

ATLAS RRB-D 2001-122

19 October 2001

**Summary of Principal LHCC Deliberations  
(May, July and October 2001 Sessions)**

**13<sup>th</sup> Meeting of the ATLAS Resource Review Board  
22 October 2001**

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## 1. General

This document summarises the principal LHCC deliberations concerning ATLAS at the Committee's sessions in May, July and October 2001.

The LHCC considers that ATLAS is progressing well with the construction of the detector, although some critical items have been identified. The Committee noted the impressive progress made towards the realisation of an experimental set-up ready to record data at the beginning of the LHC operation in 2006, although detector installation is foreseen beyond the initial running. The proposed lay-out of the detector at LHC start-up will allow ATLAS to address satisfactorily the physics issues of Higgs and SUSY.

However, the LHCC noted that the above schedule is known to be limited in certain cases by resources, both in terms of money for installation and integration and in terms of expert manpower available from collaborating institutes for parallel installations.

The conclusions from a recent cost review of ATLAS were reported to the October 2001 session of the LHCC. The Committee took note that although there is a cost increase as well as a deficit in the funding, it considers that the Collaboration is following strict budgetary control in constructing this technologically demanding detector.

## 2. LHCC Comprehensive Review

The second of the LHCC Comprehensive Reviews of ATLAS took place on 2-3 July 2001. The LHCC referees addressed the following areas: Inner Detector, Calorimetry, Muon Spectrometer, Trigger/DAQ/DCS, Physics Studies, Computing, and the topics of Management, Technical Coordination, Integration, Schedules and Costs.

Since the first of the ATLAS Comprehensive Reviews in July 2000, the ATLAS Collaboration has made very significant progress towards the realisation of an experimental set-up ready to record proton-proton collisions at the LHC in April 2006. In particular, construction of the majority of the final components has either started or is imminent.

It is realistic to expect ATLAS to install an initial working detector for the first collisions of the LHC pilot run starting in April 2006 and for the physics run starting in August 2006, although detector installation can be foreseen beyond this date. However, the LHCC considers that the ATLAS plan to have commissioned an initial working detector for first collisions in April 2006 is challenging, as a number of systems no longer have any contingency in the schedule, originally included as a safety margin for their installation. The schedules of the Barrel Toroid Magnet, the TRT End-cap A, the LAr EM Barrel, the LAr End-cap A, and the Muon Drift Tube chambers are considered to be critical. The LHCC observes that additional resources, both in terms of money and manpower, would aid in accelerating the current ATLAS schedule, thereby allowing a timely completion of the initial detector in 2006.

A detailed scenario to complete the initial working detector by August 2006 is being worked out by ATLAS and will be submitted to the LHCC at the end of October. The ATLAS Collaboration must develop such a detailed scenario, which should in particular address the critical schedule issues above.

Detector elements not installed by August 2006 will be staged. The staging plan consists of deferring installation of some components of the Inner Detector, the Calorimetry, the Muon Instrumentation, the High-level Trigger and DAQ and the radiation shielding. Their installation in a shutdown of a few months in 2007 after the completion of the first physics run, while requiring additional resources and realisation of the Memorandum of Understanding obligations, would complete the ATLAS detector as described in the approved Technical Design Reports.

The LHCC considers that a completed initial working detector, in time for the first physics run in August 2006, should allow the experiment to address satisfactorily the physics searches for Higgs and SUSY at the  $10 \text{ fb}^{-1}$  luminosity level. The proposed staging scenarios of the detector have a minimal impact on the searches at a luminosity of order  $10^{33} \text{ cm}^{-2} \text{ s}^{-1}$ . The staged components would, however, need to be installed for the higher luminosity running.

The principal conclusions and concerns of the LHCC are given below. They will allow the Committee to follow-up outstanding issues and to monitor future progress of this project in upcoming sessions of the LHCC prior to the next ATLAS Comprehensive Review.

- The majority of detector sub-systems are now well into the construction phase, have just entered it or are approaching this stage.
- The construction of the large, time-critical components of the Common Projects, in particular the magnets and LAr cryostats, are well underway and progressing satisfactorily.
- Particular emphasis is presently given and will continue to be given by ATLAS to the integration issues which are on the critical path, and to the preparations for the assembly and installation phases.
- Progress on problems reported at the previous ATLAS Comprehensive Review has been clearly demonstrated. However, some issues remain critical and include the construction schedule of the Barrel Toroid Magnet, the TRT End-cap A, the LAr EM Barrel, the LAr End-cap A, and the Muon Drift Tube chambers. Moreover, the procurement of radiation-hard electronics, particularly for the Pixel detector, remains a concern. The Collaboration is addressing these difficulties in order to recover as much as possible the incurred delays.
- The final version of the overall ATLAS construction and installation schedule and milestones are under revision. Globally, the project can be completed, albeit with a challenging schedule, to meet the start of physics date in August 2006. The most lengthy delay is that of the LAr End-cap A.

- The LHCC noted the short-fall in money and resources to complete the detector, both the initial detector for August 2006 and the final detector as described in the Technical Design Reports. The remaining resource issues for ATLAS are being discussed with the funding agencies in view of developing a plan for completion.
- Widespread and coherent computing and trigger/DAQ projects are in progress.
- ATLAS has confirmed with extensive simulation studies the Collaboration's motivation to exploit the physics at the LHC and the detector's excellent potential for major discoveries.

### 3. Magnets

The Magnet Advisory Group to the LHCC (MAG) reported orally its conclusions on the review of the ATLAS magnet system to the October 2001 session of the Committee. The review is not yet finalised and agreed by the LHCC.

However, the MAG noted the successful testing of the  $B_0$  prototype coil of the barrel toroid magnets and noted the substantial progress on these magnets, which were a matter of severe concern in 2000. A technically sound solution has now been identified, albeit at an increased expense. The MAG also noted the sound progress on the central solenoid magnet and congratulates the group for completing the first spectrometer magnet for the LHC experiments. However, the end-cap toroids are now late and the accrued delays are becoming critical. ATLAS is discussing with the commercial supplier of the cold mass ways to ensure the delivery of this time-critical piece.

Although the cost of the ATLAS magnets has increased from the 1996 estimates, strict cost management has been exercised by ATLAS, thus minimising the cost overrun, which could otherwise have been very substantial.

### 4. Resistive Plate Chambers

The LHCC recommended that all LHC experiments produce a detailed document illustrating the individual tasks to be undertaken in the manufacturing phase of the Resistive Plate Chambers (RPCs). The report should also address Quality Assurance and Control. This document should be reviewed within each of the experiments and should also be communicated to the LHCC. The LHCC will use this information to review and monitor the production of the RPCs. The task list should also serve as a basis to prepare the contract with the manufacturing firm. The LHCC also recommended that the experiments should not move hastily into production of the chambers before ensuring both their functionality and the manufacturing process. The LHCC will continue monitoring the progress in the RPCs.

## 5. Computing

The LHCC considers that the LHC Computing Review, which was held under the chairmanship of S. Bethke, has set out a sound model for the future LHC Computing. The LHCC also endorses the identification of a potential lack of resources – hardware, infrastructure and related manpower – while noting the limited maturity of the current planning and resource estimates for the production of the software, the development and support of simulation packages and the support and future evolution of analysis tools.

The LHC Computing Review has recommended the instigation of the LHC Software and Computing Steering Committee (SC2) to help facilitate the deployment of the entire LHC hierarchical computing structure, and the LHCC concurs with this conclusion.

The LHCC considers that the plan for the LHC Computing Grid Project, which includes the required additional resources both at CERN and in the Member States and Non Member States, is reasonable and endorses it as the next step forward in proceeding with the LHC Computing.