production of the 550 tons of HCAL steel converter plates is ongoing, and the assembly of the first module (out of 52) is expected to start in May 2002. The Engineering Design Review (EDR) for the Preshower Detector took place in March 2002. The front-end ASIC chips of ECAL/HCAL and Preshower were successfully reviewed in November 2001 and they were declared ready for production.

4-8) Muon System

The Muon TDR has been approved by the Research Board in November 2001. Aging tests of prototypes continued until the end of the year, with accumulated charge densities equivalent to at least five years of operation. The engineering details for the detector production are being defined and will be reviewed this summer. The development of the two front-end ASIC's, CARIOCA and DIALOG, in 0.25μm CMOS is nearly completed and first prototypes show encouraging results.

4-9) Trigger

The algorithm of the Level-0 muon trigger has been improved to be more robust against chamber cross-talk. It was found that the efficiency of the Level-1 trigger can be significantly improved by adding the information from the Level-0 trigger with little change in hardware. A prototype for the Level-1 trigger CPU farm is now operating with 32 processors at 1.24 MHz input rate fulfilling the LHCb requirement.

4-10) Computing

In March 2002, the TDR of the LHCb Online System was recommended by the LHCC for approval. It describes the timing and fast control, data acquisition system, online trigger filter farm and detector control system. An OO-based software framework is now used for the event reconstruction and a similar framework is being prepared for physics analysis. Work to implement the OO framework for simulation is in progress. Several informal computing agreements between the LHCb collaboration and participating institutes for their contribution to the computing are ready to be signed.