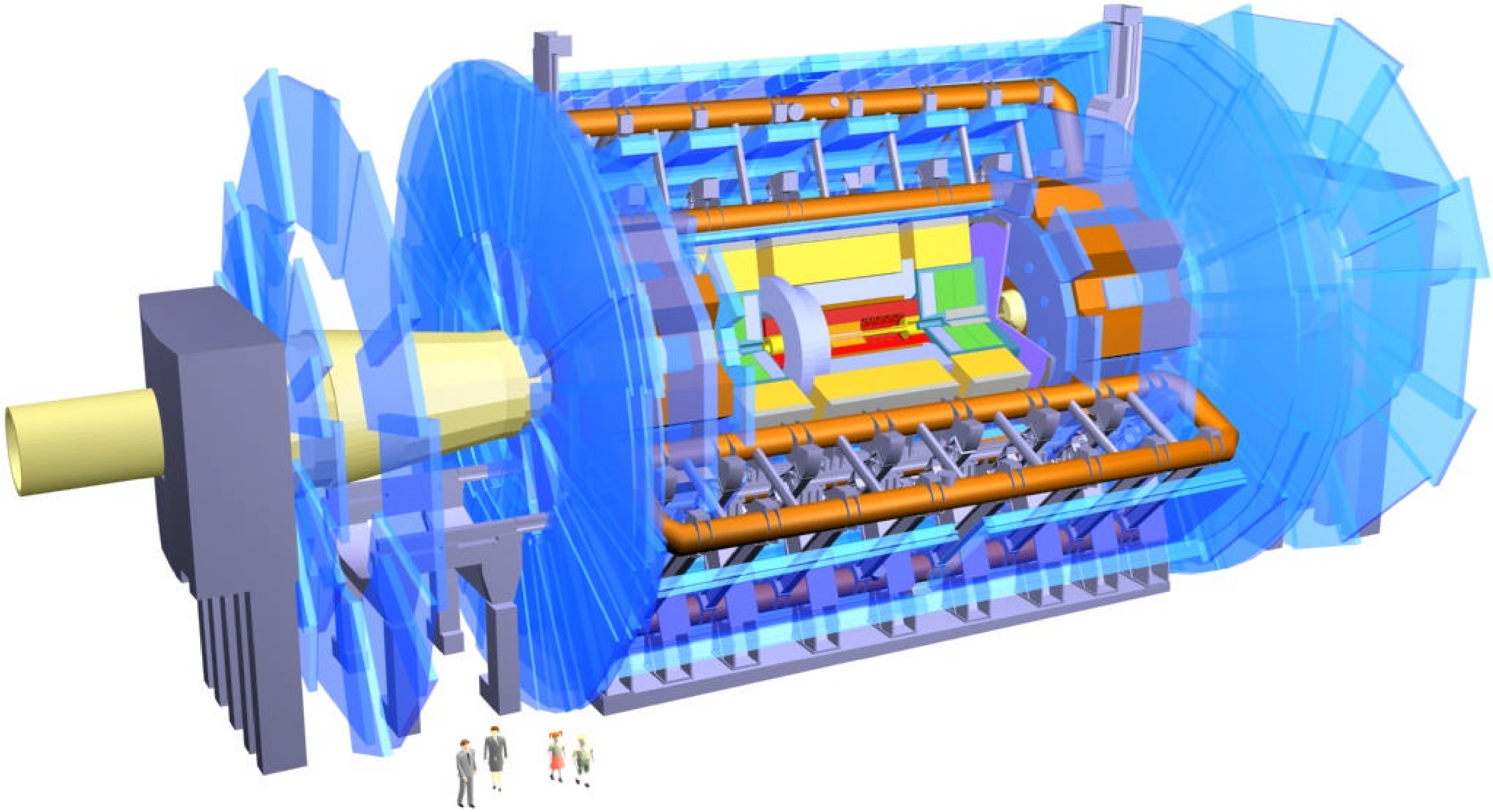
Progress of the ATLAS Detector Construction

CERN-RRB-2002-054



Collaboration and Management
Construction Status of the Detector Components
Initial Staged Detector
Schedule and Milestones
Conclusions

Collaboration Composition and Management

ATLAS Collaboration

(Status April 2002)

Albany, Alberta, NIKHEF Amsterdam, Ankara, Ann Arbor, LAPP Annecy, Argonne NL, Arizona, Arlington UT, Athens, NTU Athens, Baku, IFAE Barcelona, Bergen, Berkeley LBL and UC, Bern, Birmingham, Bonn, Boston, Brandeis, Bratislava/SAS Kosice, Brookhaven NL, Bucharest, Cambridge, Carleton/CRPP, Casablanca/Rabat, CERN, Chinese Cluster, Chicago, Clermont-Ferrand, Columbia, NBI Copenhagen, Cosenza, INP Cracow, FPNT Cracow, Dortmund, JINR Dubna, Duke, Frascati, Freiburg, Fukui, Geneva, Genoa, Glasgow, ISN Grenoble, Technion Haifa, Hampton, Harvard, Heidelberg, Helsinki, Hiroshima, Hiroshima IT, Indiana, Innsbruck, Iowa SU, Irvine UC, Istanbul Bogazici, KEK, Kobe, Kyoto, Kyoto UE, Lancaster, Lecce, Lisbon LIP, Liverpool, Ljubljana, QMW London, RHBNC London, UC London, Lund, UA Madrid, Mainz, Manchester, Mannheim, CPPM Marseille, MIT, Melbourne, Michigan SU, Milano, Minsk NAS, Minsk NCPHEP, Montreal, FIAN Moscow, ITEP Moscow, MEPhI Moscow, MSU Moscow, Munich LMU, MPI Munich, Nagasaki IAS, Naples, Naruto UE, New Mexico, Nijmegen, Northern Illinois, BINP Novosibirsk, Ohio SU, Okayama, Oklahoma, LAL Orsay, Oslo, Oxford, Paris VI and VII, Pavia, Pennsylvania, Pisa, Pittsburgh, CAS Prague, CU Prague, TU Prague, IHEP Protvino, UFRJ Rio de Janeiro, Rochester, Rome I, Rome II, Rome III, Rutherford Appleton Laboratory, DAPNIA Saclay, Santa Cruz UC, Sheffield, Shinshu, Siegen, Southern Methodist, NPI Petersburg, Stockholm, KTH Stockholm, Stony Brook, Sydney, AS Taipei, Tbilisi, Tel-Aviv, Thessaloniki, Tokyo ICEPP, Tokyo MU, Tokyo UAT, Toronto, TRIUMF, Tsukuba, Tufts, Udine, Uppsala, Urbana UI, Valencia, UBC Vancouver, Victoria, Washington, Weizmann Rehovot, Wisconsin, Wuppertal, Yerevan

(149 Institutions)

Changes

The Helsinki Institute of Physics, Finland, has announced its withdrawal for 30th June 2003, respecting the 18 months notice period as stipulated in the MoU (Art. 3.3), wishing to concentrate its resources on ALICE and CMS

Since quite some time there is only one physicist from this group active in ATLAS

The Bulgarian Academy of Sciences, Sofia, has joined ATLAS as part of the JINR team, working on the MDT construction

Contacts under negotiation

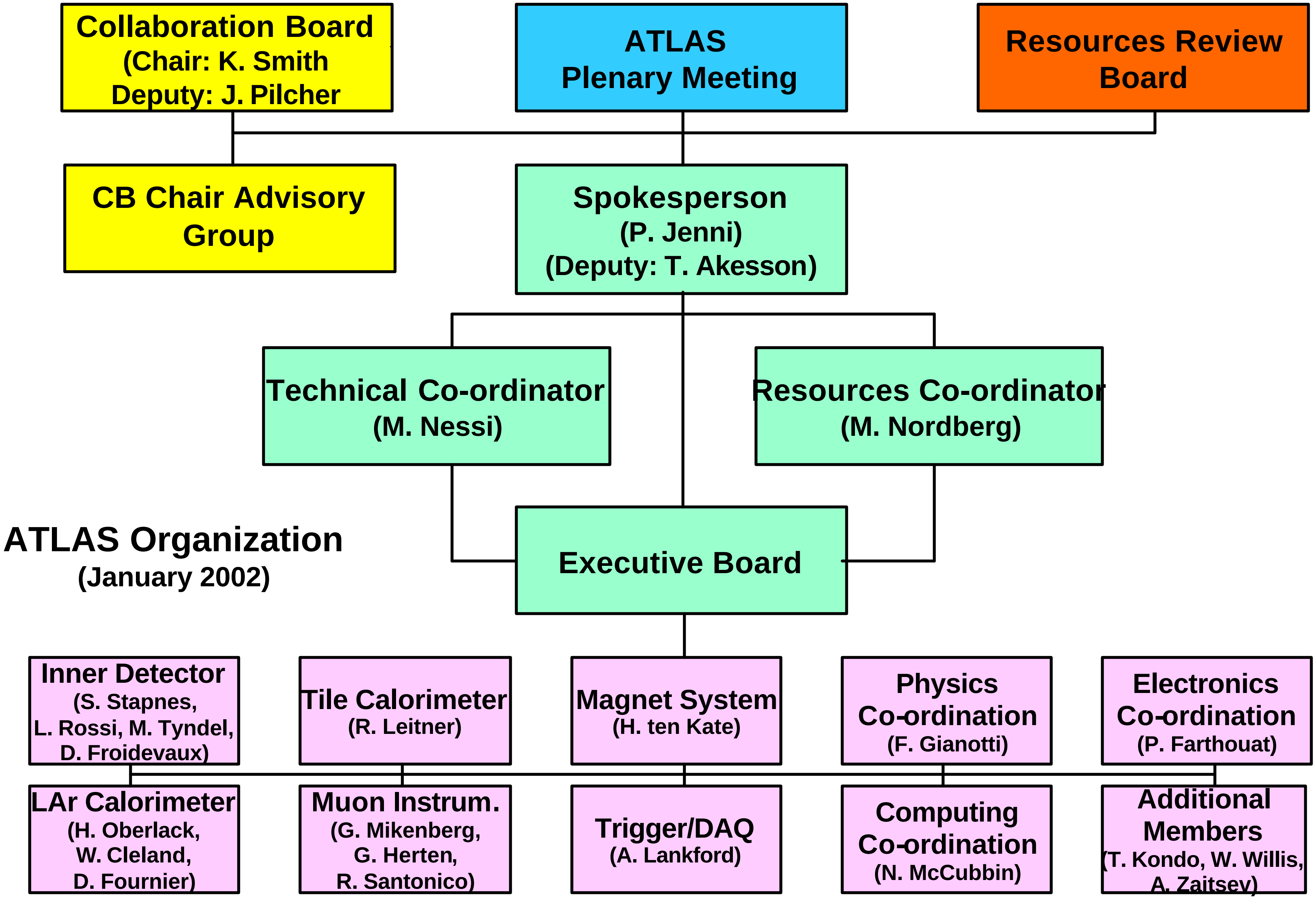
Gazi University Ankara, Turkey
Institute of Physics Belgrade, Serbia
University of Texas Pan America, US
Yale University, US

Scientific Authors

The Collaboration member list has been updated with the new criteria as stipulated in the draft M&O MoU for Scientific Authors

Total Scientific Authors	**1546**
Total Scientific Authors holding a PhD or equivalent	**1366**

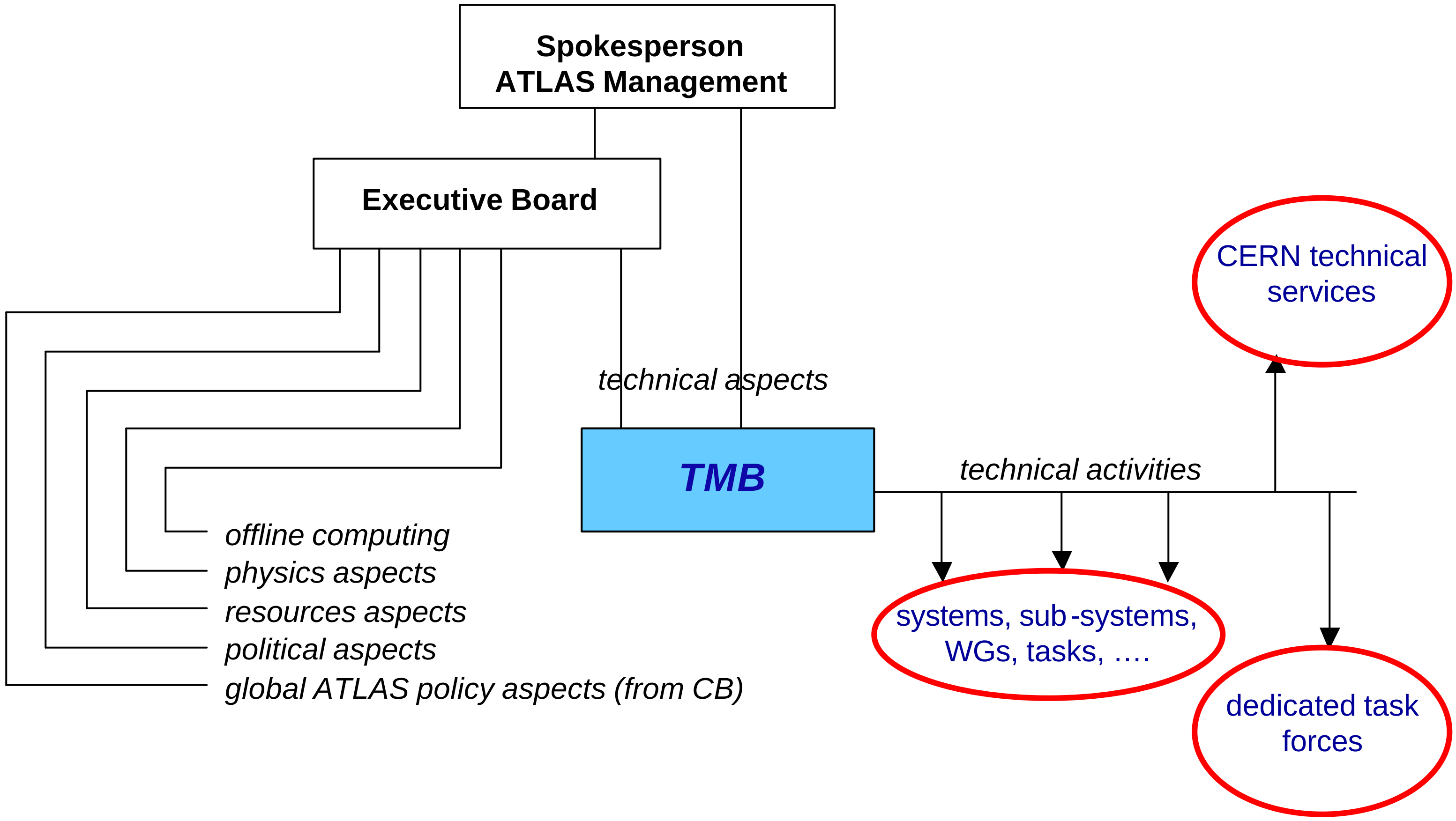
(Note that the name lists of the TDRs with 1800 names included partially also technical staff)


Collaboration Board
(Chair: K. Smith
Deputy: J. Pilcher
ATLAS
Plenary Meeting
Resources Review
Board
CB Chair Advisory
Group
Spokesperson
(P. Jenni)
(Deputy: T. Akesson)
Technical Co-ordinator
(M. Nessi)
Resources Co-ordinator
(M. Nordberg)
ATLAS Organization
(January 2002)
Executive Board
Inner Detector
(S. Stapnes,
L. Rossi, M. Tyndel,
D. Froidevaux)
Tile Calorimeter
(R. Leitner)
Magnet System
(H. ten Kate)
Physics
Co-ordination
(F. Gianotti)
Electronics
Co-ordination
(P. Farthouat)
LAr Calorimeter
(H. Oberlack,
W. Cleland,
D. Fournier)
Muon Instrum.
(G. Mikenberg,
G. Herten,
R. Santonico)
Trigger/DAQ
(A. Lankford)
Computing
Co-ordination
(N. McCubbin)
Additional
Members
(T. Kondo, W. Willis,
A. Zaitsev)

Technical Coordination

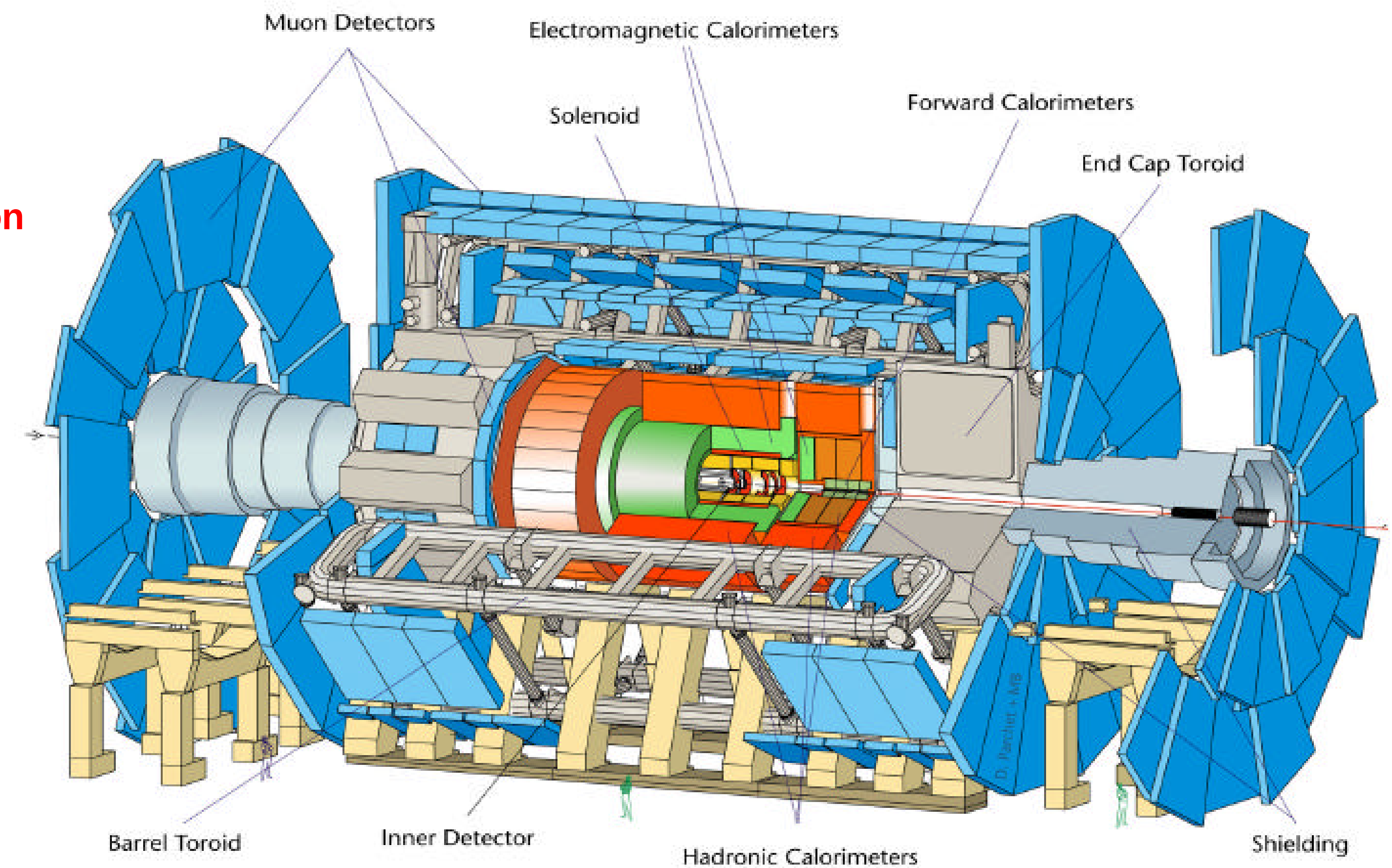
A new TC organization is now in place and operational since a year, and very clear benefits in term of detector integration progress and installation planning are visible

Significant contributions from the collaborating Institutions and CERN can be acknowledged for strengthening this area, *which will demand further increased efforts, in particular now approaching more and more the installation phase*



Construction Status of the Detector Components

Inner detector
Calorimetry
Muon instrumentation
TDAQ system

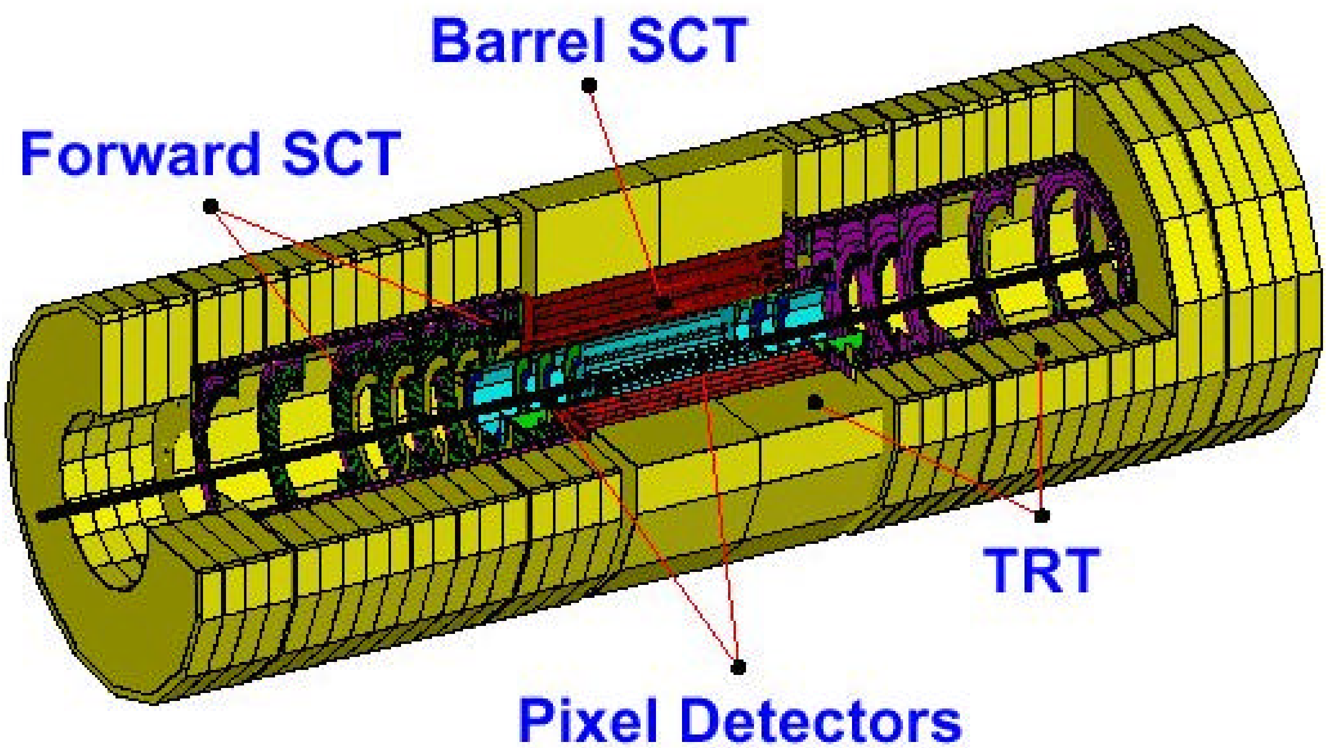


The progress on the large components of the Common Projects (magnet system, LAr cryostats and cryogenics, supports and shielding structures, general cavern infrastructure) will be covered in the presentation of M Nessi

Inner Detector (ID)

The Inner Detector (ID) is organized into three sub-systems

Pixels
Silicon Tracker (SCT)
Transition Radiation Tracker (TRT)
plus the common ID items



ID Pixels

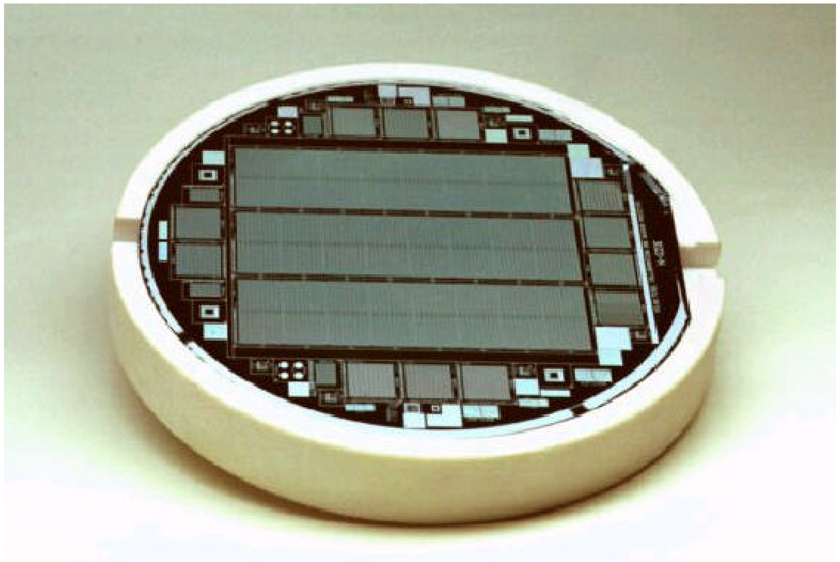
Sensor preseries from two producers have passed successful tests, and batches of 10 and 25% have been launched with the two firms (delivery May/June 2002)

The developments of the hybridization, the local and the global supports proceed well after Production Readiness Reviews (PRRs) in the last six months

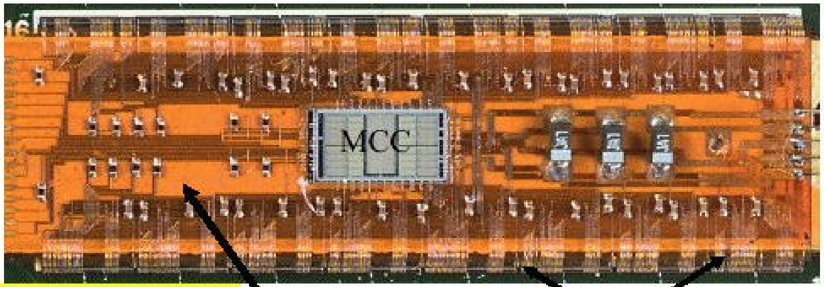
The most critical component in the sub-system is the DSM FE electronics for which successful test results can now be reported from fully functioning prototypes (the yield was still unusually low for DSM, and is expected to improve)

Given this major step passed, the Pixel groups can now move forward with module production and system tests

The Pixel sub-system project plan foresees to meet the installation dates for the initial detector configuration with 2 layers (out of 3), still with a considerable float



Pre-production Pixel sensors



Kapton hybrid glued to sensor

Kapton hybrid

Front-end chips

Pre-production Pixel module

ID SCT

The silicon sensor production is running smoothly, more than 60% have been delivered and accepted

The rad-hard DMILL version of the FE electronics has passed last year the PRR, and is now in series production, about 25% of the wafers have been delivered and partially tested

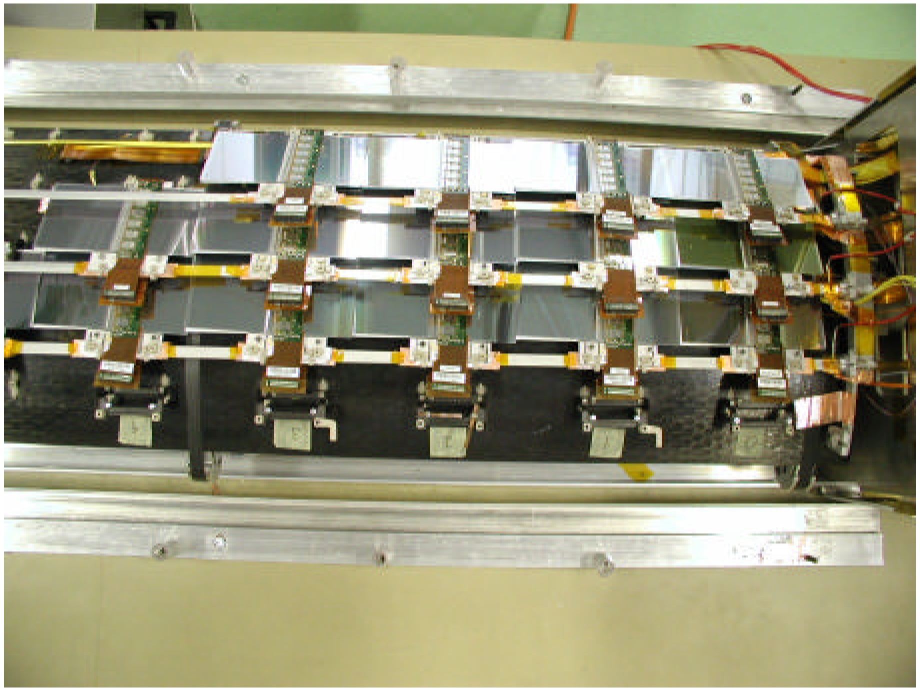
All the barrel module components are in production, as well as the barrel support cylinders, and the site qualification module pre-productions are under way

For the end-cap modules further optimization was needed for the hybrids because of excess noise observed in early module and system tests; performance within specifications has now been achieved, next will be a Final Design Review (FDR) in June or July 2002

Good progress according to plans can be reported for the optical links, power supplies, and off-detector electronics

Growing system tests are continuing for barrel and end-caps

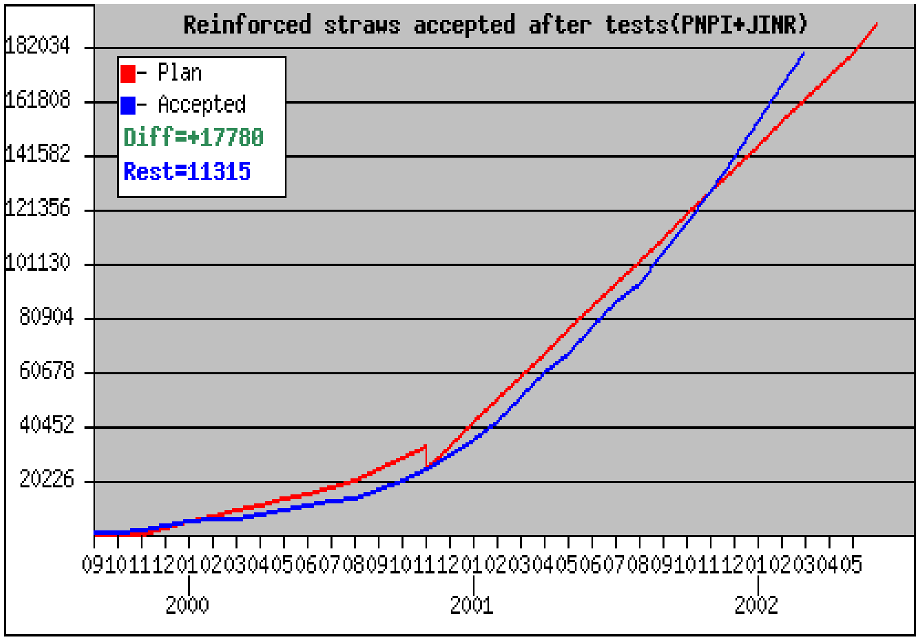
The sub-system delivery is expected to be consistent with the ATLAS schedule



SCT barrel system test

ID TRT

The raw straw production, and also the straw reinforcement, are completed, and the end-cap straw preparation is also 50% finished



TRT straw reinforcement rate

TRT end-cap wheel assembly

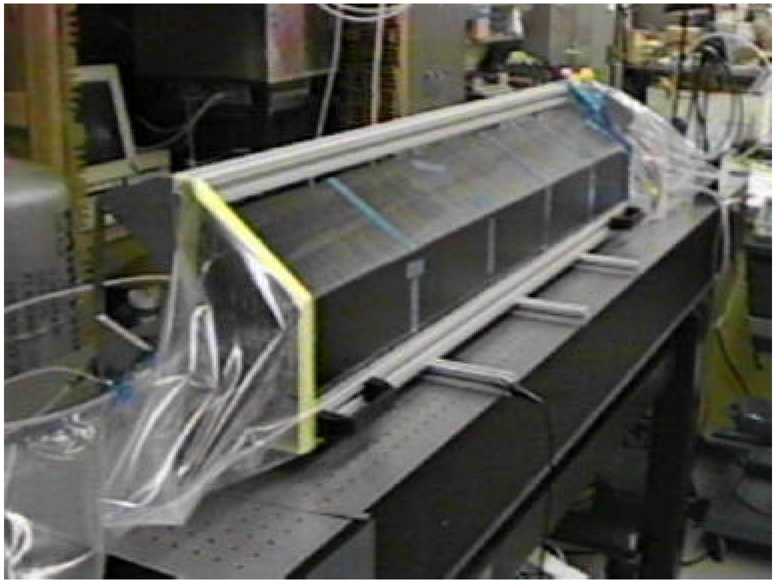
The end-cap wheel construction has now started fully at the two sites, after initial start-up problems which are overcome

Based on schedule and resources the end-cap construction strategy is to complete in time for the initial detector first all type 'A' and 'B' wheels (linked to the end-cap SCT), and to stage the 'C' type

Both chips of the rad-hard electronics gave very satisfactory results in DMILL, for cost reasons the digital chip is also developed in DSM, with a decision milestone in May 2002

A new problem was encountered for the barrel TRT modules: long-term irradiation tests with the final gas mixture (Xe-CO_2-CF_4) showed failures in the glass wire joints

The wire joint is used to separate the wires in the middle of the barrel modules to half the occupancy



TRT barrel module

Polyimide-encapsulated epoxy joint (the new wire joint retained after the first milestone end of March, and being pursued now for final decision in May)

With highest priority a programme has been initiated to develop and qualify alternative solutions, with well-defined milestones and decision path before the end of May 2002

In the meantime mechanical barrel module production continues, with the aim to resume stringing of wires in June 2002

With a rearranged construction sequence the completion of the barrel modules is foreseen by May 2003, still compatible with the overall TRT and ID schedules

ID infrastructure and common items

Definitive progress has been achieved in the critical area of services routing through the calorimeter and muon systems, with major relocations of patch panels outside the first chamber layer

Good progress can also be mentioned from another challenging area, the evaporative cooling system for the Pixels and SCT, with the 'phase-II' set-up now operational with a capacity of 1/6 of the final one

Full-scale mock-up of the ID, LAr barrel, tile calorimeter and inner barrel muon chambers to study the services routing

Compressor of the evaporative phase-II Pixel and SCT cooling set-up

The integration and commissioning work for the entire ID will take place at CERN from 2003 to 2006 in a new large clean room facility (SR1 building) near the experimental pit, where also all future maintenance and upgrade work on the ID will be undertaken

Substantial infrastructure will be installed during 2002 and 2003 in this building

The ID schedule anticipates on-time completion of the sub-systems and their integration for the initial detector configuration

ID clean room facility under construction near the surface building at pit 1

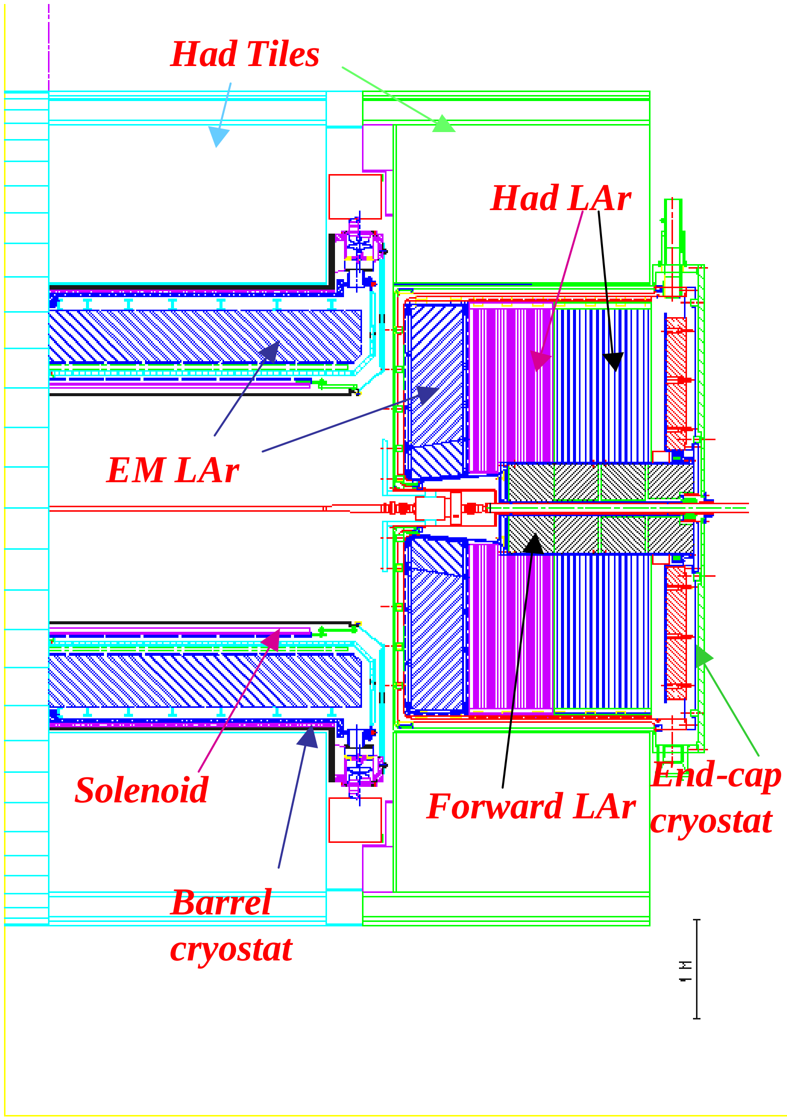
LAr Calorimetry

The LAr calorimetry (pre-samplers, EM, hadronic end-caps, and forward calorimeters) has progressed well in its production phase

(This is also the case for the cryostats, the feedthroughs, and the cryogenics as will be presented by M Nessi)

Previously reported technical difficulties with industries which delayed the start-up of all sub-systems more or less strongly at some stage have all been overcome and are off the critical path now

Solving these problems caused however some over costs, for which ATLAS is grateful to the Funding Agencies having covered them



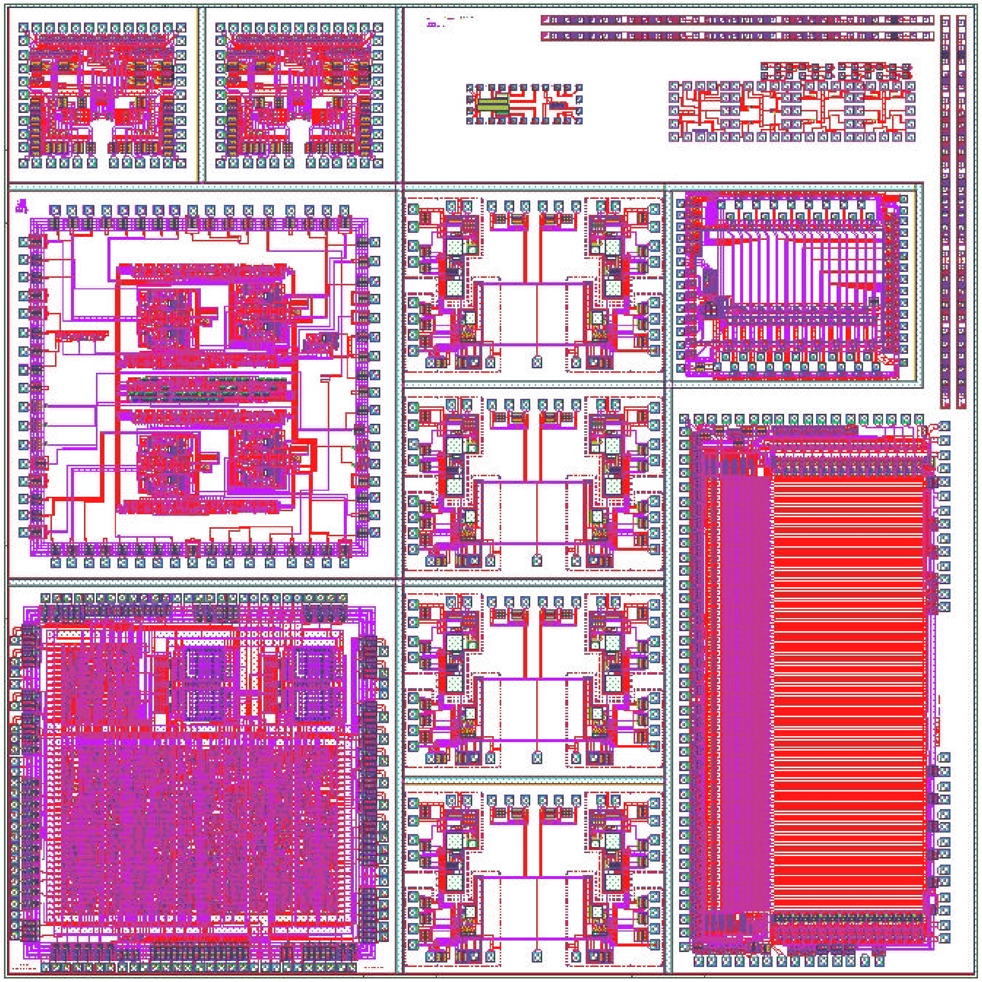
LAr electronics

Work proceeded further as planned on the LAr electronics, a total of 11 chips are now available in DMILL and have been successfully tested, and the SCAs are in production

The large SCA controller chip is also ready in DSM technology

The first radiation tolerant, complete Front End Board (FEB) operated successfully (except for the still missing negative voltage regulators), and the first full FEB crate is planned to be tested by end 2002

Off-detector component developments and fabrications are on schedule



Various LAr DMILL chips

LAr EM Calorimeter

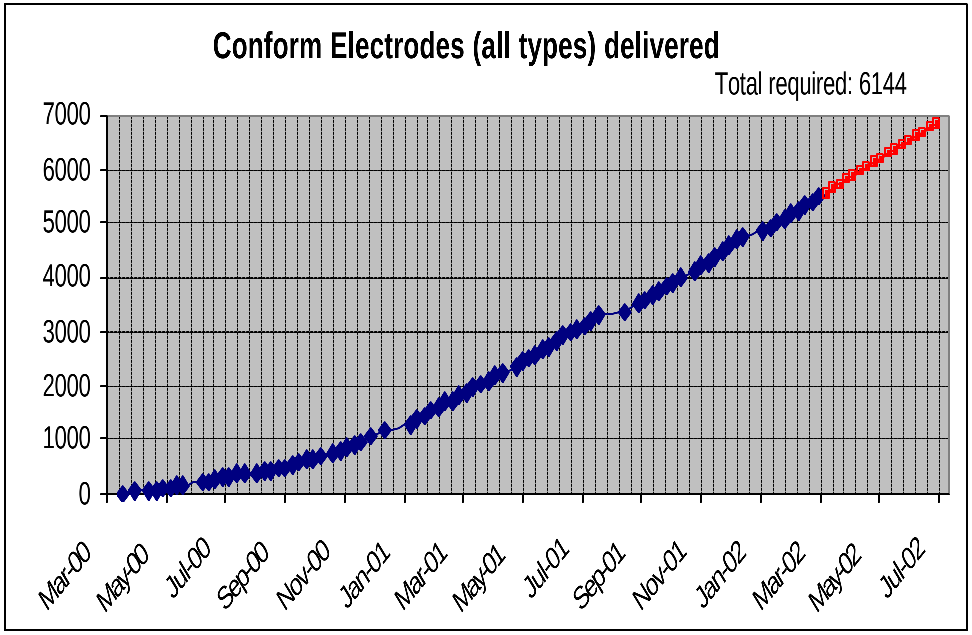
The series production of the <u>pre-sampler modules</u> is ongoing for both the barrel and the end-caps, and is expected to meet the required delivery dates

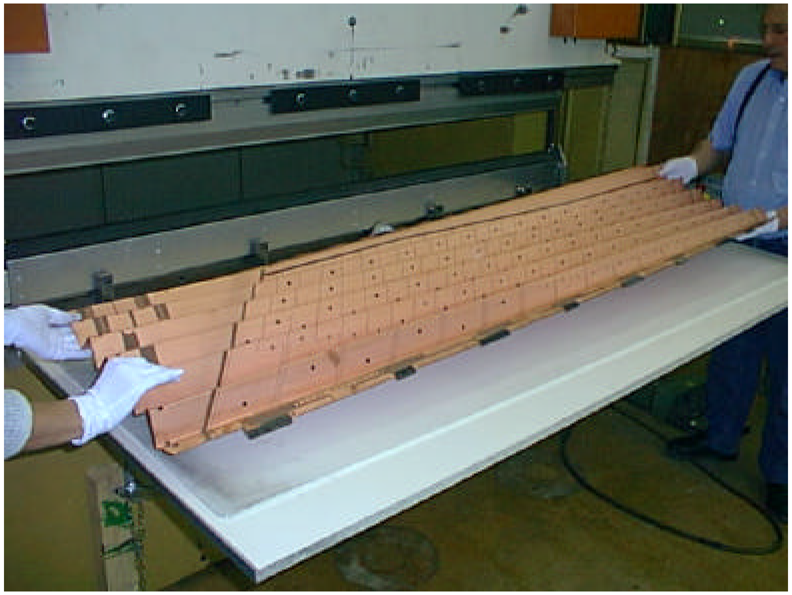
For the barrel, 15 out of the 64 modules are made, and the second production site started now after delays (shortage of manpower, delay in cold test facility)

Fabrication of the <u>read-out electrodes for the EM modules</u> was for a long time on the critical path

This proceeded very smoothly for the last year, and industrial fabrication will be completed soon

Also the bending process for the barrel is now fully mastered with the new tooling





LAr EM read-out electrode after bending

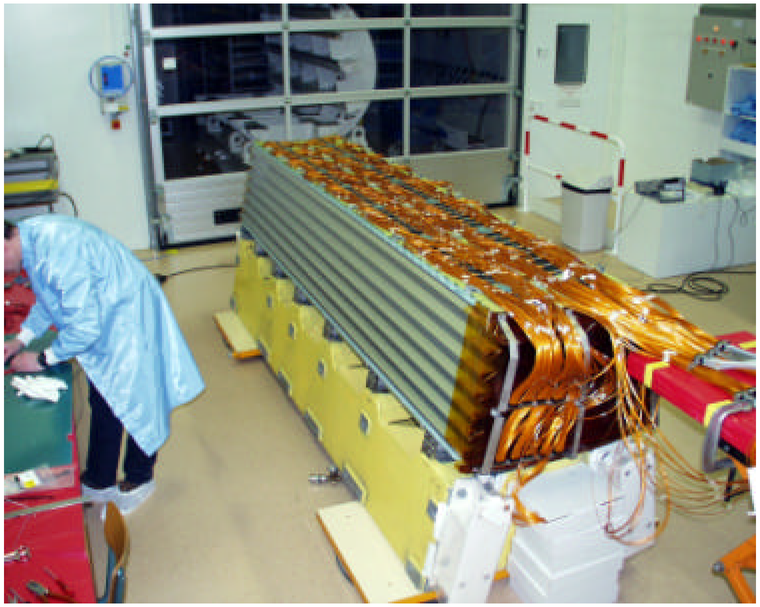
The absorber fabrication has progressed in a steady pace, with about 55% for the end-caps and about 70% for the barrel completed

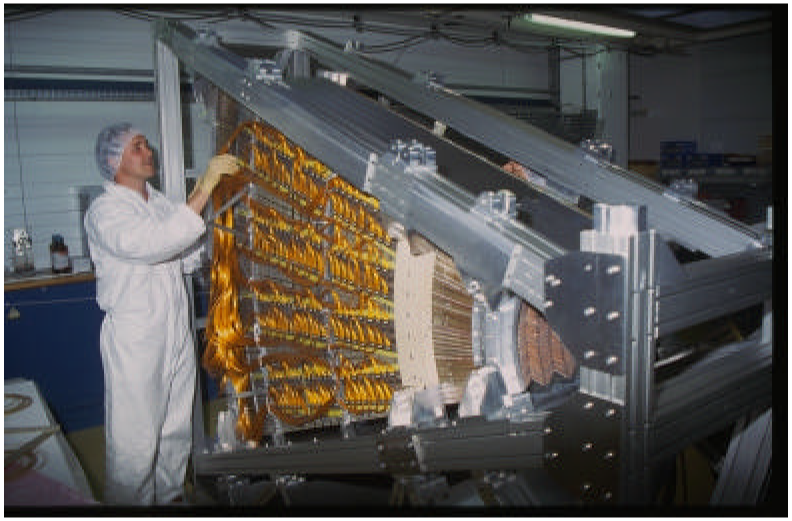
Stacking and cabling of the modules proceeds at 3 barrel and 2 end-cap assembly sites:

- **13 out of 32 series barrel modules are ready, 10 cold tested**
- **5 out of the 16 series end-cap modules are made, 3 cold tested**

Completion is expected for spring 2003 (barrel) and fall 2003 (end-caps), and improvements have been made to the cold test rate

The schedule remains very tight for the end-caps, due to manpower limitations





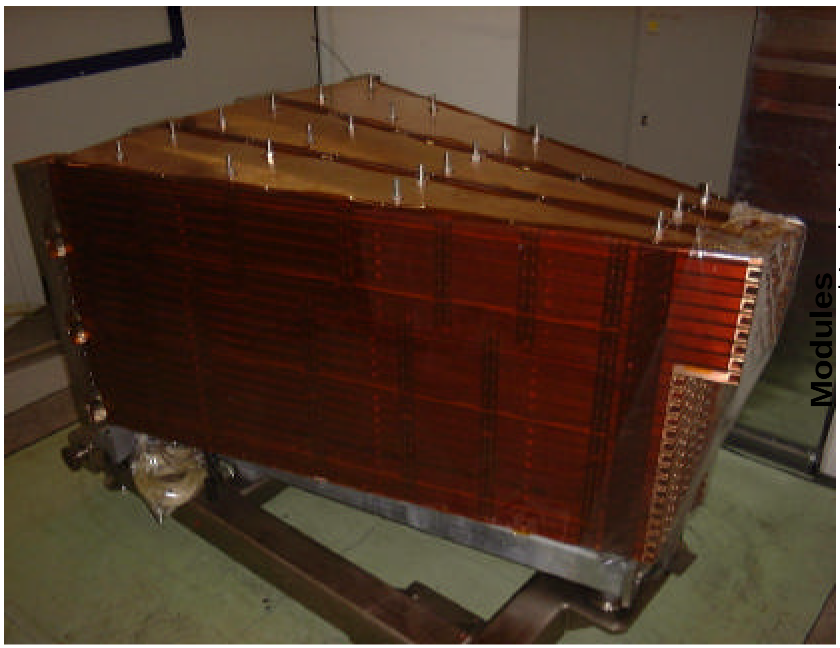
LAr EM barrel and end-cap modules

LAr Hadronic End-Cap Calorimeters

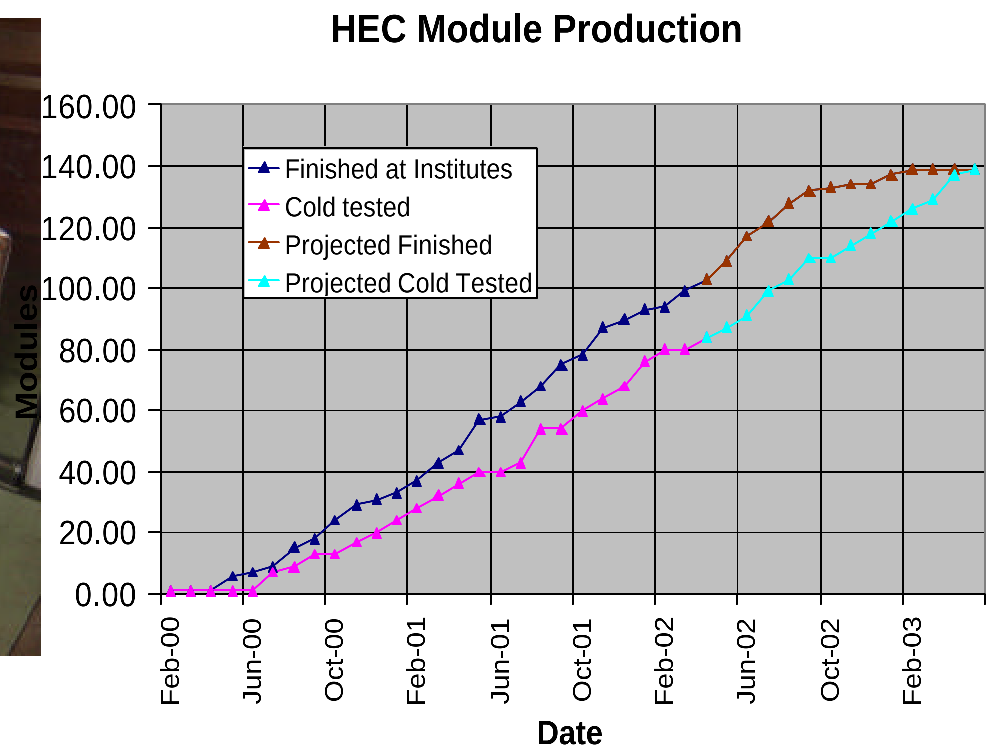
The LAr hadronic end-cap series production continues to run smoothly:

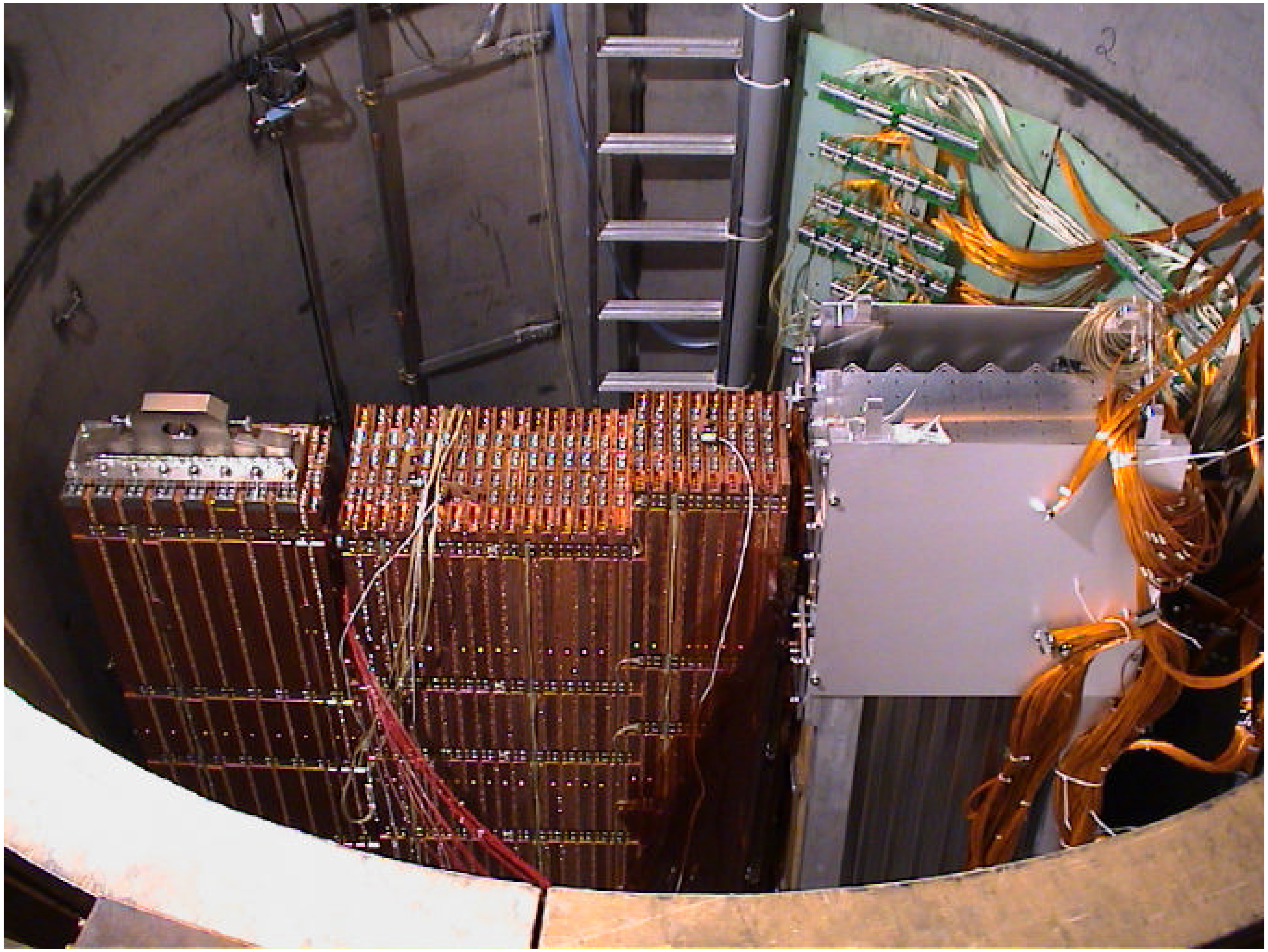
- **107 out of 134 modules (including spares) have been completed, and 83 cold tested and accepted**

A critical issue remaining, and being followed up, is the capacity for machining Copper plates for the front modules, but in-time availability of the sub-system is nevertheless expected



Assembly of three series front modules ready for cold testing





LAr end-cap calorimeter system test and calibration set-up, with EM and HEC modules installed in the cryostat at the SPS H6 test beam for the forthcoming test beam period

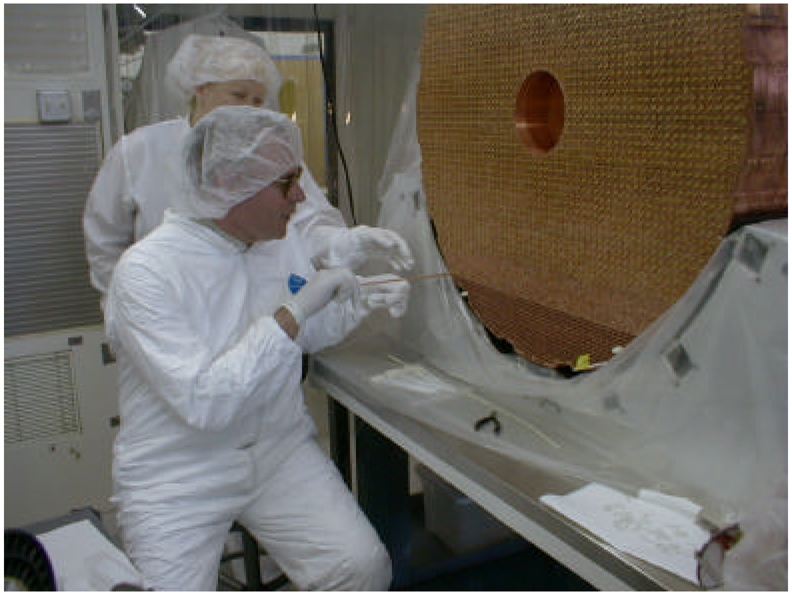
LAr Forward Calorimeters

The LAr forward calorimeter module assembly is now also in full swing

The absorber structures for the first side is almost complete (readiness is expected by mid-2002), and for the second side work is well on its way

A schedule risk remains the W-rod delivery, but the situation has considerably improved since the last RRB

A critical issue is the test beam calibration of one side FCAL, this has to happen in 2003



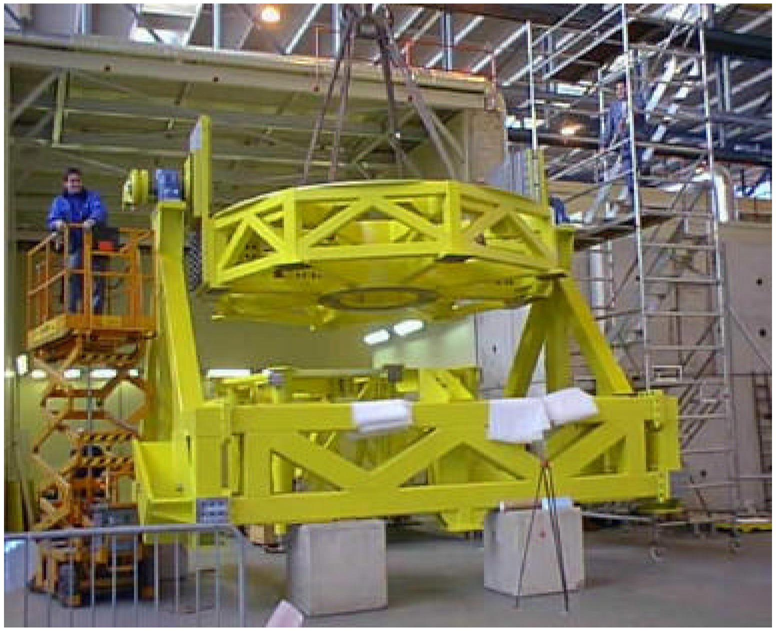
FCAL2 and FCAL1 assembly for the first side

LAr Integration in Hall 180

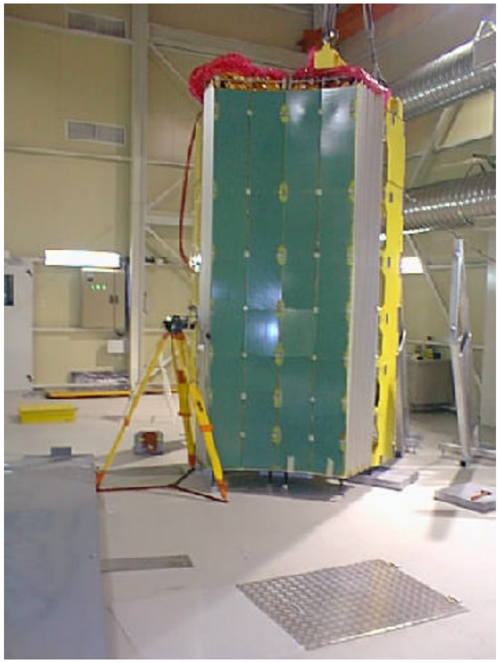
The good status of the cryostats and feedthroughs (all mounted for the barrel) will be covered by M Nessi when reporting about the Common Projects

The major integration activities have started in Hall 180 where the modules will be assembled into half-barrel rings and wheels for the end-caps, and then introduced into the barrel and the two end-cap cryostats respectively

The considerable pre-operation activities will include complete cold tests of the three fully loaded LAr calorimeter units (as well as the solenoid for the barrel) with test electronics



HEC wheels assembly and rotation tool



Trial assembly of two EM barrel modules

Tile Calorimeter

Mechanics series production is progressing very smoothly at all sub-module and module assembly sites, nearing completion

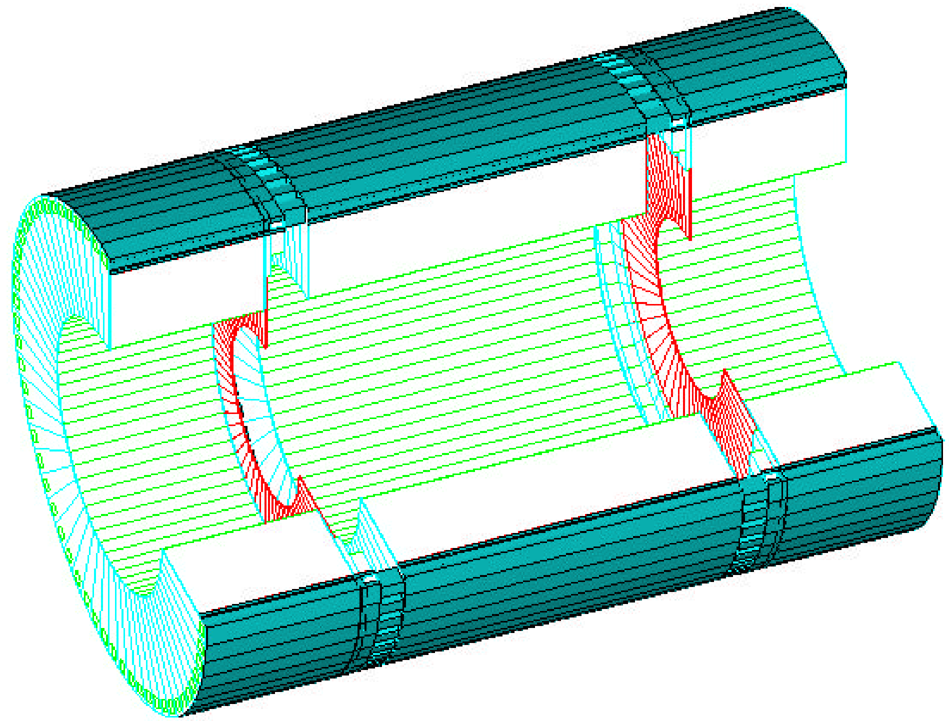
Almost 85% of all modules are at CERN and equipped with their optical components, ready for the initial Cs-source calibration

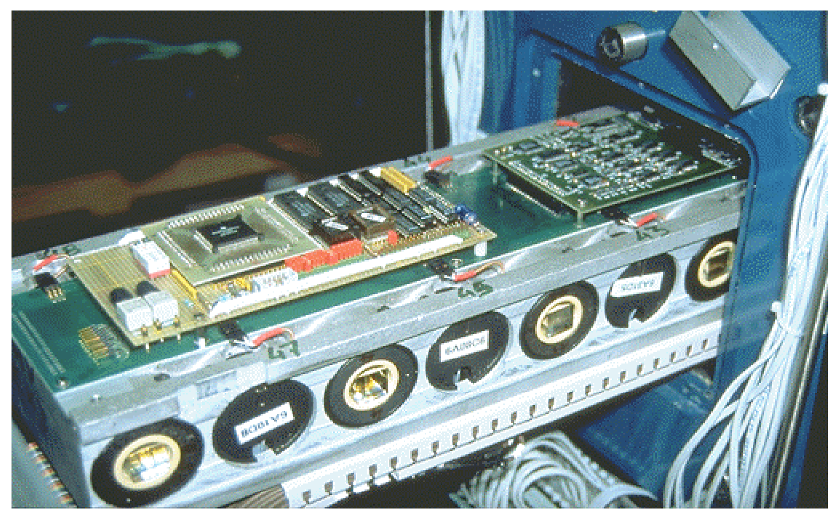
All electronics components are in the procurement phase, and integration into the drawers has started

About 75% of the PMTs have been delivered and tested with good results

The next major steps will be the pre-assembly of the complete Tile calorimeter cylinders that will start in Summer 2002

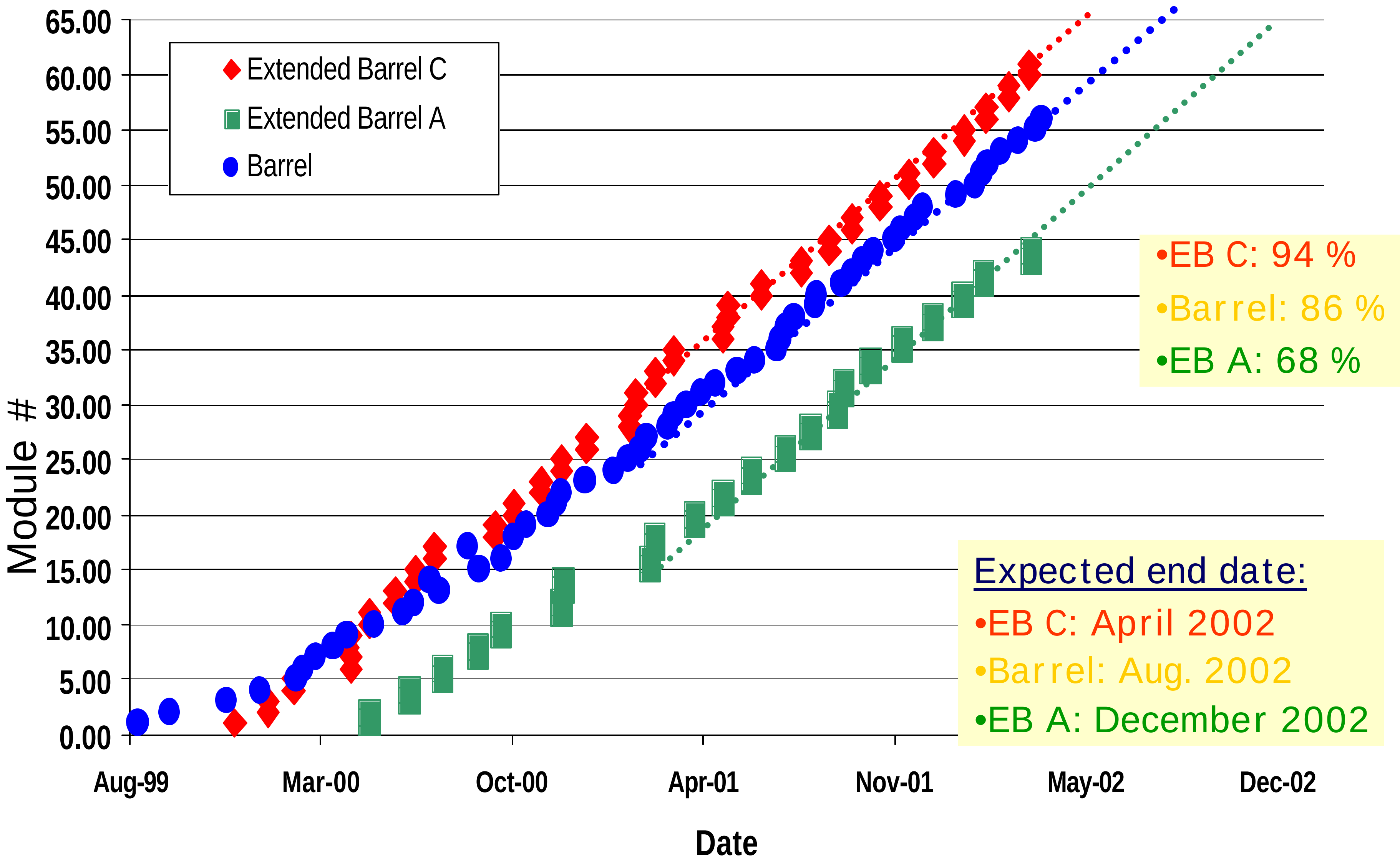
For this major integration and pre-operation activity the timely procurement of the support structures and the manipulation tool are on the critical path, but overall the system is on schedule





Drawer housing PMTs and electronics

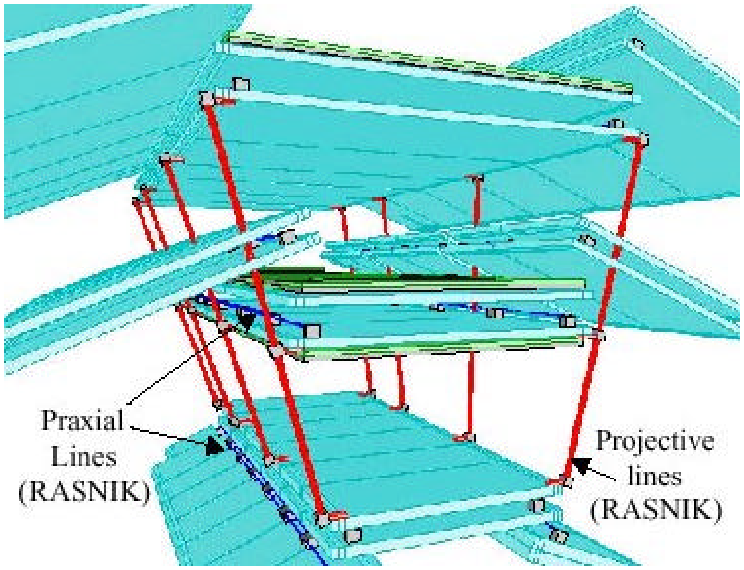
Tile calorimeter optics instrumentation curve (modules ready at CERN)



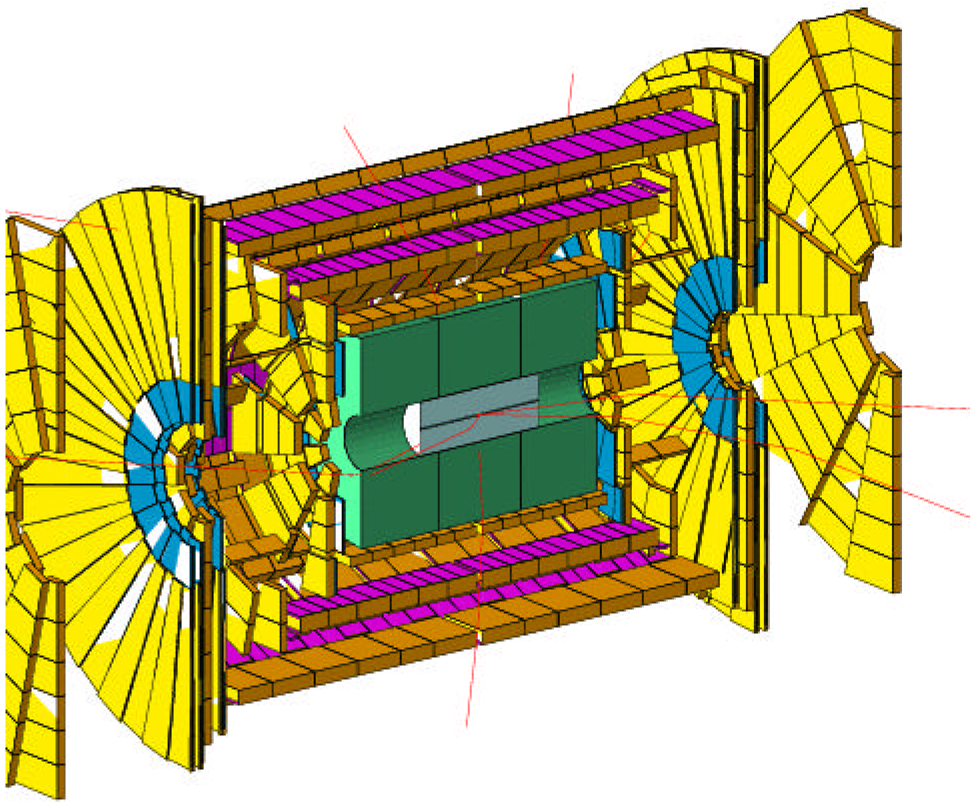
Muon Spectrometer Instrumentation

The Muon Spectrometer is instrumented separately with precision chambers and fast trigger chambers

A crucial component to reach the required accuracy is the sophisticated alignment measurement system



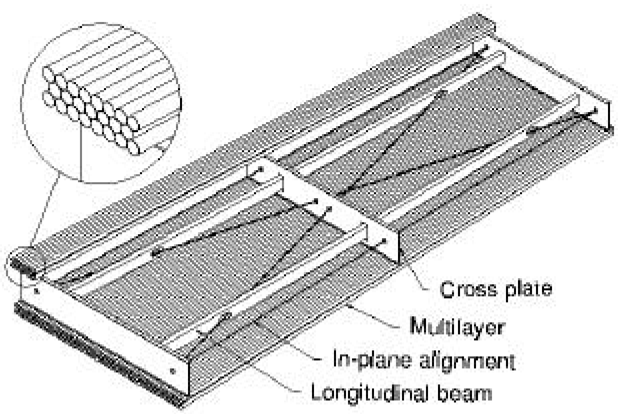
Alignment system in the barrel



Precision chambers:
- MDTs in the barrel and end-caps
- CSCs at large rapidities in the innermost end-cap stations

Trigger chambers:
- RPCs in the barrel
- TGCs in the end-caps

Muon Precision Chambers MDTs

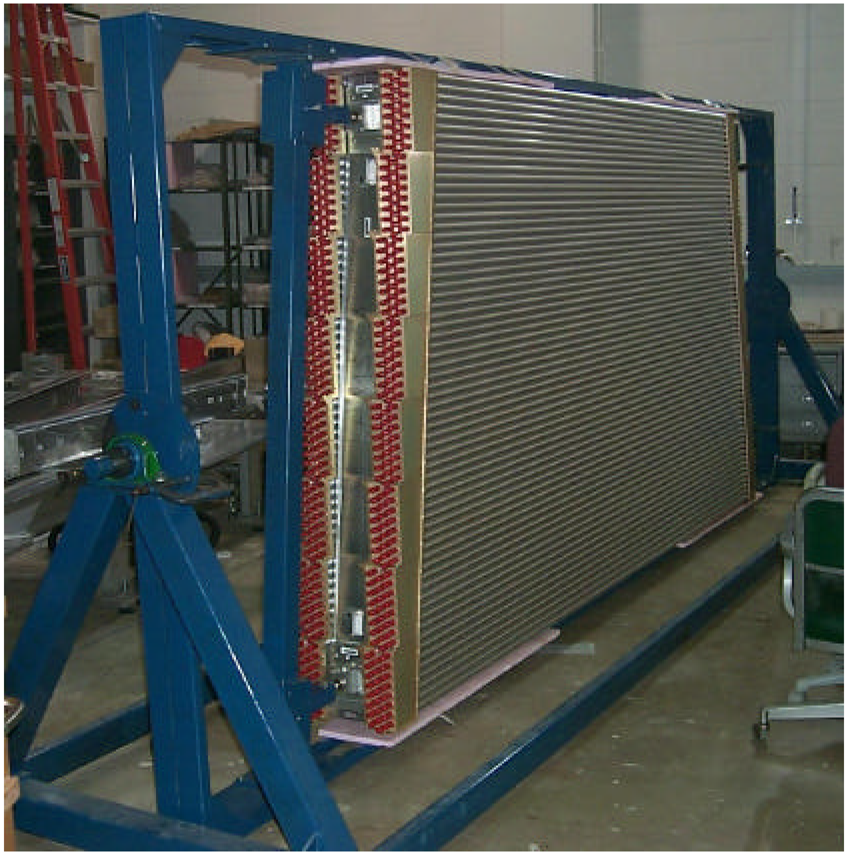


In terms of series MDT tubes about a third have been assembled and tested, rejected tube rates are well below the acceptable level

More than 20% of the bare MDT chambers have been assembled in the 11 out of 13 production sites (2 will start as planned later during 2002)

The quality of sample series chambers is regularly monitored with the X-ray facility, and all sites are found to fulfill well the required high accuracy

The production planning conforms to the required installation dates for the initial detector configuration

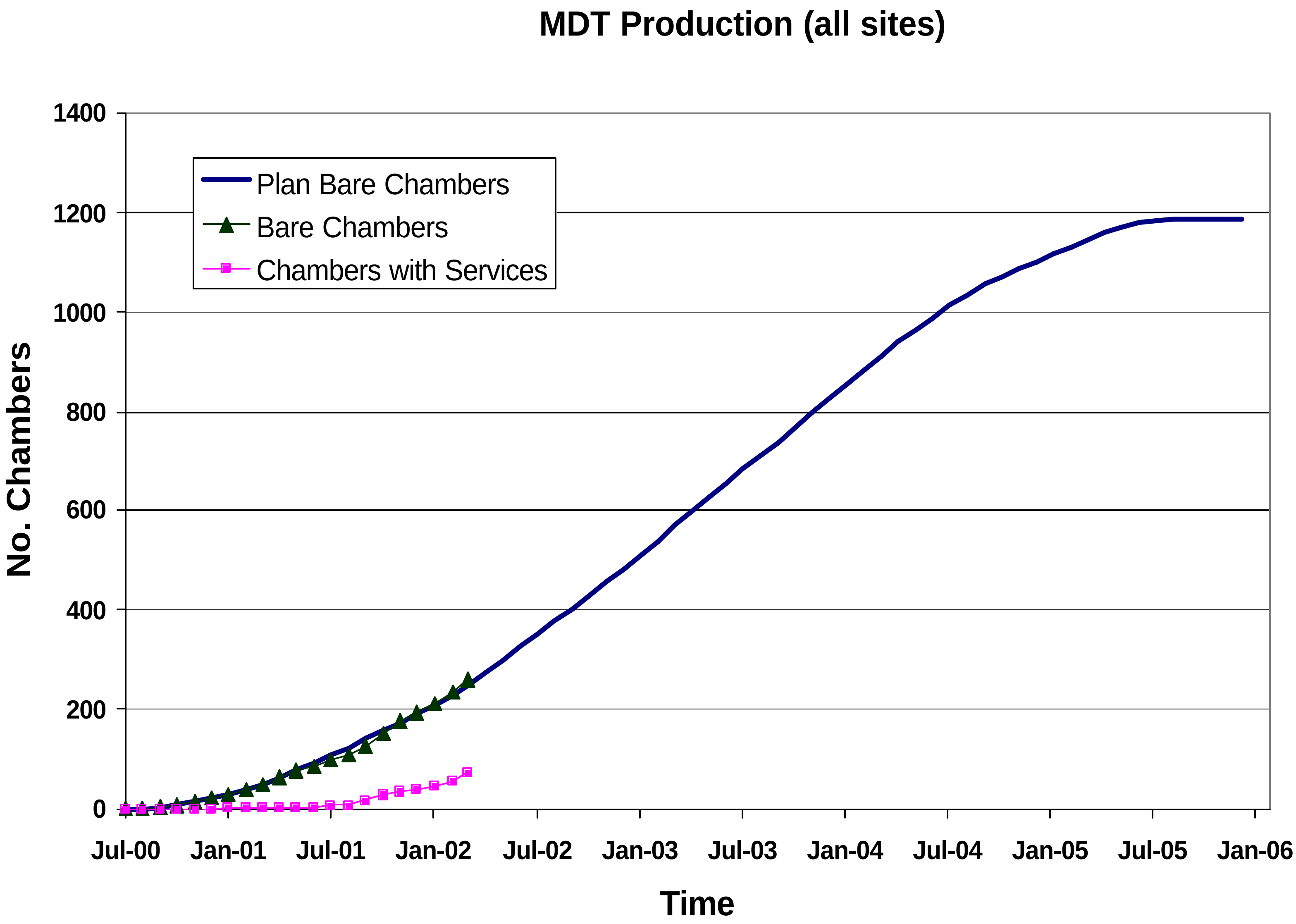


End-cap MDT chamber

Pre-series FE MDT electronics is working in first chamber stations, and the final version Is being tested now

MDT Chamber production

Status	31-Mar-02						
Site	series tubes	module-0 chambers	series bare chambers	plan series bare chambers	series MDT with gas, FC	series MDT tested (gas)	plan 100% bare chamb.
Greece - BIS	13,410	2	43	42	0	0	28. Apr 04
Boston - EI, EM	11,570	1	32	35	10	4	30. Jun 04
Univ. Michigan - EM	15,894	1	37	31	22	22	30. Jul 04
Univ. Washington - EI, EM	14,717	1	37	31	30	12	09. Sep 04
Dubna/Munich - BOS/BOF	17,800	1	25	25	5	3	13. Aug 04
Frascati - BML	10,300	1	25	22	2	1	08. Nov 04
Cosenza/Roma - BIL/BIR	3,900	1	8	11	1	0	09. Sep 04
Dubna - BMS	5,100	1	2	8	0	0	30. Aug 04
Protvino - EO	15,000	1	32	26	0	0	02. Aug 05
Nikhef - BOL	11,000	1	15	13	1	1	28. Apr 05
Cosenza, Pavia - BIL/BIR	3,800	1	3	7	0	0	09. Sep 04
Freiburg - BOG	0	0	0	0	0	0	18. Feb 04
Beijing - BEE, BIS8	0	0	0	0	0	0	23. Sep 04
Sum	**122,491**	**12**	**259**	**251**	**71**	**43**	
Fraction produced	**33.0%**		**22.3%**	**21.6%**	**6.1%**	**3.7%**	



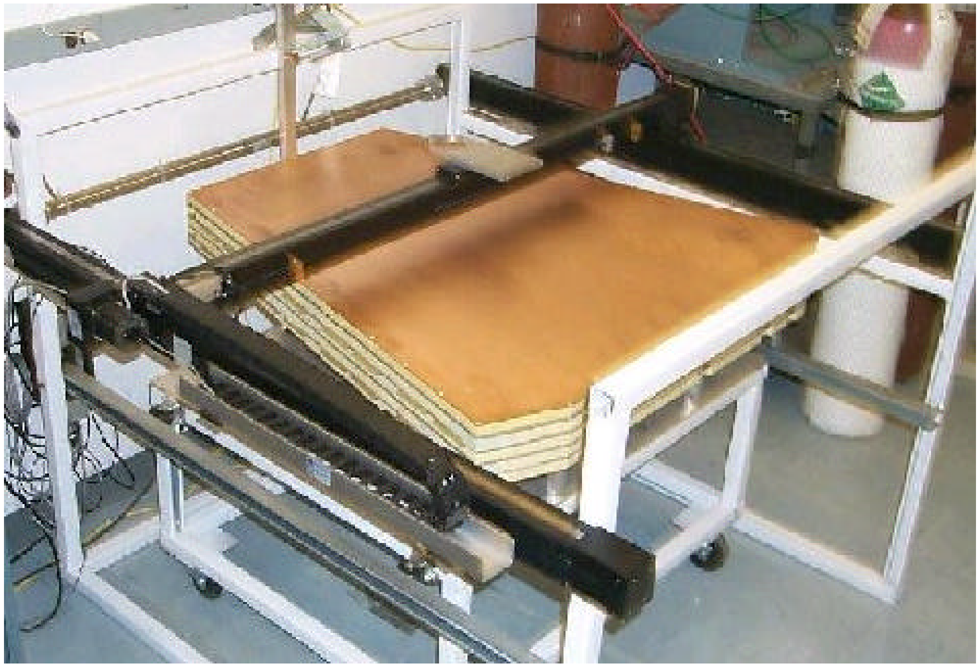
MDT Production (all sites)
1400
1200
1000
800
600
400
200
0
No. Chambers
Plan Bare Chambers
Bare Chambers
Chambers with Services
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Time

Muon Precision Chambers
CSCs

The initial detector will have 32 chambers (half of the layers, the rest is a high-luminosity upgrade)

A pre-series of 4 chambers has been constructed and is undergoing thorough tests

All material for the remaining chambers has been purchased, and the full scale production is now starting, with completion expected in June 2003



CSC chamber production

Muon Trigger Chambers
RPCs

A first pre-series of 24 RPC chambers has been assembled last year, and passed a Production Advancement Review (PAR) with special emphasis on QA/QC procedures in view of problems experienced by another experiment

Components and facilities are ready for the assembly for a second pre-series of 85 chambers

The on-chamber RPC electronics component production is well advanced

The gas volume capacity assigned to ATLAS in the factory is 11/day, and the assembly laboratory is ready for 3 to 4 units/day

With these improvements, a timely completion is anticipated in spite of the considerable delay in the production start-up

A fully functional barrel muon station test, with a BML MDT and two RPCs mechanically mounted together, will occur in the coming months

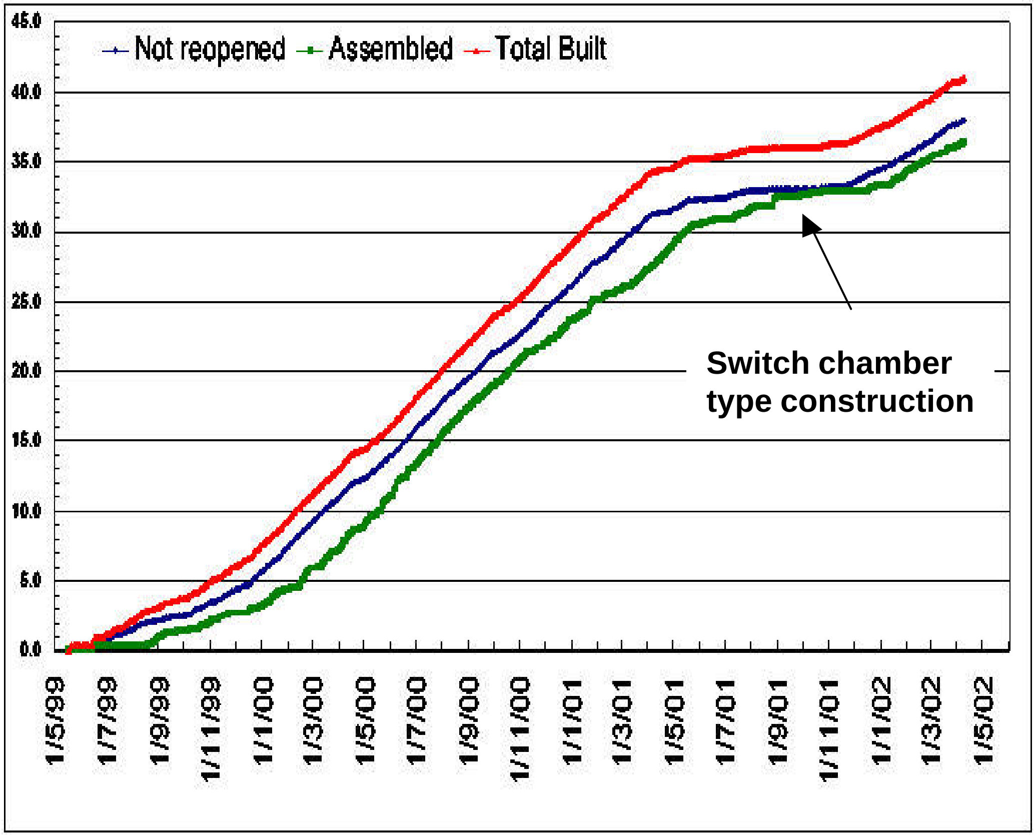
RPC chamber production

Muon Trigger Chambers
TGCs

The TGC series chamber production has continued to progress well, with three assembly sites:
- 60% of the material needed for all chambers has been machined and prepared
- 40% of chambers produced, and 12% tested, at the first site
- 25% of chambers completed at the second site
- third production site has started now, with the first two chambers just finished (the progress will depend on resources)

The full FE electronics board production is completed since some time

Globally the TGCs are expected to meet the schedule



TGC chamber production in % at the first site

Muon Integration and System Aspects

The muon detector integration is very closely linked to the overall detector integration, and major work has progressed together with Technical Coordination on (movable) supports, shielding, services routing from the ID and calorimeters, and access scenarios, leading to new fixed baseline dimensions

The large system test facility, both for projective end-caps and barrel sectors, in the SPS H8 beam is now becoming operational with first series chambers during this year

Concerns which are being dealt with, and as already reported at previous RRBs, include

- **constant struggle to secure space for storage and pre-assembly**
- **cost issues of common muon items**

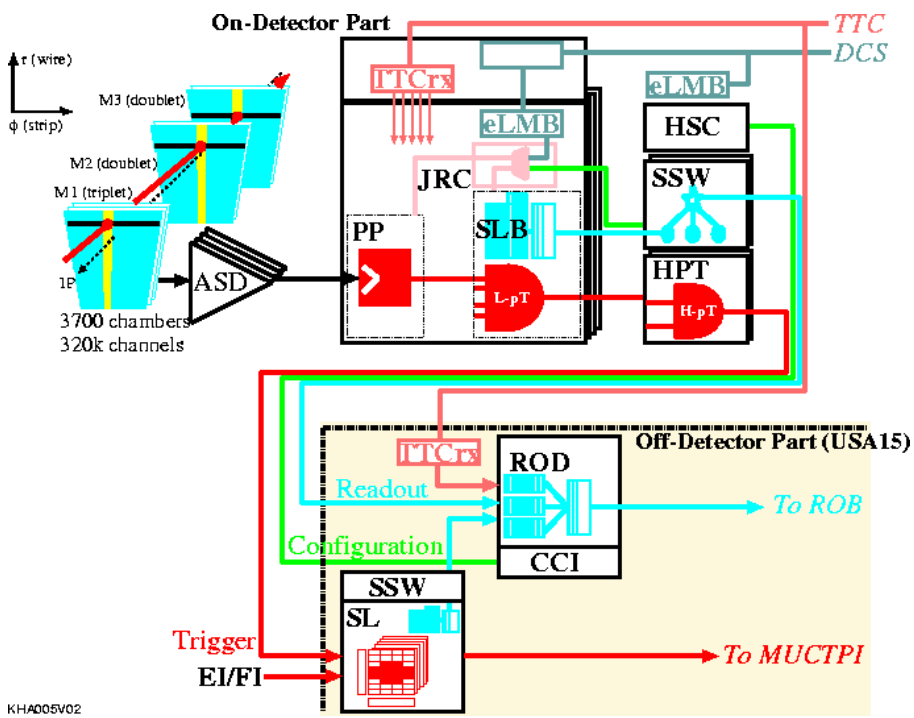
SPS H8 system test structures

Trigger/DAQ/DCS

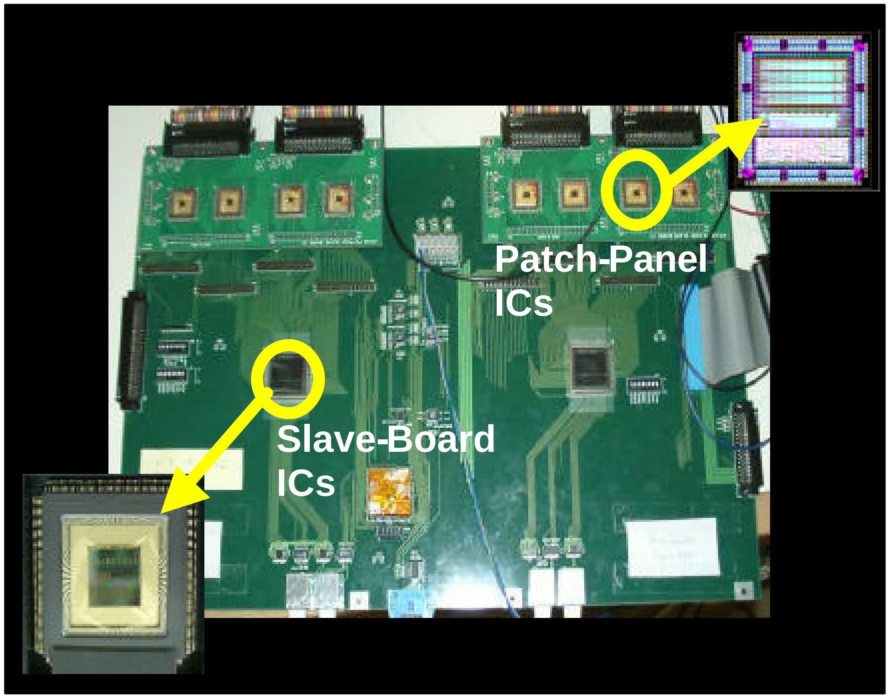
The level-1 trigger (calorimeter, muon, and central processor logic) developments have progressed as planned, with successful ASIC developments and many full-functionality prototypes modules

Major emphasis has been put on large-scale system tests ('slice-tests') to confirm the final designs

The first stage of such a test was performed successfully at the end of 2001 for the end-cap TGC muon trigger, and for this year the plan foresees such complete tests also for the barrel RPC muon trigger and the calorimeter triggers



End-cap muon trigger slice-test



PS board, one of the components for the TGC muon trigger slice-test

The High-Level Trigger (HLT) and DAQ systems studies have been pursued with many coherent activities both in software and hardware

The first stage of a Phase 2 Integrated Prototype has been developed to demonstrate full functionality and performance scaling (will be completed by end 2002)

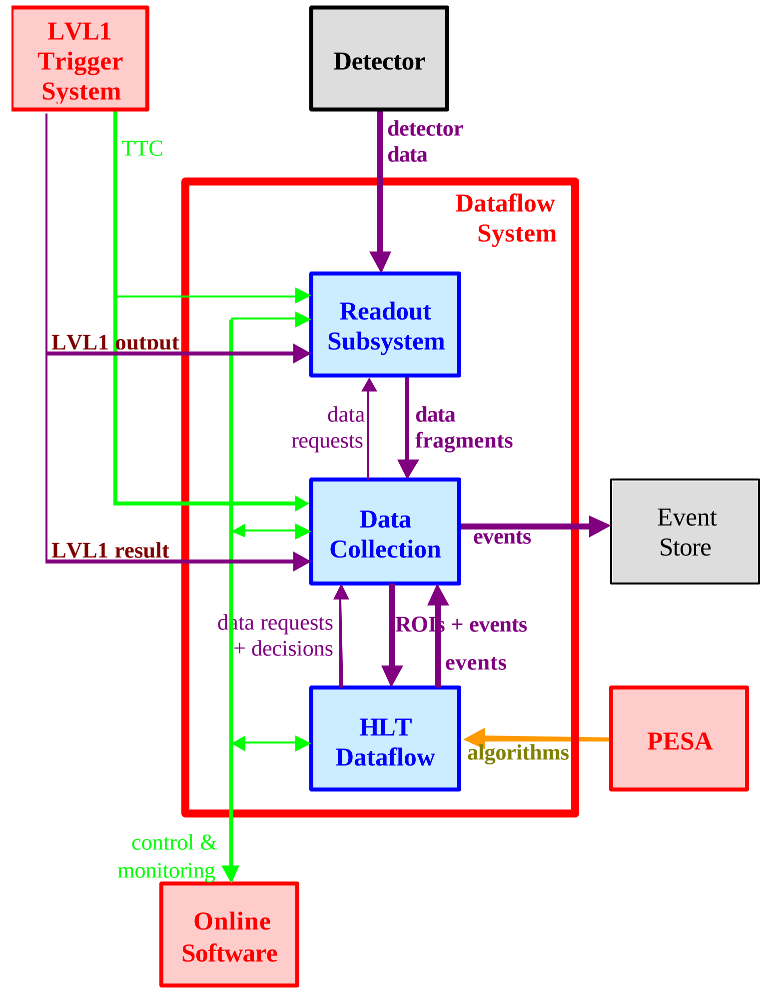
The main activities included refinements of the online software and data flow designs

A major effort is also underway for evaluating and optimizing the trigger and event rates, with a delicate balance between full flexibility to exploit the rich discovery potential and to minimize costs for both the HLT/DAQ system and offline computing

The Detector Control System (DCS) has been developed further, fulfilling radiation qualifications for the embedded local monitor board (ELMB) as specified, and with the SCADA system and ELMB already in use by all detector systems in their tests

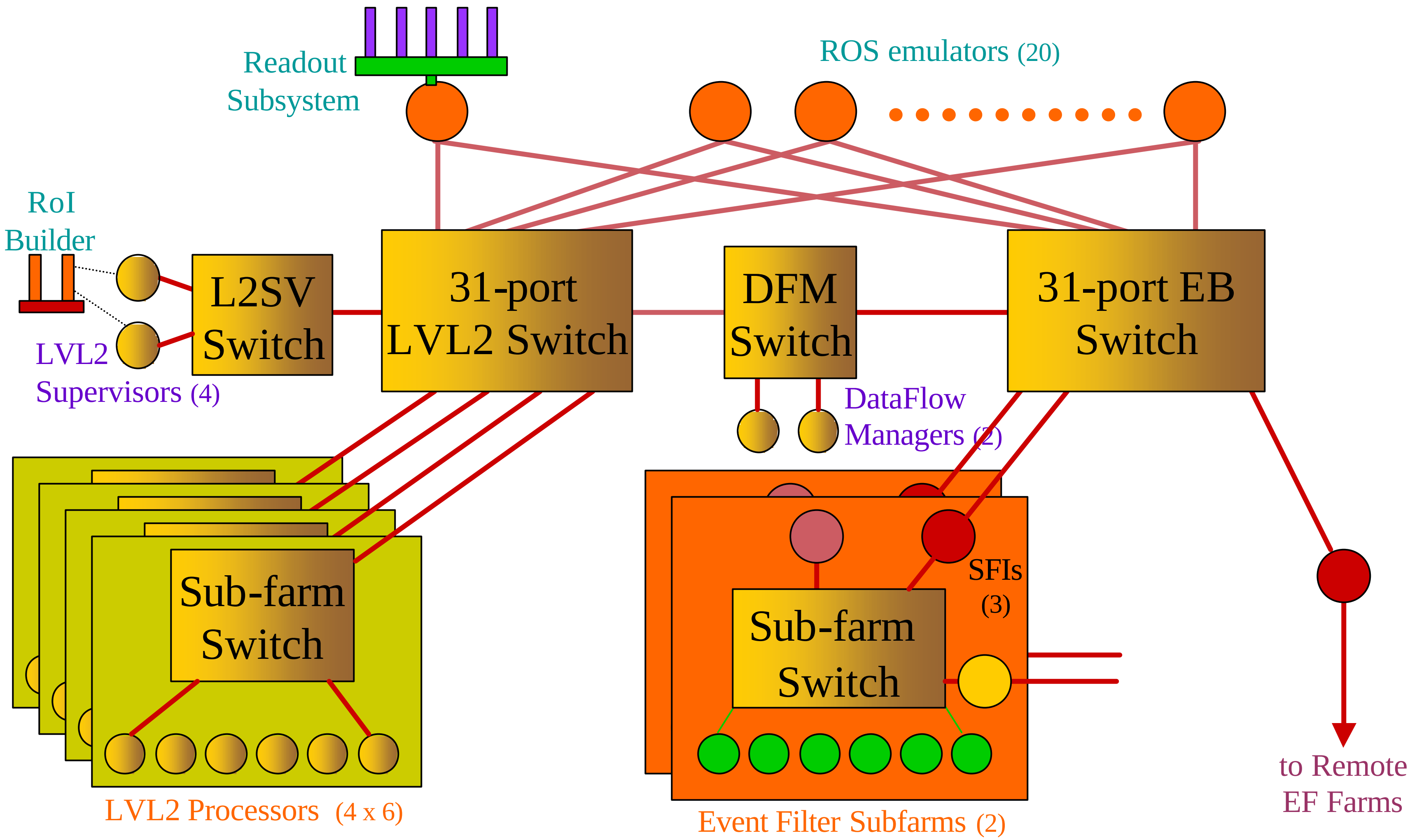
The Detector Interface Group (DIG) continued to play a major role in facilitating and standardizing the interfacing of DAQ with the various detector system read-out electronics, and in test beam implementations

The Trigger/DAQ/DCS system is expected to be ready in time for the commissioning of the detector



Schematic organization and interactions within the data flow design

A large 'testbed' is being assembled for performance studies of the data flow system



Computing

The broad and coherent computing software activities have been focussed by the preparation for the Data Challenges (DCs)

The DCs require that most the key software components have to work together

A first (incomplete) stage, called DC0, is currently underway, and DC1 is planned to provide a very high statistics simulation sample (10^7 events) for the HLT/DAQ TDR performance evaluation during the second half of 2002

The DCs will be embedded naturally into the framework of the CERN LHC Computing Grid Project (LCG) as soon as possible (this activity is discussed in the dedicated Computing RRB)

The *ATHENA* framework, which is acting as a backbone for the whole software chain, has been further developed, as have C++ versions of the reconstruction codes and some existing Fortran codes

In the area of simulation, the very active and fruitful cooperation with the GEANT4 collaboration has continued in order to validate the physics performance of the code (particularly still ongoing and needed on the hadronic calorimetry)

The overall progress has been recently reviewed critically by a broad, strategic ATLAS Overview Review, with external reviewers

The conclusions have revealed good progress in many areas, but also emphasized the need for significant improvement in a few key areas like Event Data Model and Detector Description, and infrastructure support for the users, which are followed up urgently

Initial Staged Detector

A concept for the initial staged detector, driven by availability of resources, has been worked out since quite some time, and has been presented last year to the LHCC Comprehensive Review and the RRB

The main staged components are

- **One Pixel layer in the ID**
- **Outermost TRT end-cap wheels (C-type)**
- **Part of the LAr ROD system**
- **Tile gap scintillators**
- **EES and EEL MDTs**
- **Half of the layers of the CSCs**
- **Part of the Common Project processors**
- **Part of the high luminosity shielding**

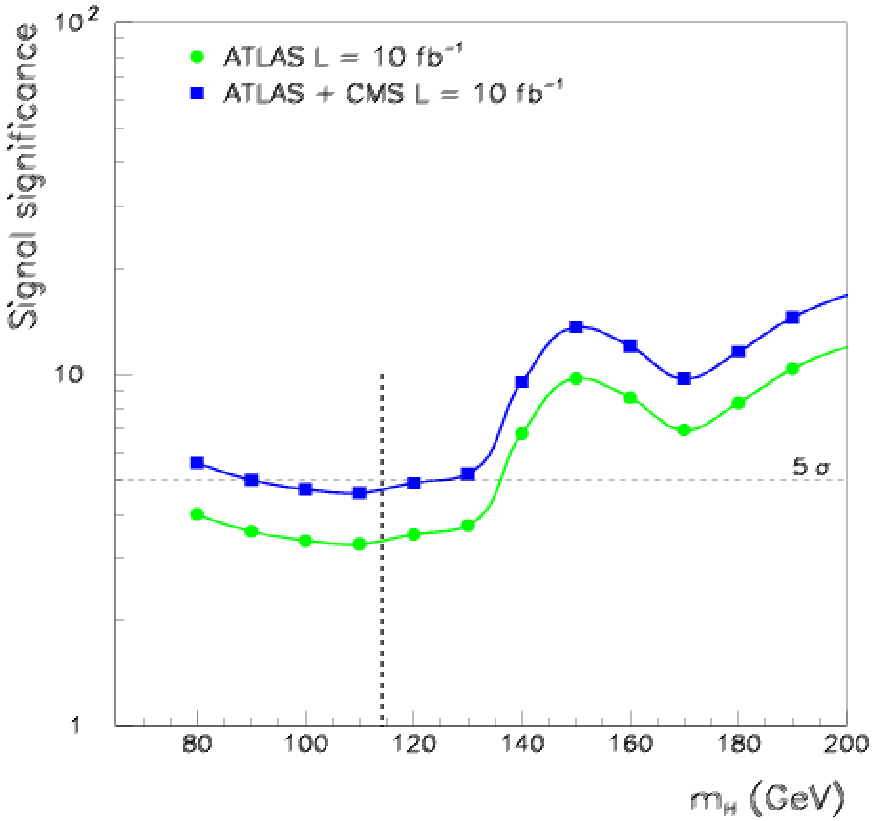
Some further parts of the outermost MDT chambers would have been staged in case the initial installation time would have been insufficient

The physics impact of this configuration on the initial LHC physics running was documented in an ATLAS Note discussing also more staging stringent options (ATLAS RRB-D 2001-118)

Staging impact

The physics implication of the initial detector configuration has been studied for the test case of the low mass Higgs discovery potential during the first physics run (10 fb^{-1})

The figure shows the SM Higgs signal significance for the complete (TDR) ATLAS detector and for combining ATLAS and CMS



Expected number of signal and background events, and significance, for m ~ 115 GeV in ATLAS alone

	H ® gg	ttH ® tt bb	Both channels
S	150	15	
B	3900	45	
S/B	0.04	0.3	
S/ÖB	2.4	2.2	3.2

The main impact of the initial staged detector configuration is that the discovery potential for the Higgs signal in several final states will be degraded by about 10% (meaning that 20% more integrated luminosity is required to compensate)

Possible penalties on the pattern recognition performance from the less robust tracking systems are not included in these results

Staged items	Main impact expected on	Loss in significance
One pixel layer	ttH ® ttbb	~ 8%
Outermost TRT wheels + MDT	H ® 4m	~ 7%
Cryostat Gap scintillators	H ® 4e	~ 8%
MDT	A/H ® 2m	~ 10% for m ~ 300 GeV

Note as a warning: the effects on other physics channels need to be considered as well, and they are less well established at present

A clear example is the deteriorated b-tagging performance, by order 30%

Schedule and Milestones

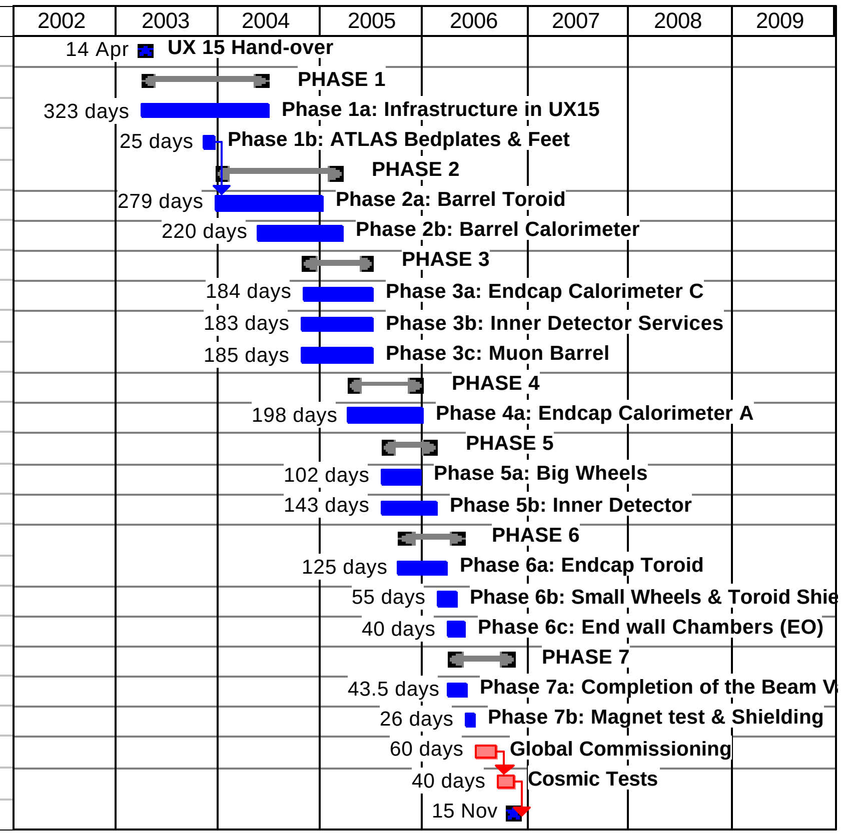
The LHC project schedule is known of being changed, with first beam injection in April 2007

ATLAS in turn is optimizing its installation schedule which in the past was very tight for several components, in particular the barrel toroid

The current working schedule (v. 4.02) would have the initial staged detector ready in autumn 2006

The ongoing system construction schedules are not slowed down, but systems benefit from the later requested delivery dates to reinstall the minimal 4 months float requested as contingency (respected by all except the last barrel toroid coil where the float is only 2 months)

Task Name	Start	Finish
UX 15 Hand-over	14 Apr '03	14 Apr '03
PHASE 1: Infrastructure & Feet	29 Mar '03	23 Jun '04
Phase 1a: Infrastructure in UX15	29 Mar '03	23 Jun '04
Phase 1b: ATLAS Bedplates & Feet	7 Nov '03	12 Dec '03
PHASE 2: Barrel Toroid & Barrel Calorimeter	15 Dec '03	18 Mar '05
Phase 2a: Barrel Toroid	15 Dec '03	6 Jan '05
Phase 2b: Barrel Calorimeter	15 May '04	18 Mar '05
PHASE 3: End-cap Calorimeter C & Muon Barrel	20 Oct '04	8 Jul '05
Phase 3a: Endcap Calorimeter C	25 Oct '04	8 Jul '05
Phase 3b: Inner Detector Services	20 Oct '04	1 Jul '05
Phase 3c: Muon Barrel	20 Oct '04	5 Jul '05
PHASE 4: End-cap Calorimeter A	28 Mar '05	29 Dec '05
Phase 4a: Endcap Calorimeter A	28 Mar '05	29 Dec '05
PHASE 5:Big Wheels & Inner Detector	28 Jul '05	14 Feb '06
Phase 5a: Big Wheels	28 Jul '05	19 Dec '05
Phase 5b: Inner Detector	28 Jul '05	14 Feb '06
PHASE 6: Toroid End-Caps & Small Wheels	3 Oct '05	23 May '06
Phase 6a: Endcap Toroid	3 Oct '05	27 Mar '06
Phase 6b: Small Wheels & Toroid Shielding (J	15 Feb '06	2 May '06
Phase 6c: End wall Chambers (EO)	29 Mar '06	23 May '06
PHASE 7: Beam Vacuum, Closing, Shielding	28 Mar '06	15 Nov '06
Phase 7a: Completion of the Beam Vacuum	28 Mar '06	29 May '06
Phase 7b: Magnet test & Shielding	24 May '06	28 Jun '06
Global Commissioning	29 Jun '06	20 Sep '06
Cosmic Tests	21 Sep '06	15 Nov '06
ATLAS Ready For Beam	15 Nov '06	15 Nov '06



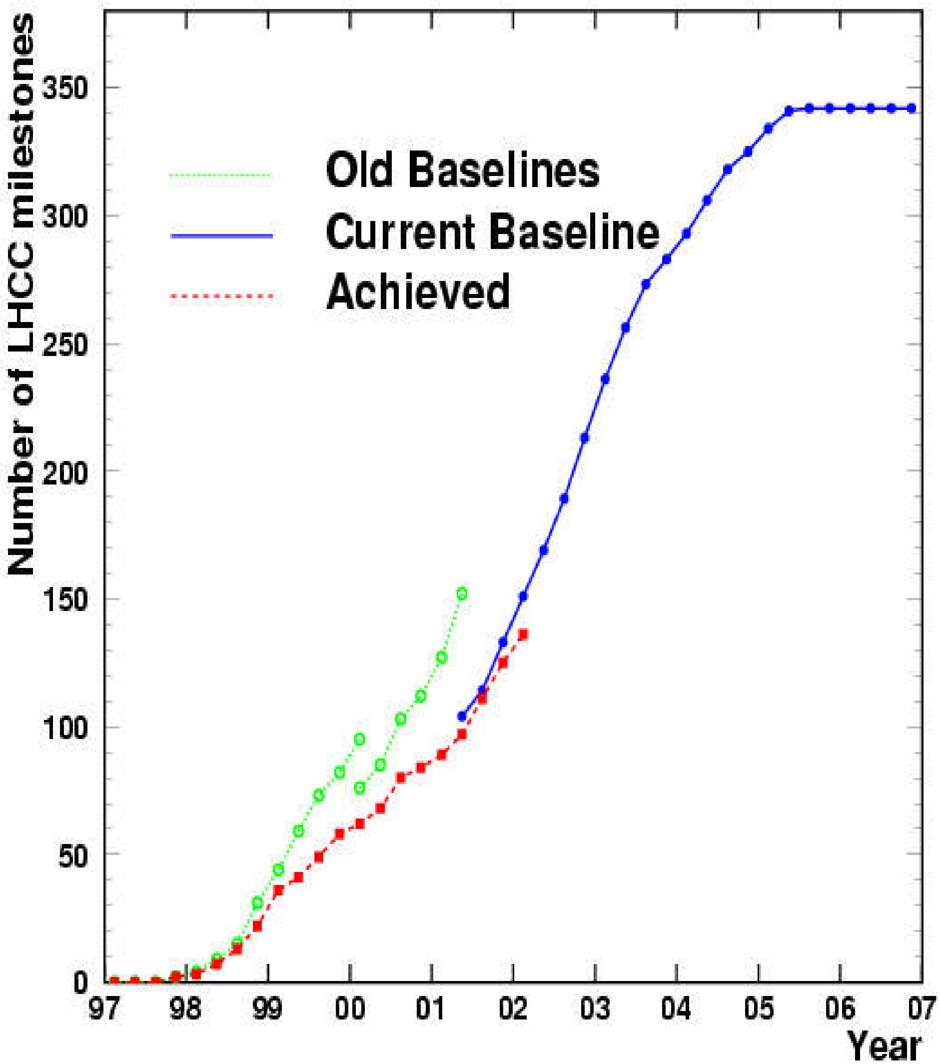
As one of the tools to follow up the construction progress the LHCC milestones are monitored 3 times a year

The plot displays the integral result in terms of passed milestones compared to the planning (as well as the history of the two baseline changes since 1997)

The current baseline milestones, adjusted for the last time in spring 2001, after the LHC project schedule change at that time, aimed at first beam in April 2006

As for the schedule, also the milestone planning will have to be re-baselined once the new LHC schedule is officially adjusted

ATLAS internal reporting of the construction progress is also implemented in the Project Progress Tracking (PPT) system, monitoring the advancement of work packages



Conclusions on the Technical Progress

The detector construction is in general coming well along the planning for the initial staged detector, operational for full commissioning in the second half of 2006

More and more components and modules of the detector (sub-) systems are being delivered to CERN

Large pre-assembly and module integration activities have started, in particular for the calorimetry

The pre-operation activities include major large-scale system tests, together with continued calibration and sample QC qualification efforts in test beams

Also, many components of the Common Project are already at CERN, and the experimental area is progressing well, as M Nessi will illustrate in the next talk

The critical path elements for the schedule remain the barrel toroid, LAr barrel and second end-cap, and the second TRT end-cap, but in all cases the situation has improved and a minimal float is respected

In parallel a broad effort on software, computing and physics preparation is in full swing, with the Data Challenges as a focal point for these activities

ATLAS has made again a visible step towards the eagerly awaited LHC physics!