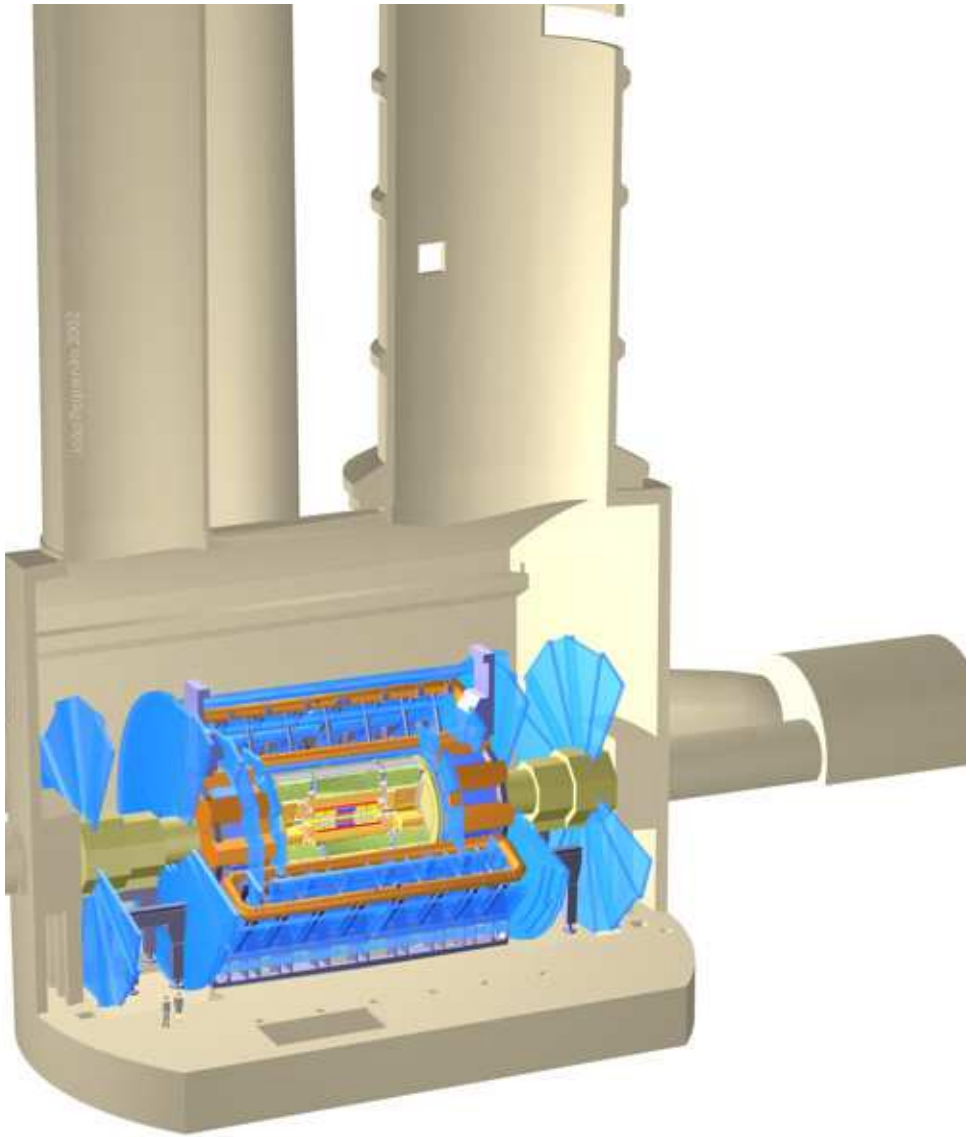
ATLAS Overview

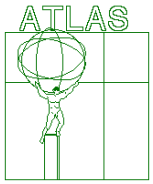
R. Leitner, Charles Univ., Prague
for the Atlas Collaboration



Status of Atlas systems

Installation and commissioning

Physics highlights



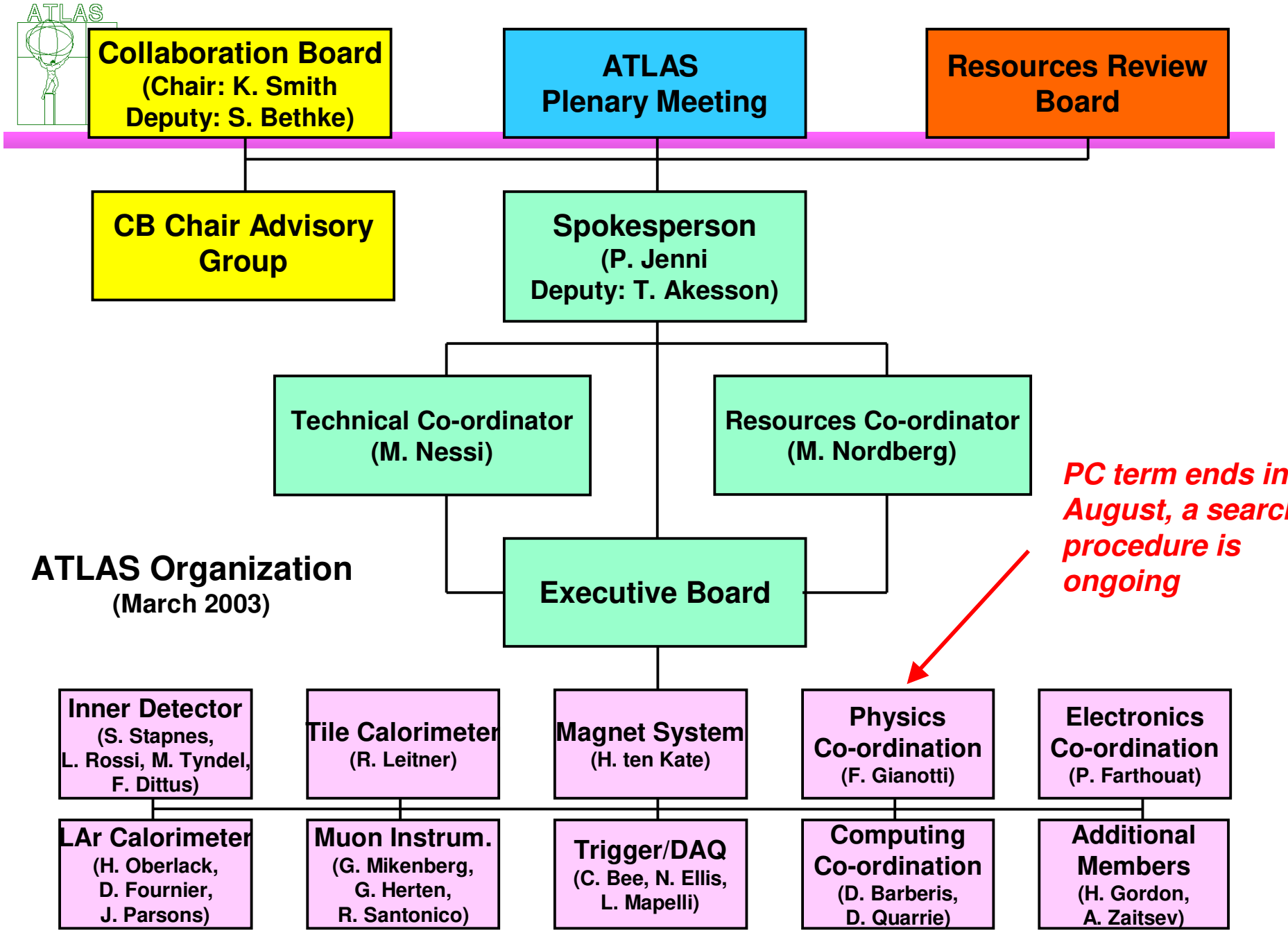
ATLAS Collaboration

(Status June 2003)

Albany, Alberta, NIKHEF Amsterdam, Ankara, LAPP Annecy, Argonne NL, Arizona, UT Arlington, Athens, NTU Athens, Baku, IFAE Barcelona, Belgrade, 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, Geneva, Genoa, Glasgow, LPSC Grenoble, Technion Haifa, Hampton, Harvard, Heidelberg, 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, 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, Ritsumeikan, UFRJ Rio de Janeiro, Rochester, Rome I, Rome II, Rome III, Rutherford Appleton Laboratory, DAPNIA Saclay, Santa Cruz UC, Sheffield, Shinshu, Siegen, Simon Fraser Burnaby, Southern Methodist Dallas, 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, Yale, Yerevan

(151 Institutions from 34 Countries)

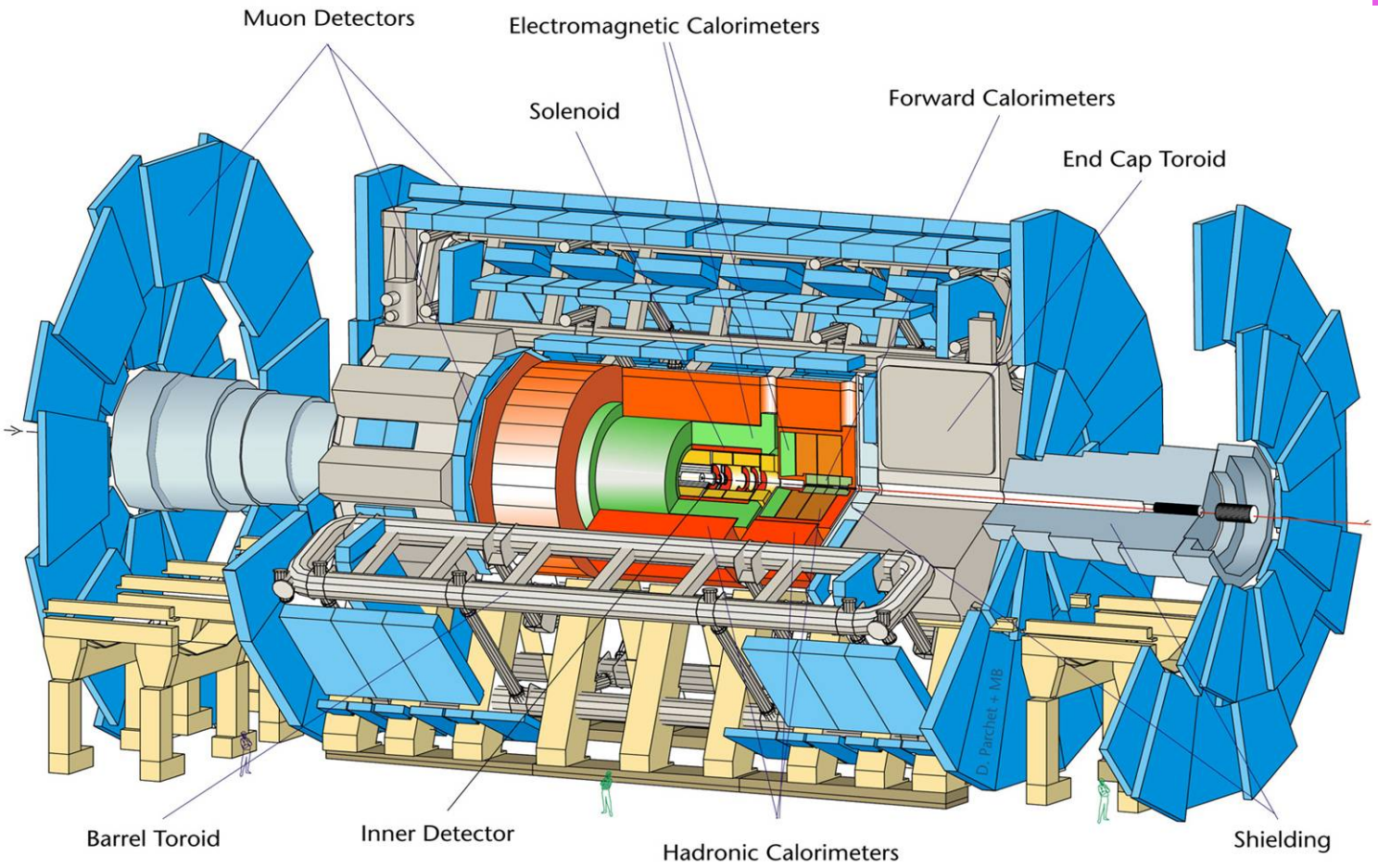
Total Scientific Authors	**1600**
Scientific Authors holding a PhD or equivalent	**1310**



ATLAS Organization
(March 2003)

PC term ends in August, a search procedure is ongoing

Atlas detector

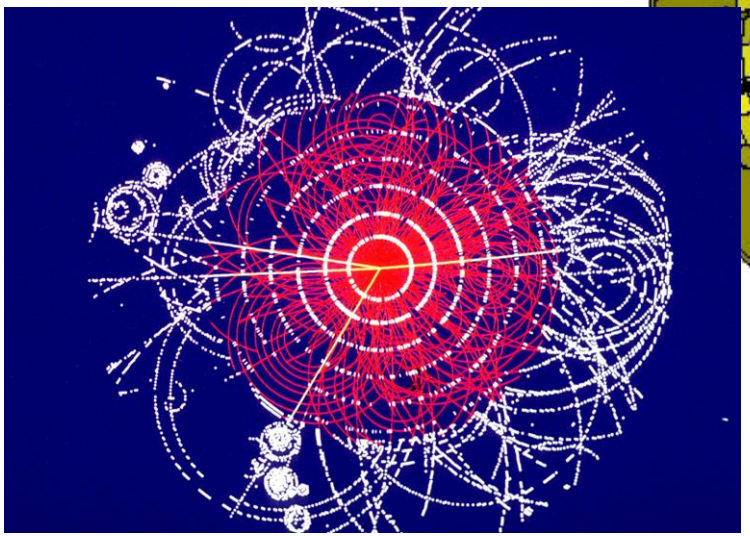


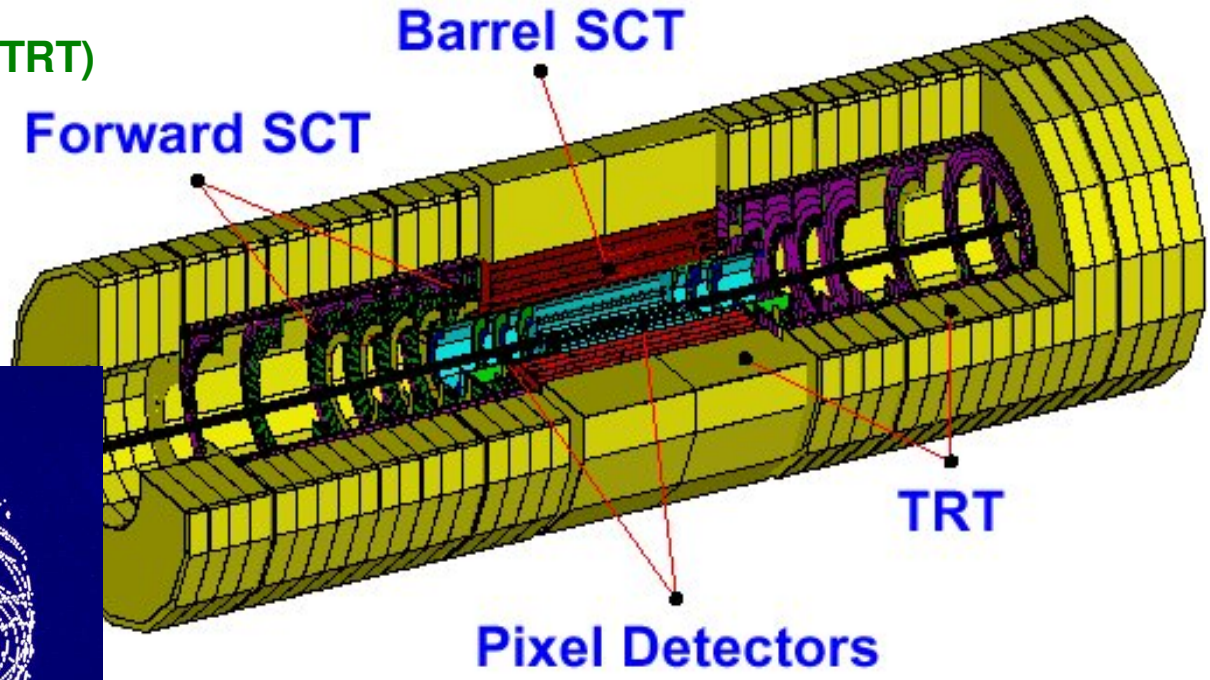
Diameter	***25 m***
Barrel toroid length	***26 m***
End-cap end-wall chamber span	***46 m***
Overall weight	***7000 Tons***

Inner Detector (ID)

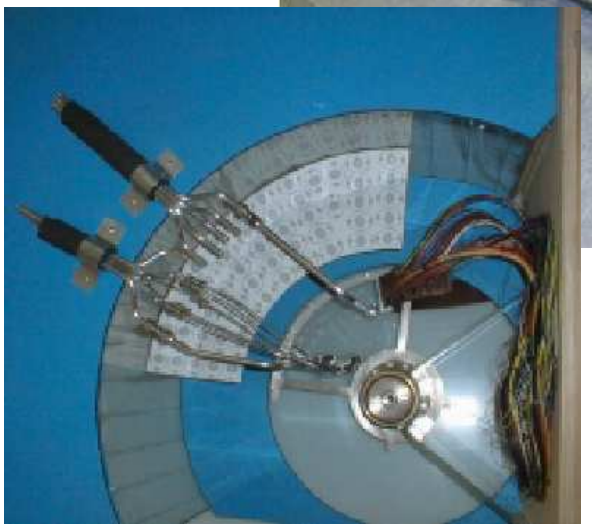
The Inner Detector (ID) is organized into four sub-systems:

- **Pixels**
- **Silicon Tracker (SCT)**
- **Transition Radiation Tracker (TRT)**
- **Common ID items**

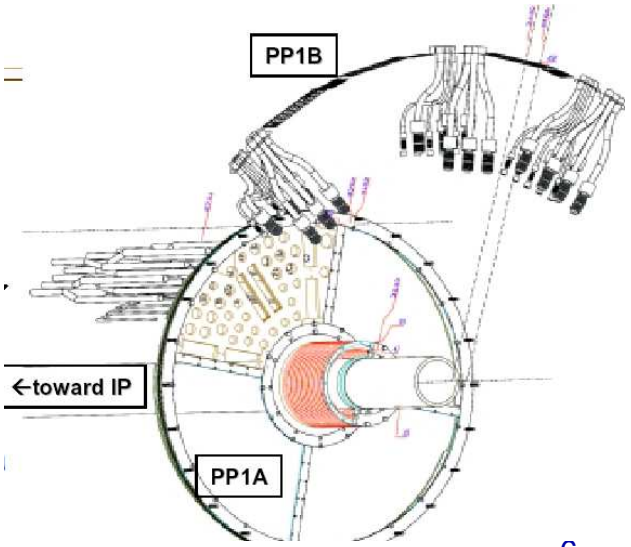




Pixel status -

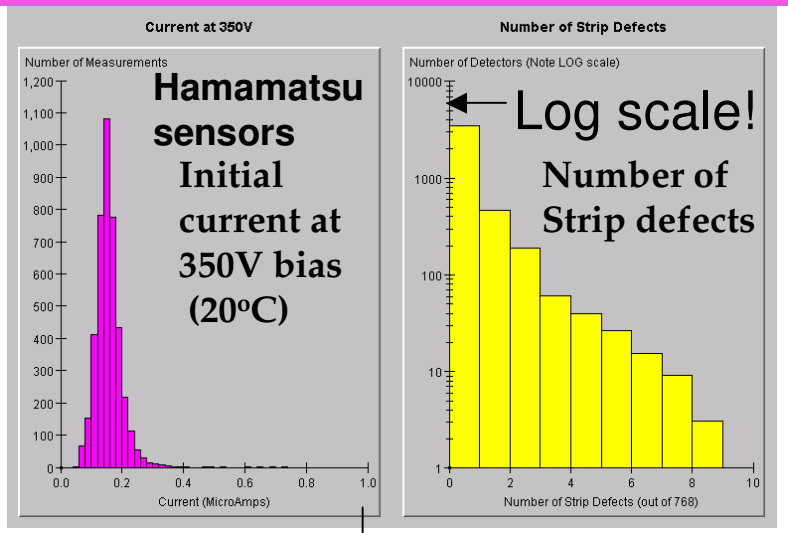


- The sensor situation :
  - CiS production of 600 good tiles (all tested) made, next 400 delivery to resume next month after the factory has been moved to a new site and restarted.
  - Tesla preproduction of some 50 tiles indicates that the post-irradiation problems (sensors were irradiated in the PS) have been understood and corrected for. Final measurements with complete modules in progress. If no problems production should be resumed in 2 months at a rate of 35 4" wafers/week.
- Mechanics/services :
  - Staves and pipes in production after some inital problems
  - The global support structure is delivered (upper corner right)
  - The Pixel Support Tube is in production (PPR in Feb.03)
  - The services FDR last week showed very good progress on local services and the very difficult PP1 region (end of PST) – see picture/drawing right.

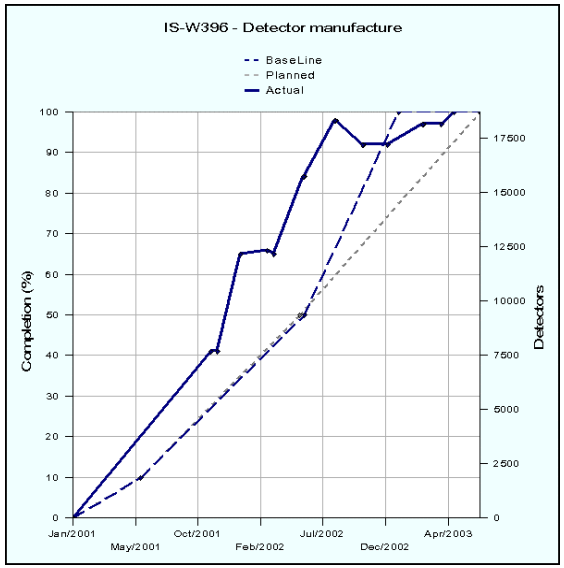


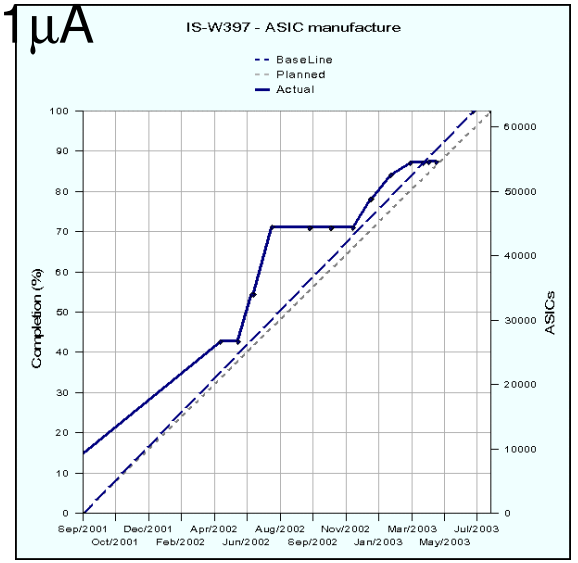
SCT Procurement – silicon sensors and ASICs

- Production & acceptance testing of the silicon detectors is completed (dip when total was changed to include final options).
- Production & acceptance testing of FE ASICs is well advanced (86%) but ATMEL production now halted.
- Negotioation with ATMEL replacement wafers (i.e. to replace wafers with yield below the guarantee) continue.



1μA

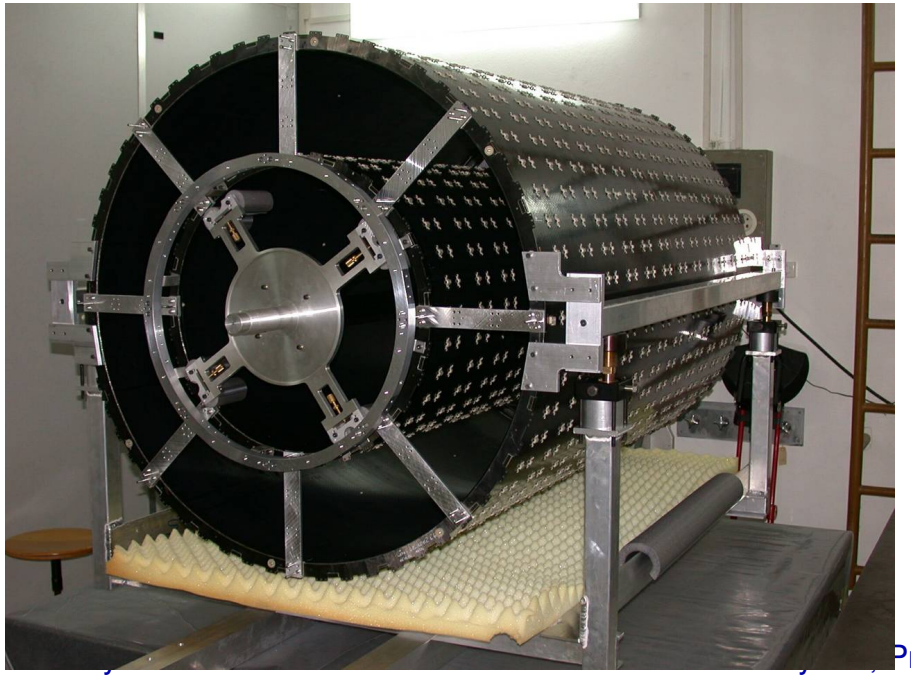


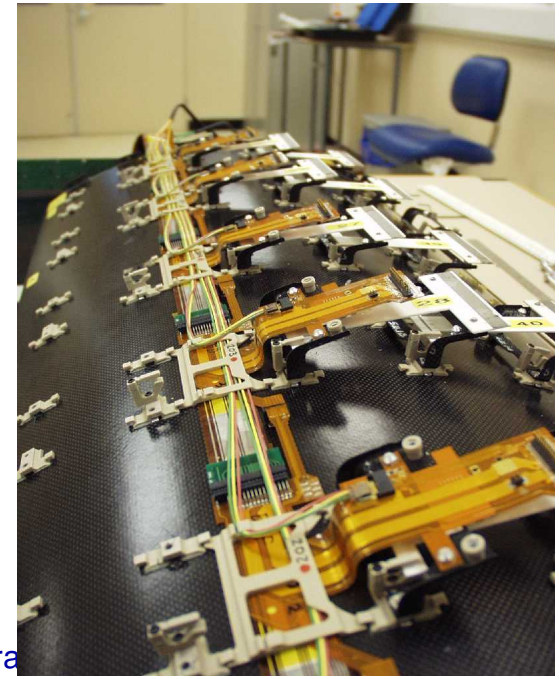


Pixel support structure

Inner Detector light-weight, high-precision, support structures

Two of the four barrel SCT support cylinders and SCT services test

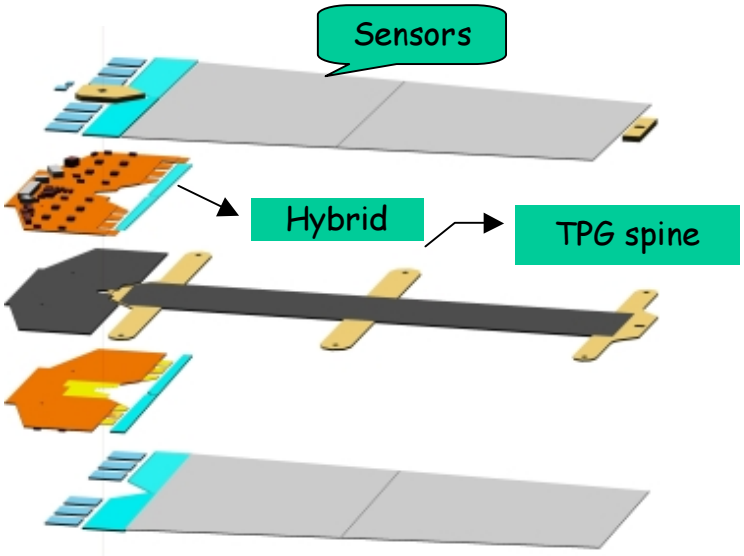


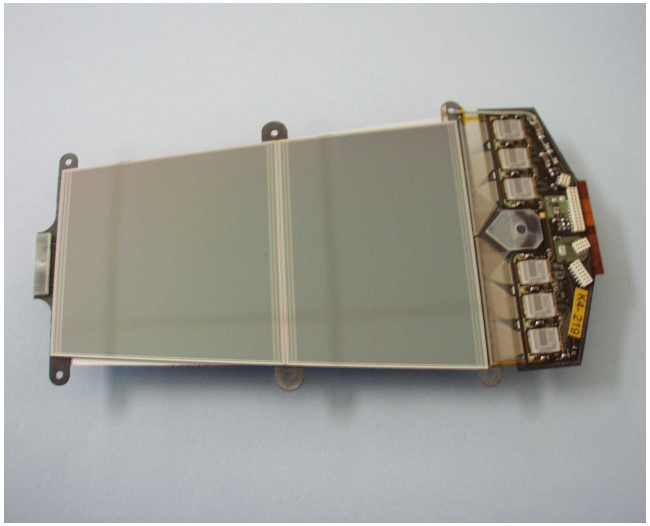


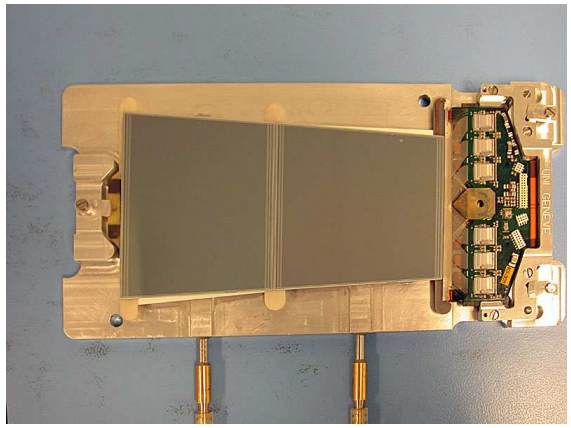
SCT Endcap modules

- The EC module passed the FDR in Dec.02. Since then hectic preparation to prepare module production and components manufacture.

Endcap Module



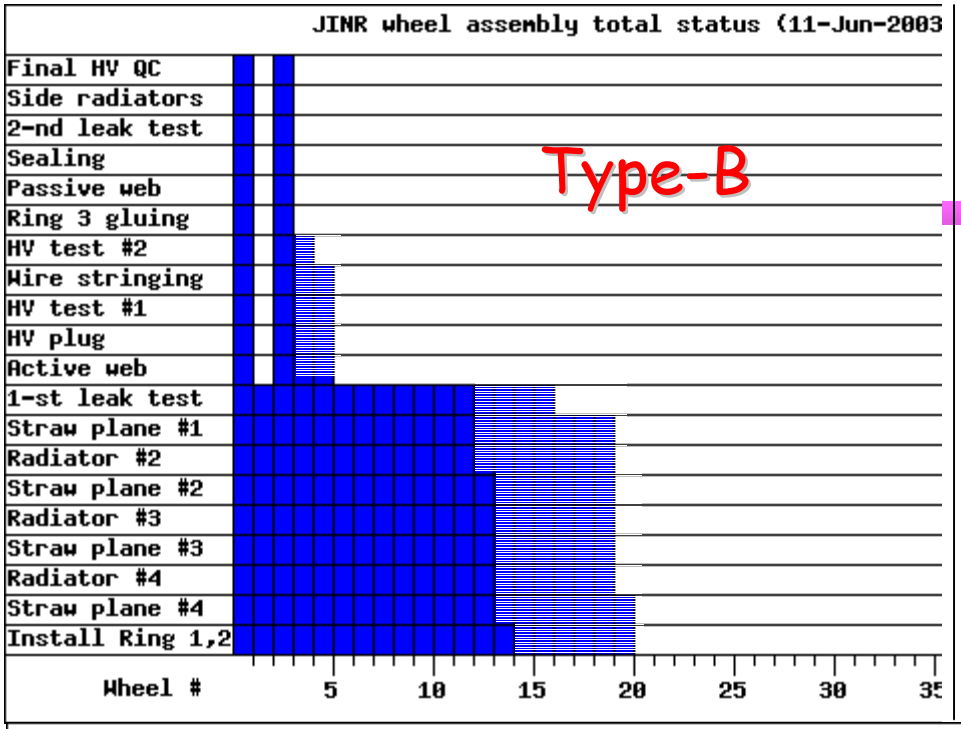


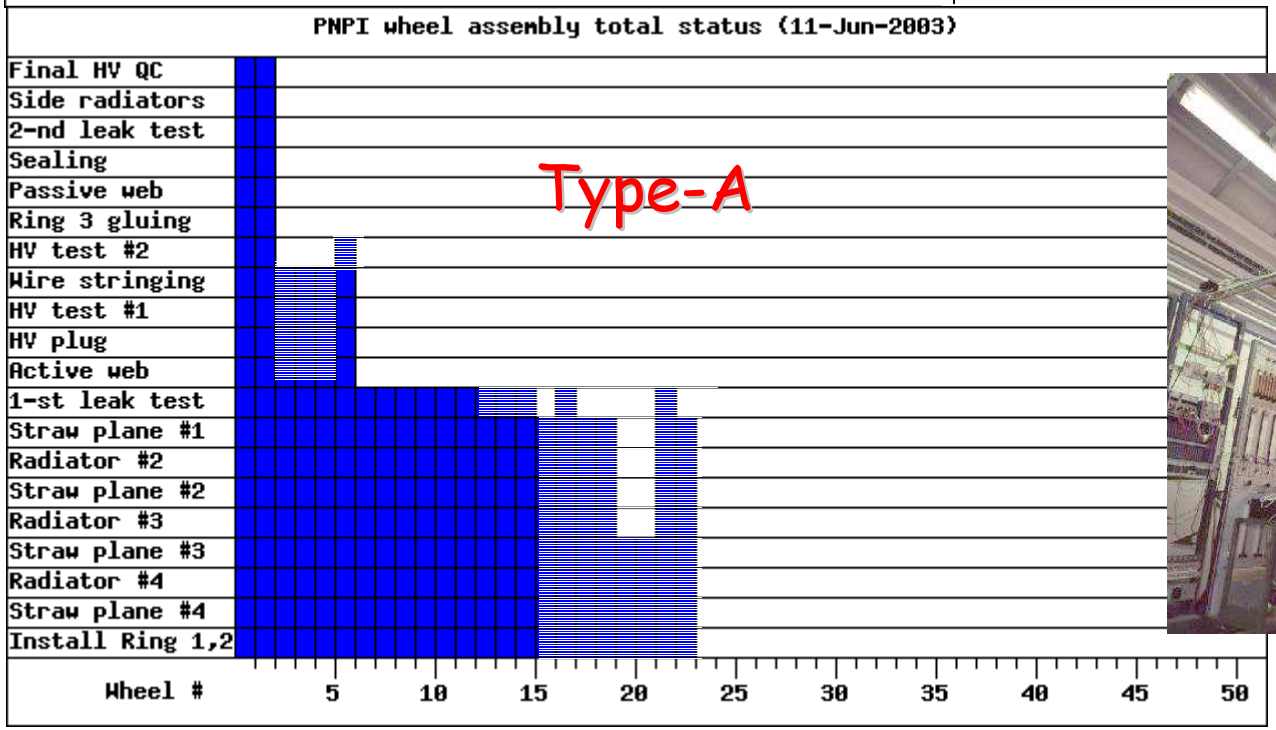


TRT Beam test structure

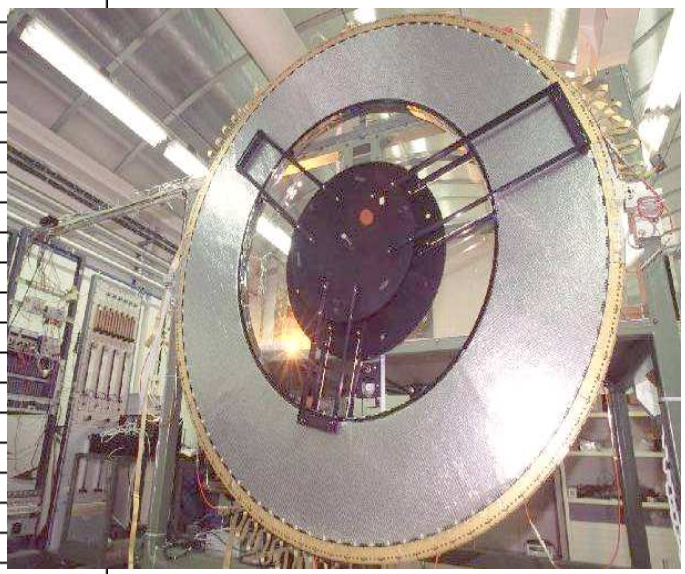
Status of TRT wheel assembly

12 June 2003





4-plane end-cap wheel

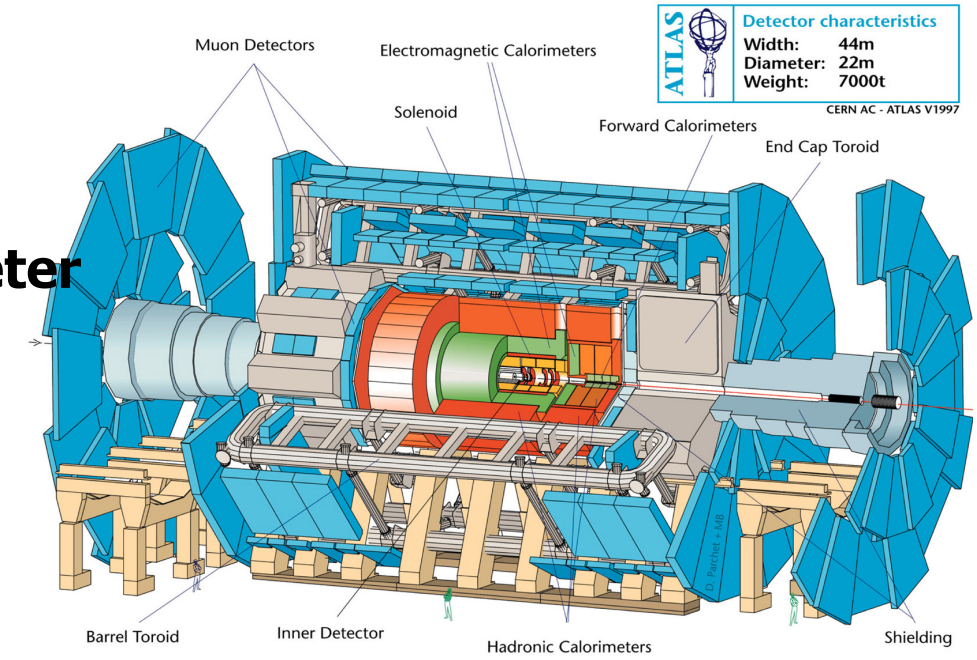


Atlas calorimeters

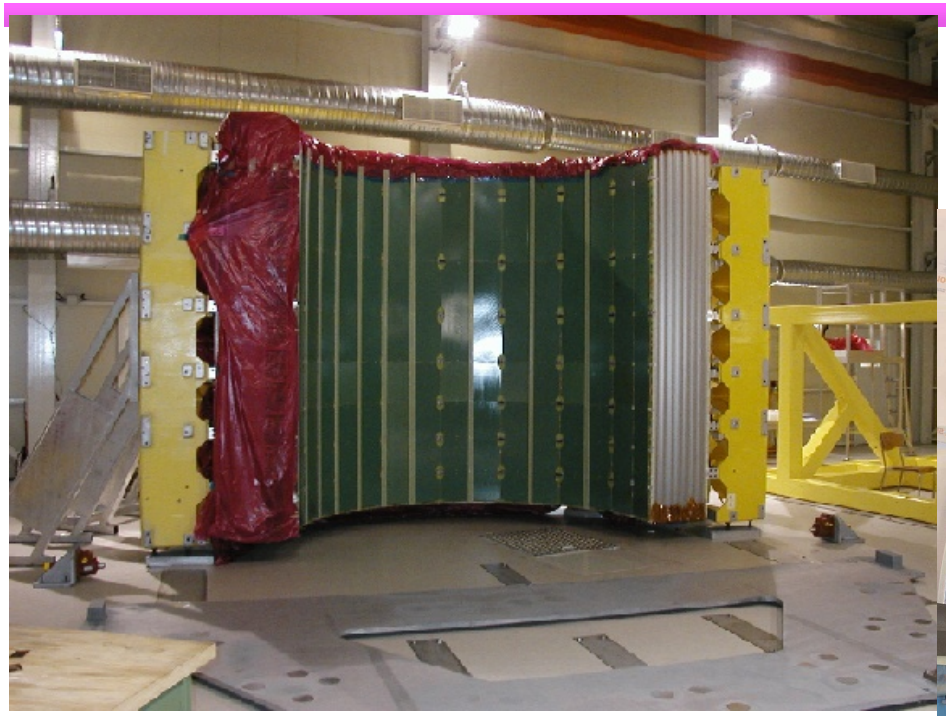
Electromagnetic calorimeters:
Lar barrel and endcaps

Hadronic calorimeters:
Tile Calorimeter
Lar hadronic end cap calorimeter

Forward calorimeters

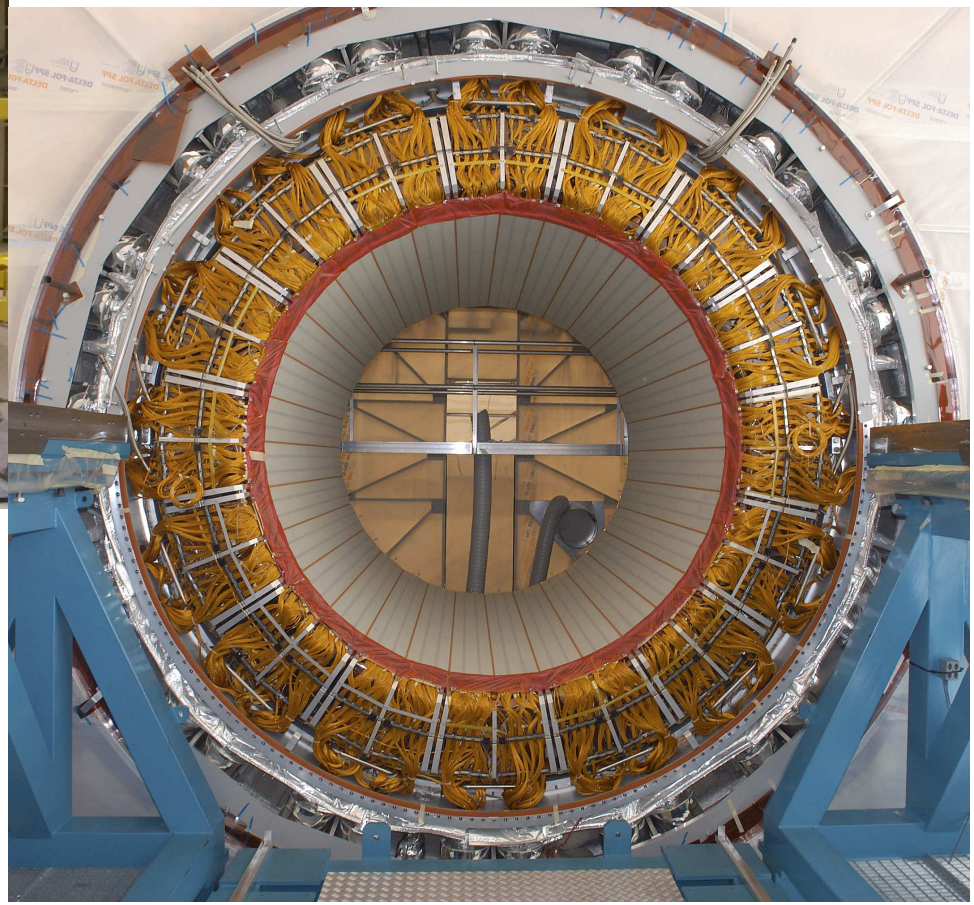


LAr barrel EM cylinder assembly



First LAr EM half barrel after insertion into the cryostat fully tested (warm conditions, cold test after insertion of the second half barrel and the solenoid early next year)

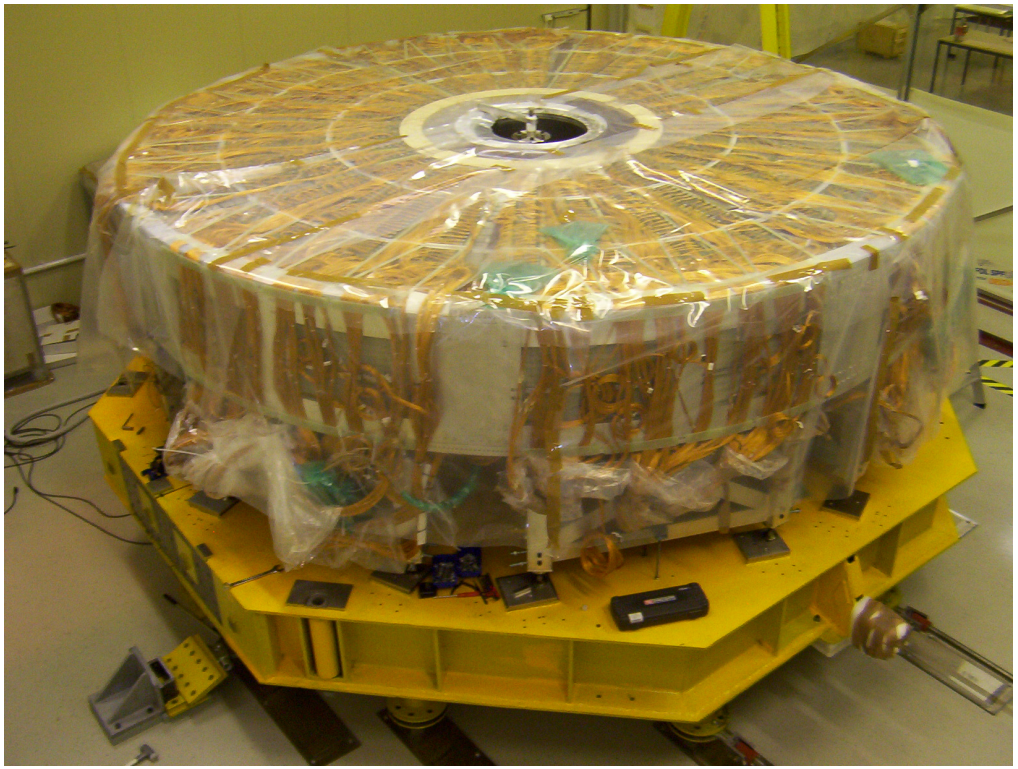
LAr EM barrel assembly in the vertical position: second half barrel is now completed



LAr end-cap wheels assembly

Hadronic end-cap wheels for first side fully integrated and ready for insertion into the cryostat (all modules complete for both sides)

First EM end-cap wheel fully assembled



LAr forward calorimeters

The three modules for the first end-cap side were shipped last year to CERN and cold-tested, they are ready for a beam calibration in June 2003

The final integration work for the second end-cap has started as well

FCAL module during insertion of W rods

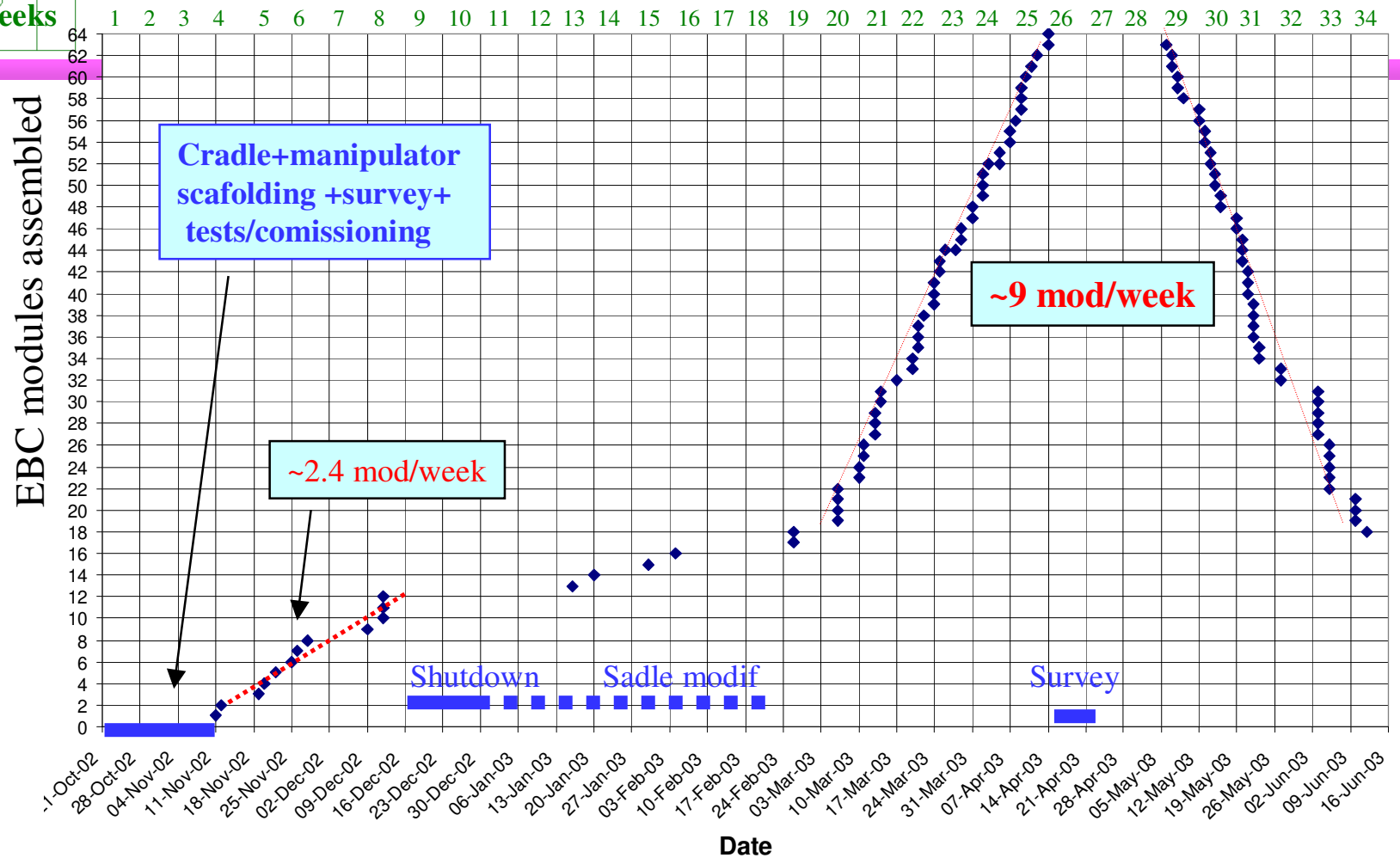
Cold test of the three FCAL modules for the first side

Tile Calorimeter pre-assembly of the first extended barrel successfully completed in April 2003

Insertion of module 64

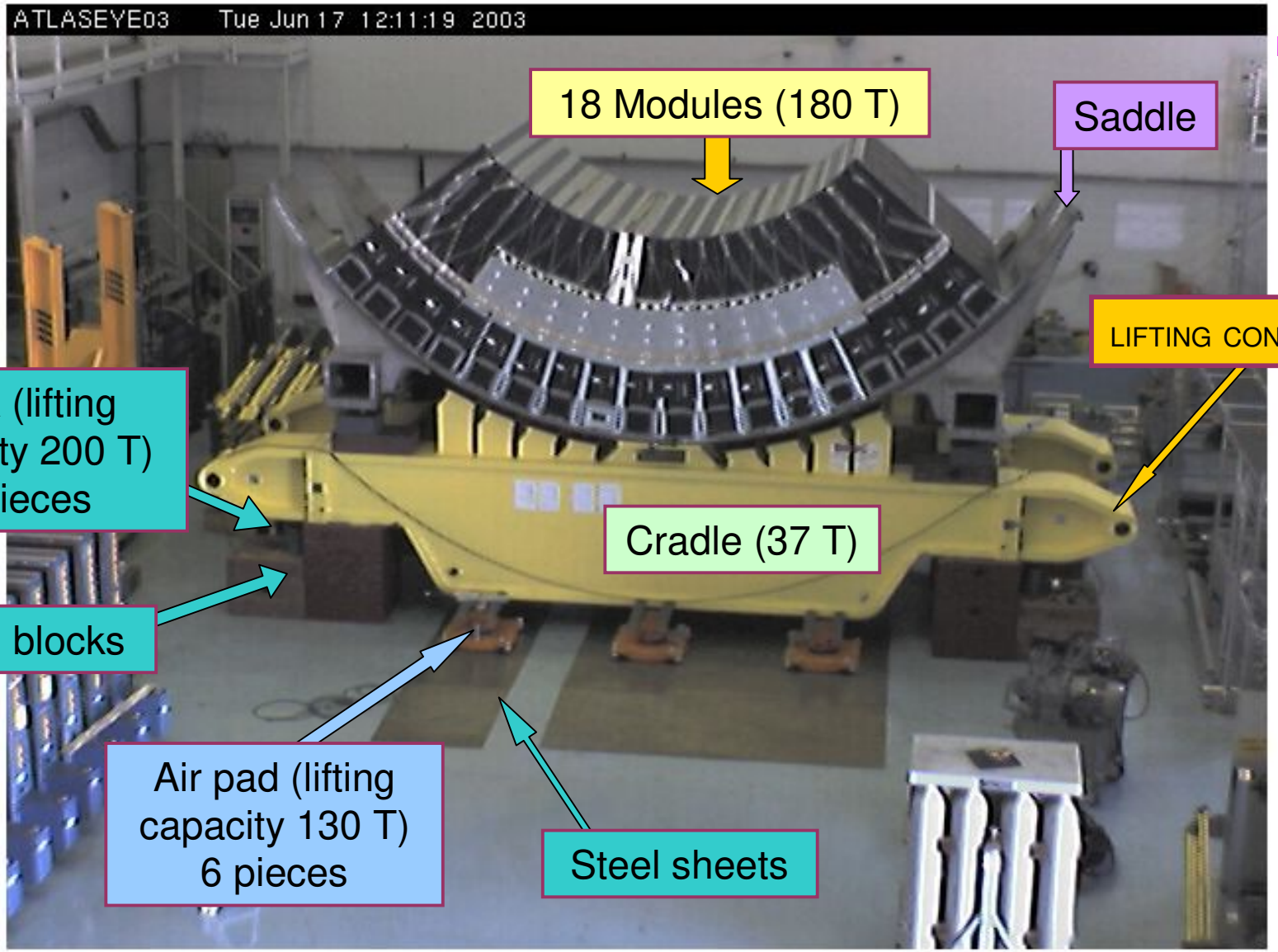
EBC pre-assembly/disassembly (21 Oct 02-12 June 03)

Xavier



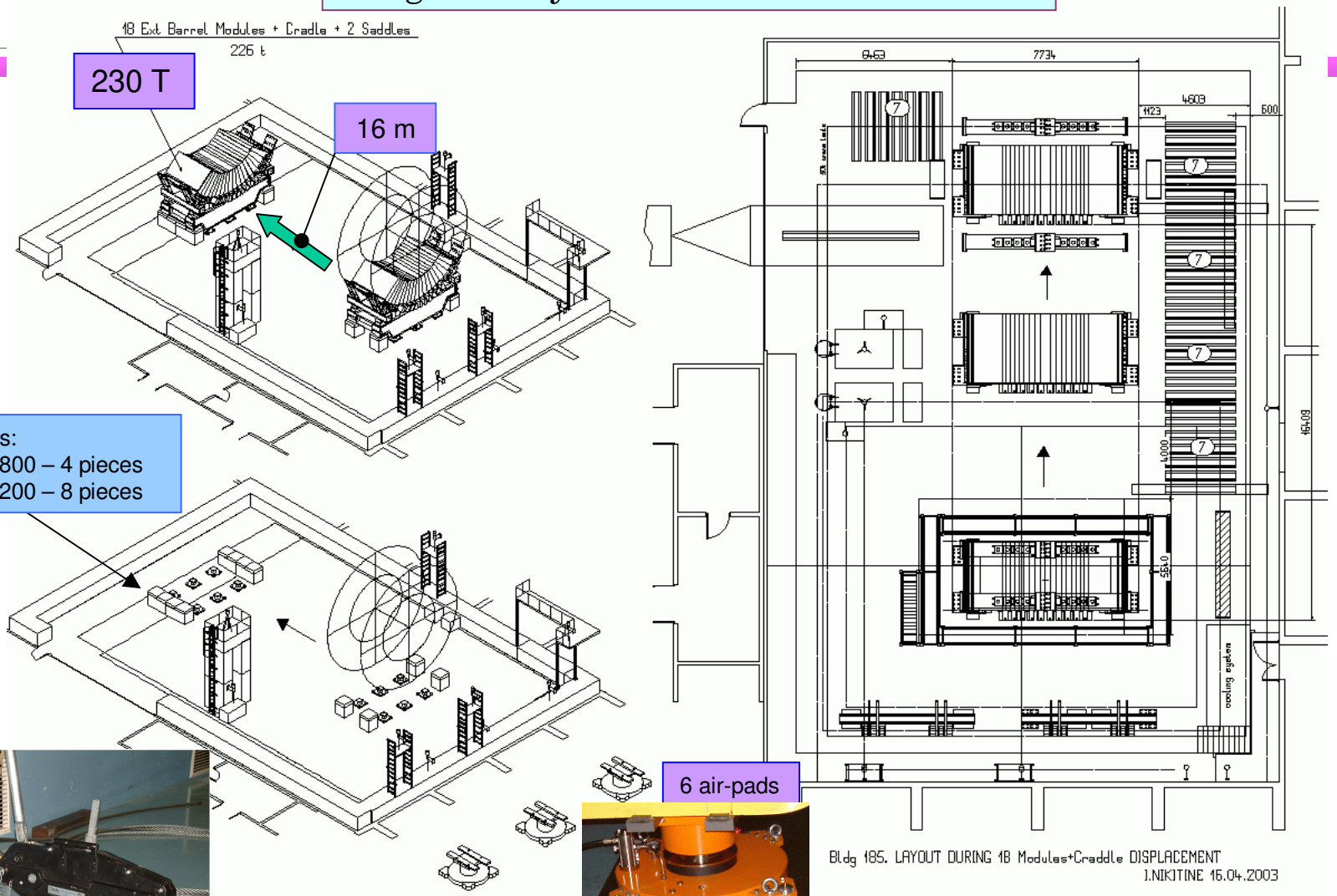
Setup to move bottom EBC inside 185 before start barrel assembly (19 June03)

Iouri



18 Ext Barrel Modules + Cradle displacement

Bldg 185 layout

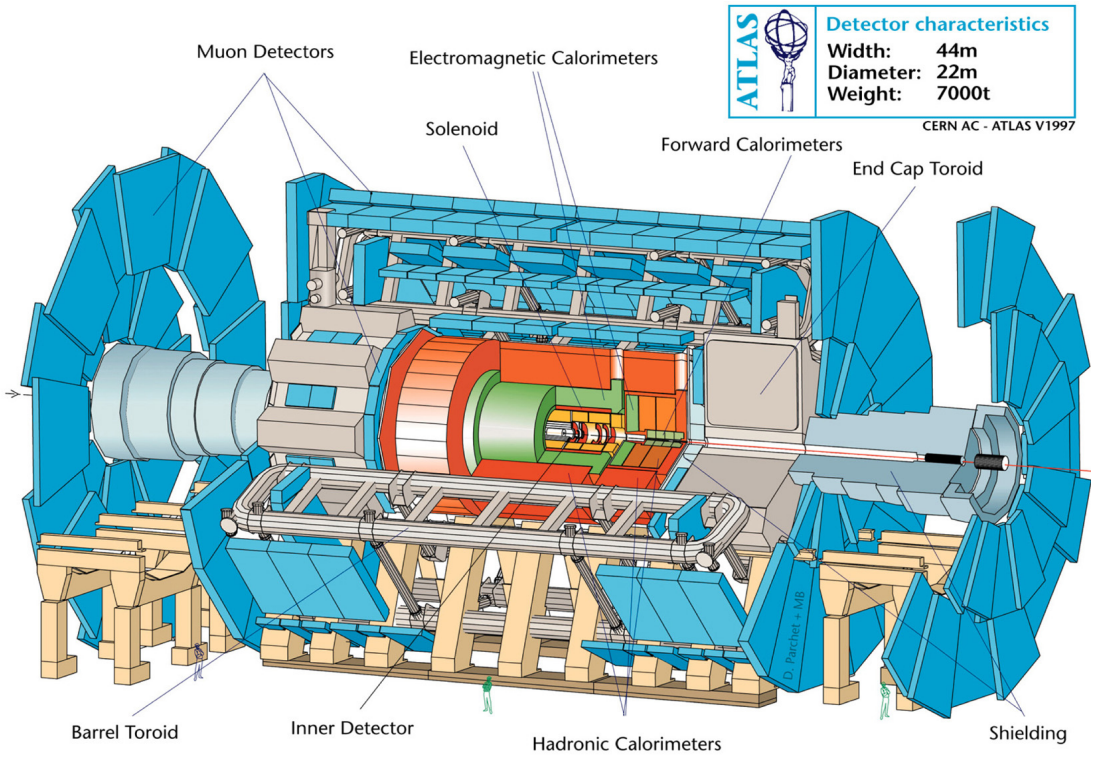


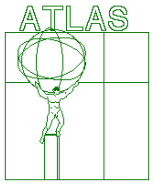
Force for movement - 2.3 T (1% - 230 T)

With help – of 2 winches (5 T each), 2 supports fixed on the floor and steel ropes

MUON System

- Tracking Chambers
  - CSC's
  - MDT's
- Trigger Chambers
  - RPC's
  - TGC's





Muon precision chamber construction status: 50% of bare chamber construction passed

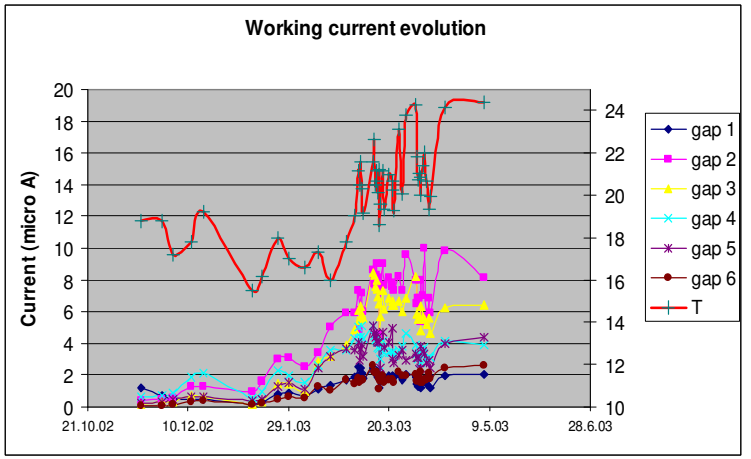
MDT/CSC Chamber production: Status 31-May-03

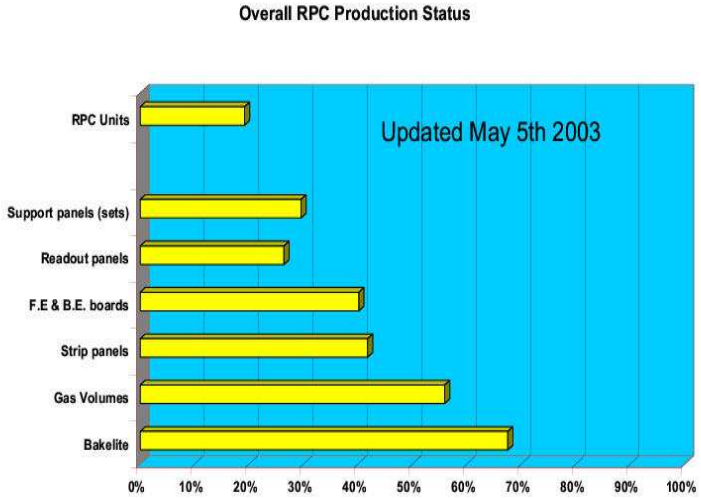
MDT	series tubes	module-0 chambers	series bare chambers	plan series bare chambers	series MDT with gas, FC	plan 100% bare chamb.
Greece - BIS	23,900	2	84	79	0	28. May 04
Boston - EI, EM	20,611	1	61	62	61	30. Jun 04
Univ. Michigan - EM	29,789	1	71	59	70	30. Jun 04
Univ. Washington - EI, EM	26,400	1	68	60	68	30. Jun 04
Dubna/Munich - BOS/BOF	33,800	1	63	56	7	13. Aug 04
Frascati - BML	22,400	1	69	55	10	08. Nov 04
Cosenza/Roma - BIL/BIR	11,100	1	34	34	10	30. Nov 04
Dubna - BMS	19,000	1	50	44	0	30. Aug 04
Protvino - EO	40,000	1	94	83	14	02. Aug 05
Nikhef - BOL	25,608	1	52	53	2	28. Aug 04
Cosenza, Pavia - BIL/BIR	11,100	1	24	30	1	30. Nov 04
Freiburg - BOG	80	0	0	0	0	01. Nov 04
Beijing - BEE, BIS8	211	0	0	0	0	30. Dec 05
Sum	**263,999**	**12**	**670**	**615**	**243**	
Fraction produced	**71.1%**		**57.6%**	**52.9%**	**20.9%**	

CSC	panels		bare chambers		certified chambers	
	total	produced	total	produced	total	produced
	160	106	32	13	32	7

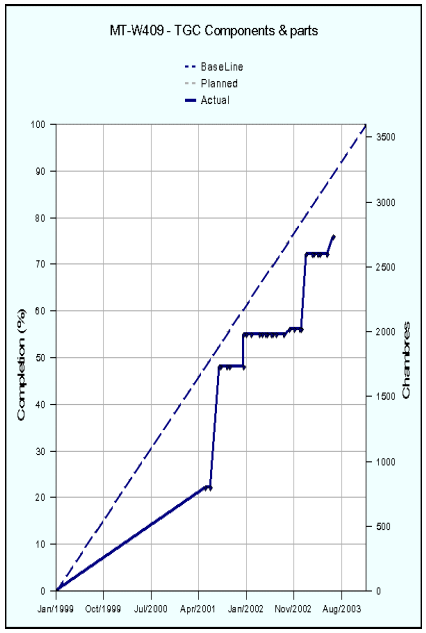
Status of RPC Production

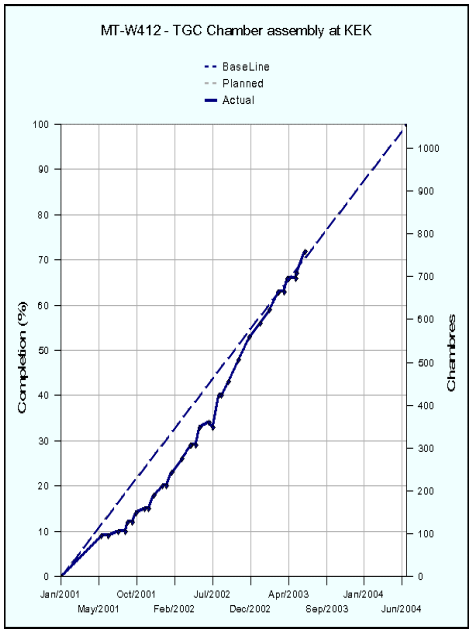
- Major aging test with 4 production chambers. It has already accumulated the equivalent of 4 ATLAS years (with safety factor of 5). A large increase in the current has been observed, however this is clearly correlated with an increase in the ambient temperature.
- The test will be also extended to test the detectors using a gas recycling system, to ensure proper performance in ATLAS.
- Production is going ahead with over 50% of the gas volumes already produced as well as 20% of the chambers.
- Very strict QA/QC procedures have been introduced, which have strongly reduced the failure rate during final testing.
- Need to increase the rate of chamber production to 3 chambers/day, in order to keep the schedule for integration and installation. The main problem is lack of production manpower as well as timely delivery of parts.

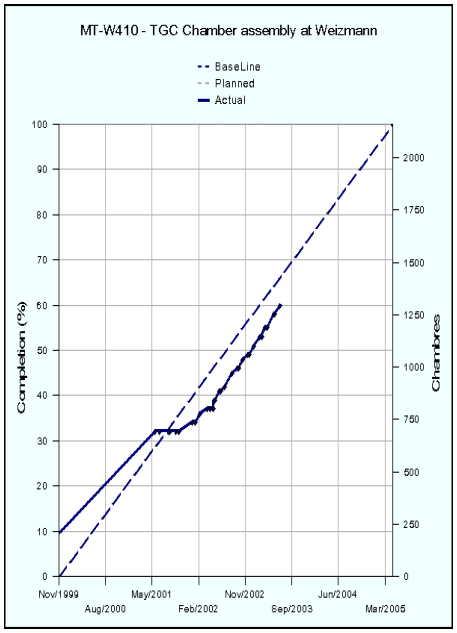


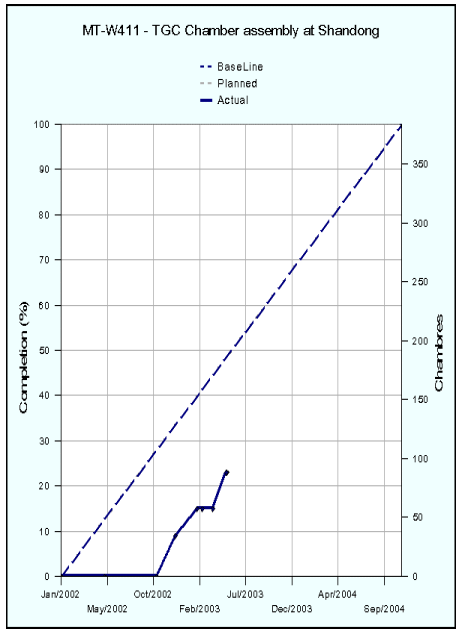


Status of TGC Production





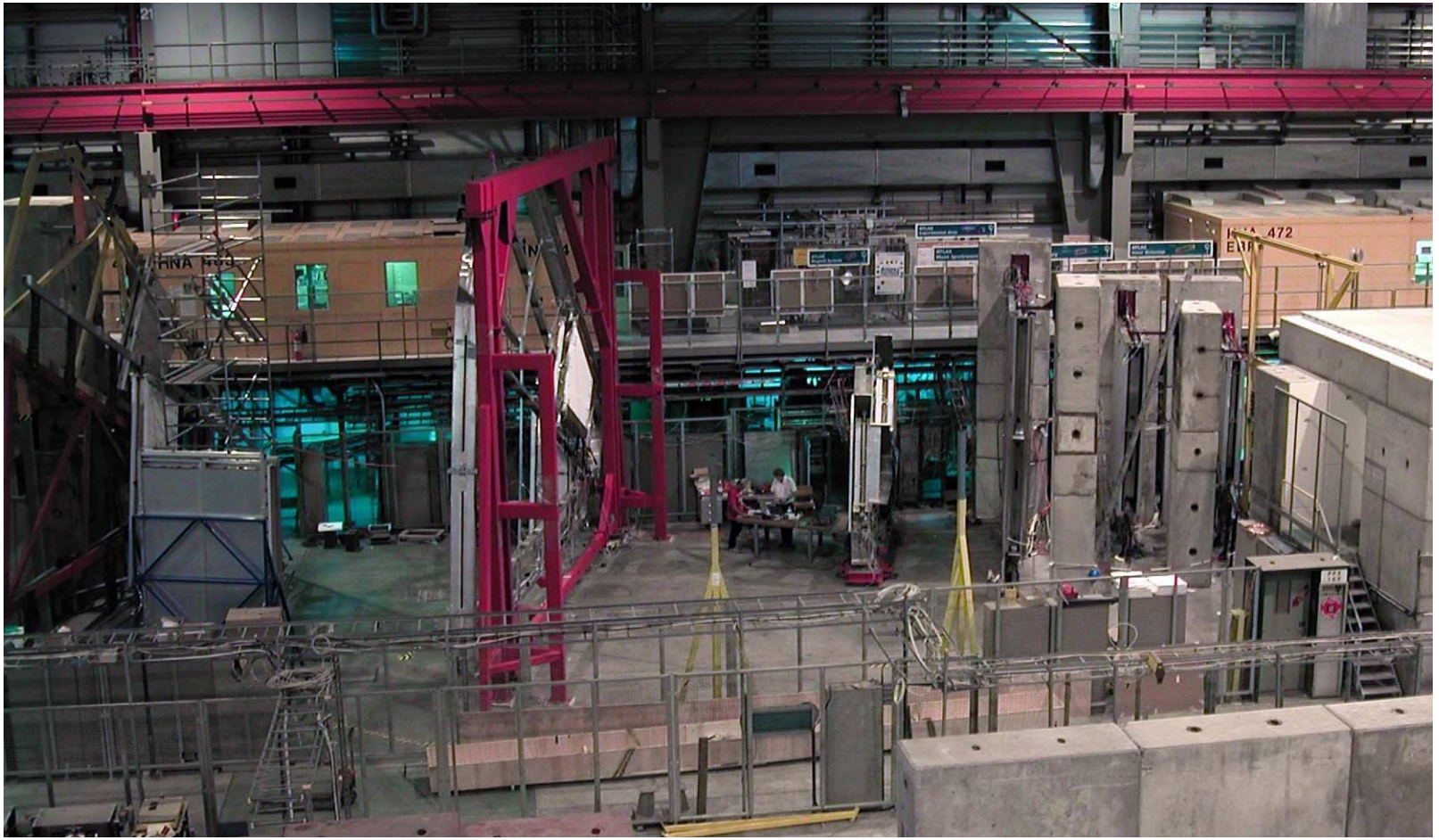




- 9.4% are at CERN after passing all tests
- Additional 20% of the detectors are ready to be send to CERN after passing all tests

A large system test facility, both for end-cap and barrel sectors, is now fully operational with first series chambers and alignment systems in the SPS H8 beam

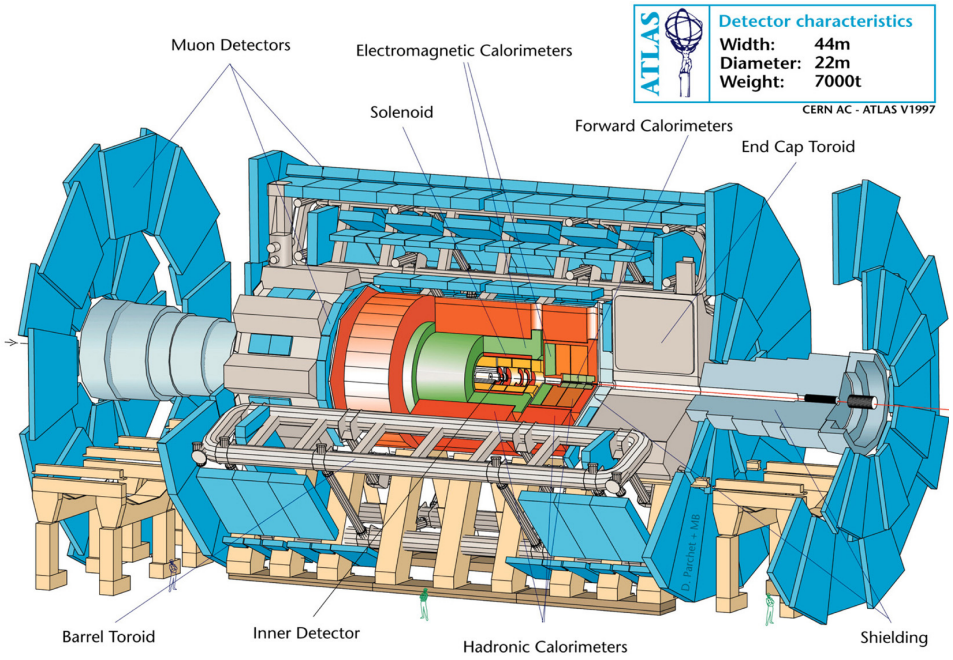
Many of the important performance aspects, in particular alignment and calibration, have been validated during the test beam runs last year



SPS H8 system test set-up

Atlas magnet system

- 1 Barrel Toroid + 2 End Cap Toroids + 1 Solenoid
  - Hybrid of 4 magnets working in harmony to provide the magnetic field for inner detector and muon detector
  - 20 m diameter x 25 m long
  - 8200 m^3 volume
  - 170 t superconductor
  - 700 t cold mass
  - 1320 t total weight
  - 90 km conductor
  - 20.5 kA at 4.1 T
  - 1.55 GJ stored E
  - Conduction cooled at 4.8 K
  - 7 years of construction 1998-2005

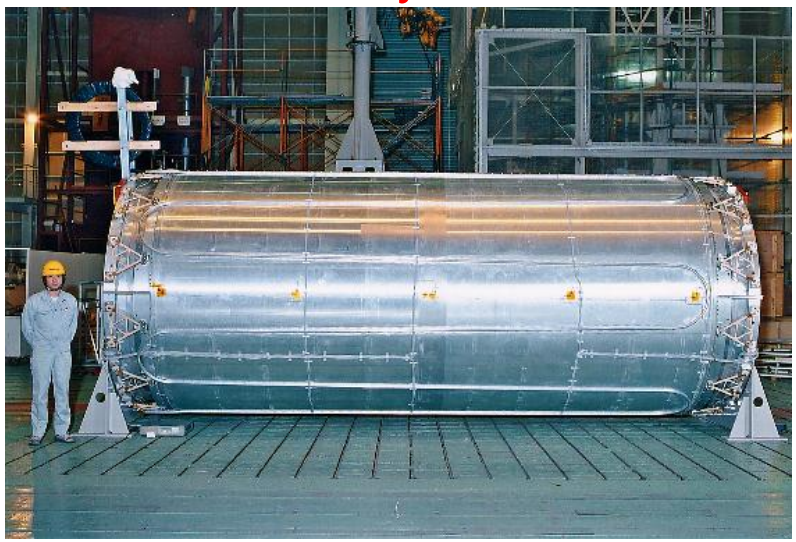


Central Solenoid

- Features
  - 2.4m bore & 5.3m long
  - 2.0 T & 38 MJ
  - 9 km Al-NbTi sc
  - 5 t cold mass, 6 t weight
  - operating in Li-Argon barrel cryostat

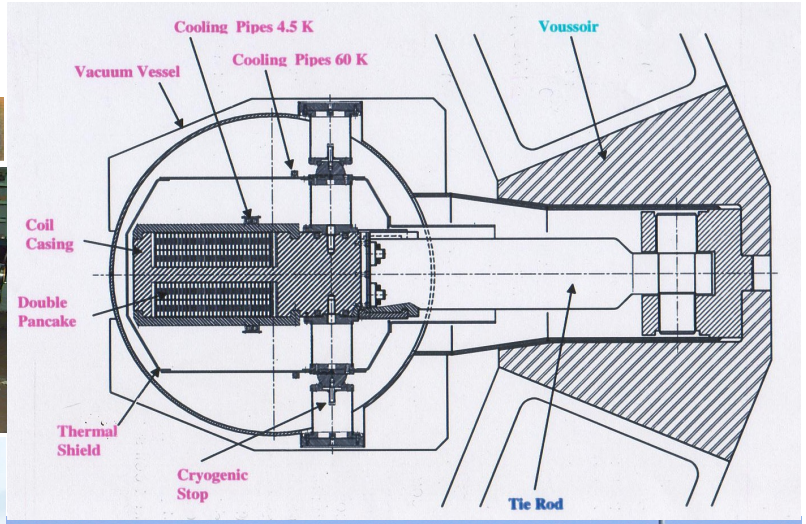
Coil status

- designed by KEK, built by Toshiba
- delivered to CERN B180 in Sept 01
- waiting for insertion in LiAr cryostat
- final on-surface test being prepared
- integration and test in Nov 03 – Feb 04



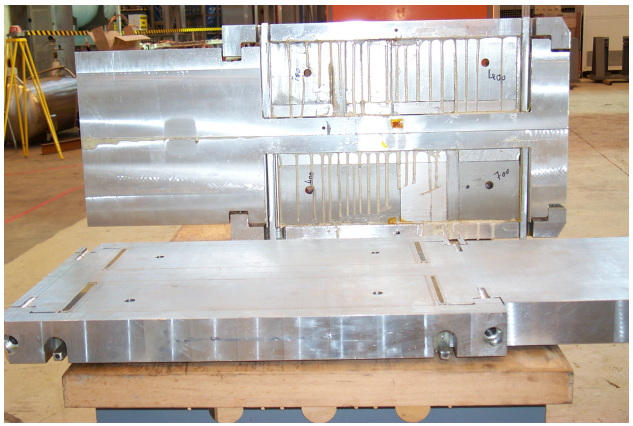
Barrel Toroid

- Components manufacturing
  - Superconductor: completed
  - Pancake coils: 16/16
  - Coil casings: 7/8
  - Tie rods 32/64
  - Stops 128/256
  - Super insulation 8/8
  - Cold masses 4/8
  - Shield 1/8 !
  - Vacuum vessels: 6/8
  - Coils integrated 0/8
  - Coils tested 0/8

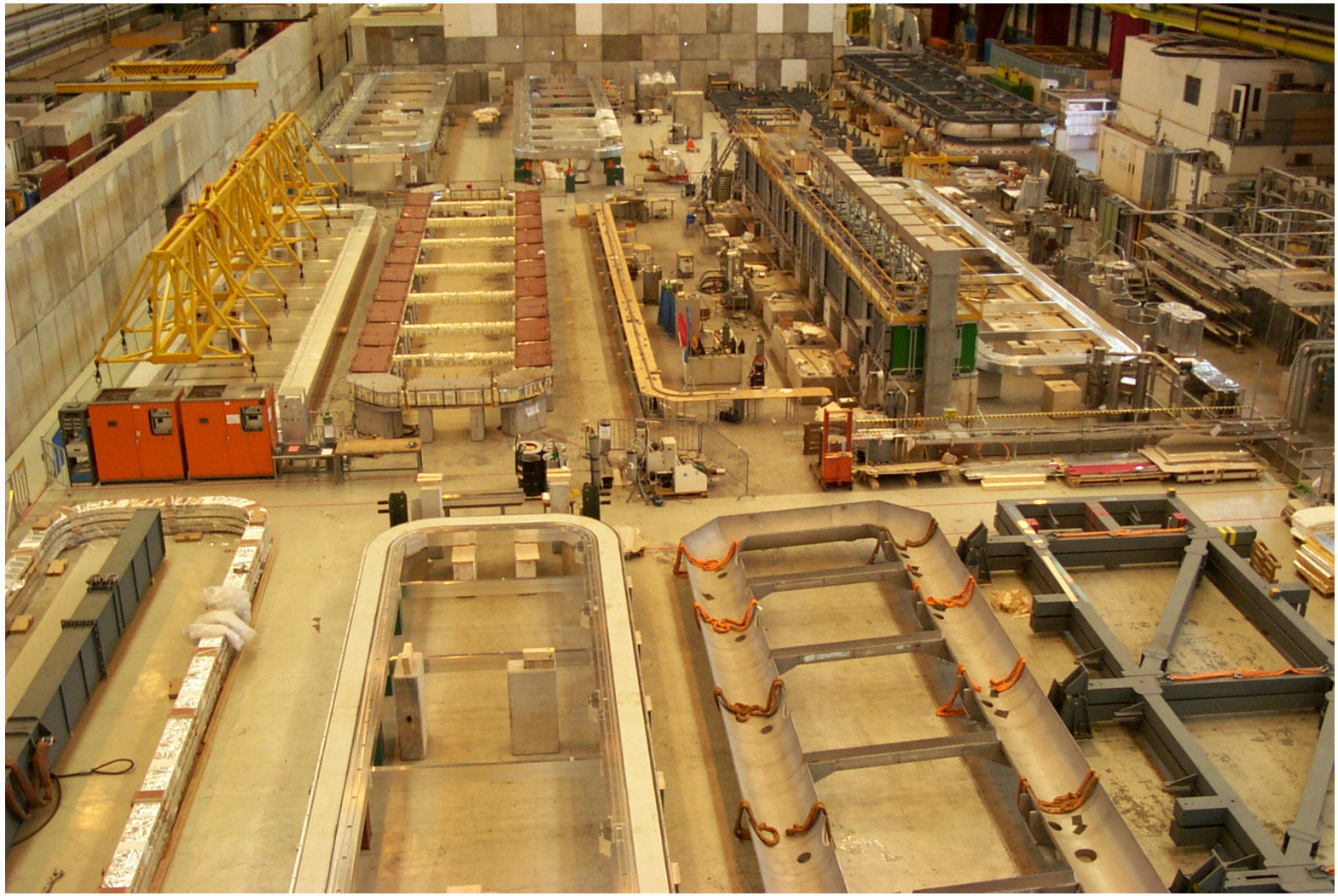


Barrel Toroid Cold Mass integration

- Cold Mass Integration in H180 runs smoothly
  - Put 2 double pancakes under pre-stress in coil casing
  - All pancakes delivered
  - Last coil casing arrives on 10 July
  - 4 cold masses completed
  - No 5 heat treated, no 6 being assembled
  - No 7 are 8 next, all ready by Oct 03

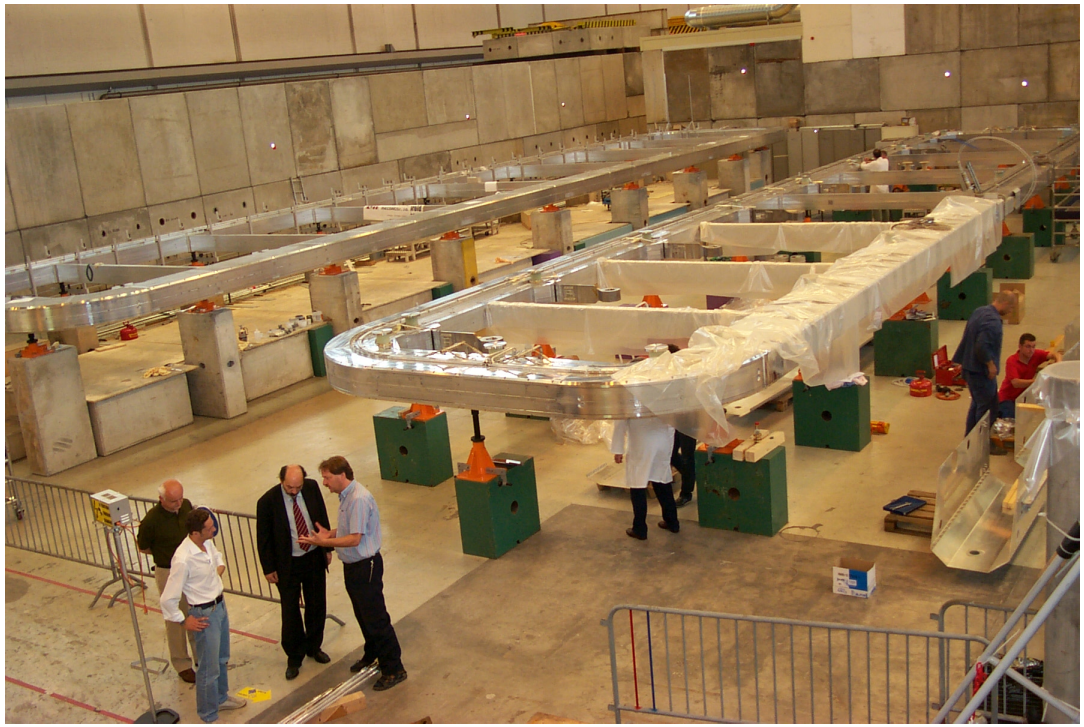


Barrel Toroid Integration and Test



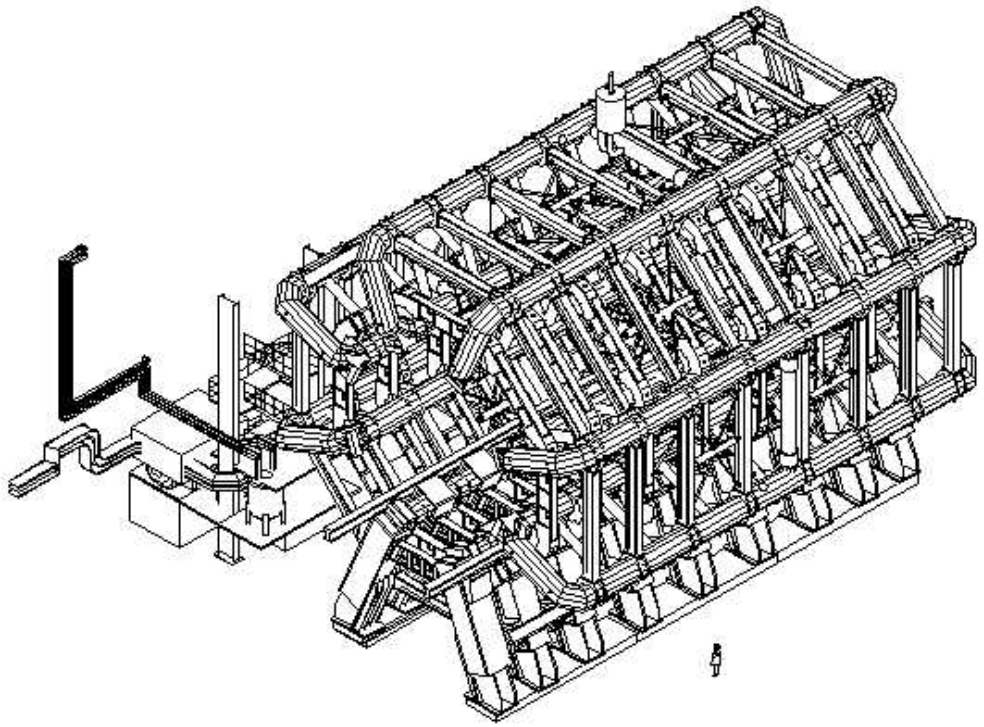
Barrel Toroid thermal shield

- **Thermal shield delivery heavily delayed by 5 months due to various production and design problems**
- **Now being installed on cold mass 1**



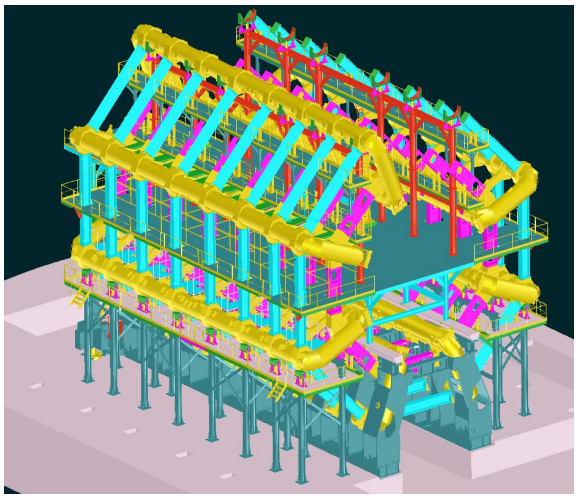
Barrel Toroid Warm structure

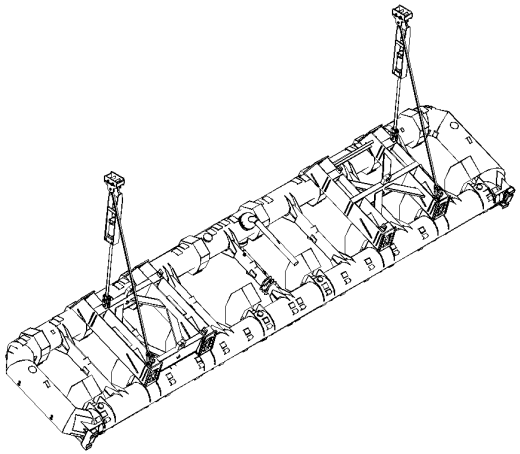
- Feet
  - 18 feet and bedplates, 9 feet voussoirs
  - All in production and being delivered to CERN soon
- 8 Coils with 16 support rings
  - 64 boxes, 64 struts, 64 voussoirs
  - Design completed, production started at RUSAL/SAMARA
  - Struts extrusions in Jul-Sep
  - 1st Boxes in Oct 03
  - 1st voussours in Nov 03
  - The machining in JINR and delivery to CERN
  - All holes and cuts in structures now agreed, final drawings ready by July

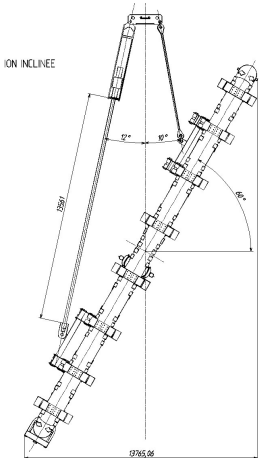


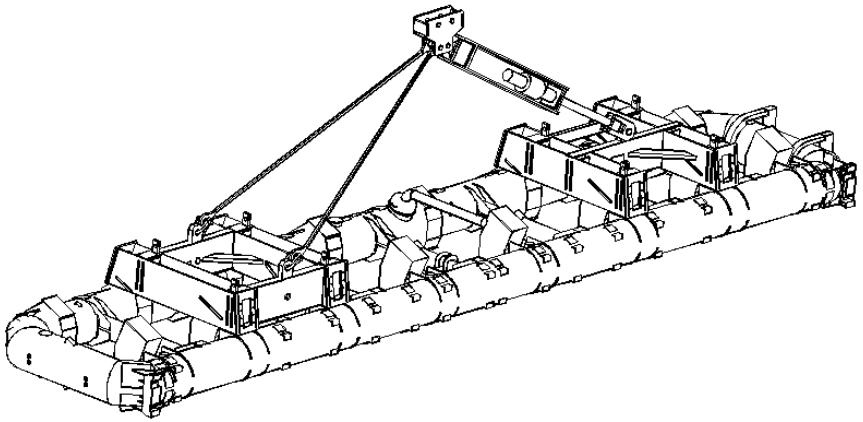
Barrel Toroid installation

- Tooling, supports, platforms, scaffolding
  - Lifting tooling under design, production starts soon
  - Lower and central platforms in production
  - Upper sectors under design
  - Delivery to CERN starts in Nov 03
  - Installation starts with bedplates and feet in Nov and coils in Jan 04



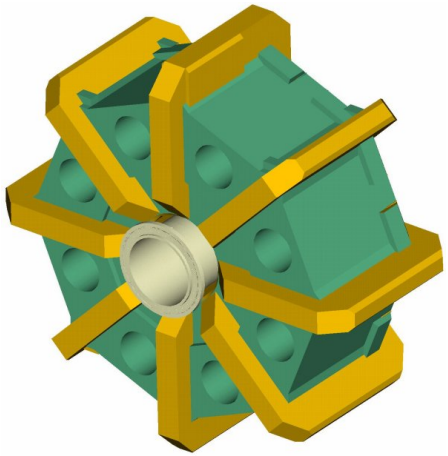






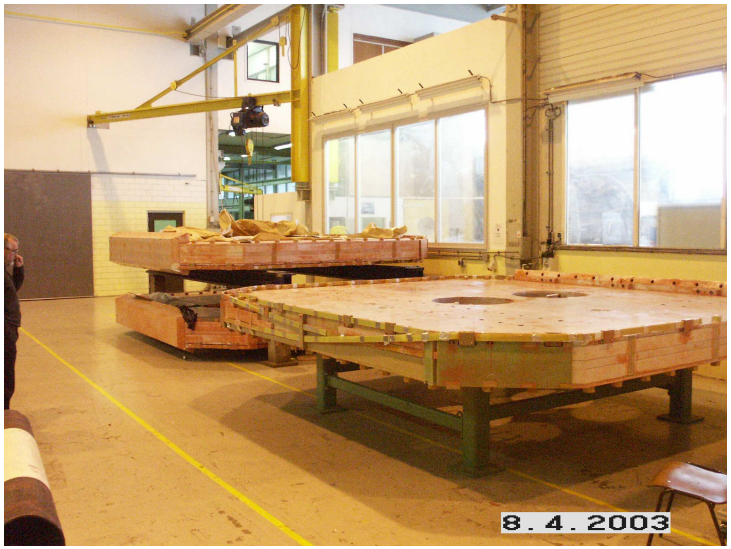
End Cap Toroids Vacuum Vessels

- 2 Vacuum Vessels
  - Delivered to CERN H191 as 2 halves
  - Welded together and vacuum tested
  - Both vessels accepted
  - Now waiting for
    - cold mass



End Cap Toroid Cold Mass

- Coil winding
  - All conductors delivered
  - Pancakes winding at Brush-HMA
  - 10/16 units wound
  - 4/16 units impregnated

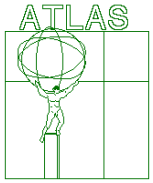


ECT cold mass assembly

- Cold mass C
  - Assembly area prepared
  - Floor mountings installed and surveyed
  - Central survey tower installed and tested
  - Coil handling and mounting checked
  - Coils mounted in assembly area
  - Ready in Jan 04

ECT cold mass production status

	COLD MASS C								COLD MASS A							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Coil																
former assembly	■	■	■	■	■	■	■	■	■	■						
winding	■	■	■	■	■	■	■	■	■							
conductor joint	■	■	■	■	■	■	■	■								
support channel	■	■	■	■	■	■	■									
VPI	■	■	■			■										
Keystone box																
machined	■	■	■	■	■	■	■	■								
U channel welded																
Assembly set-up																
Coils	■	■				■										
K Boxes																
Cooling circuitry																

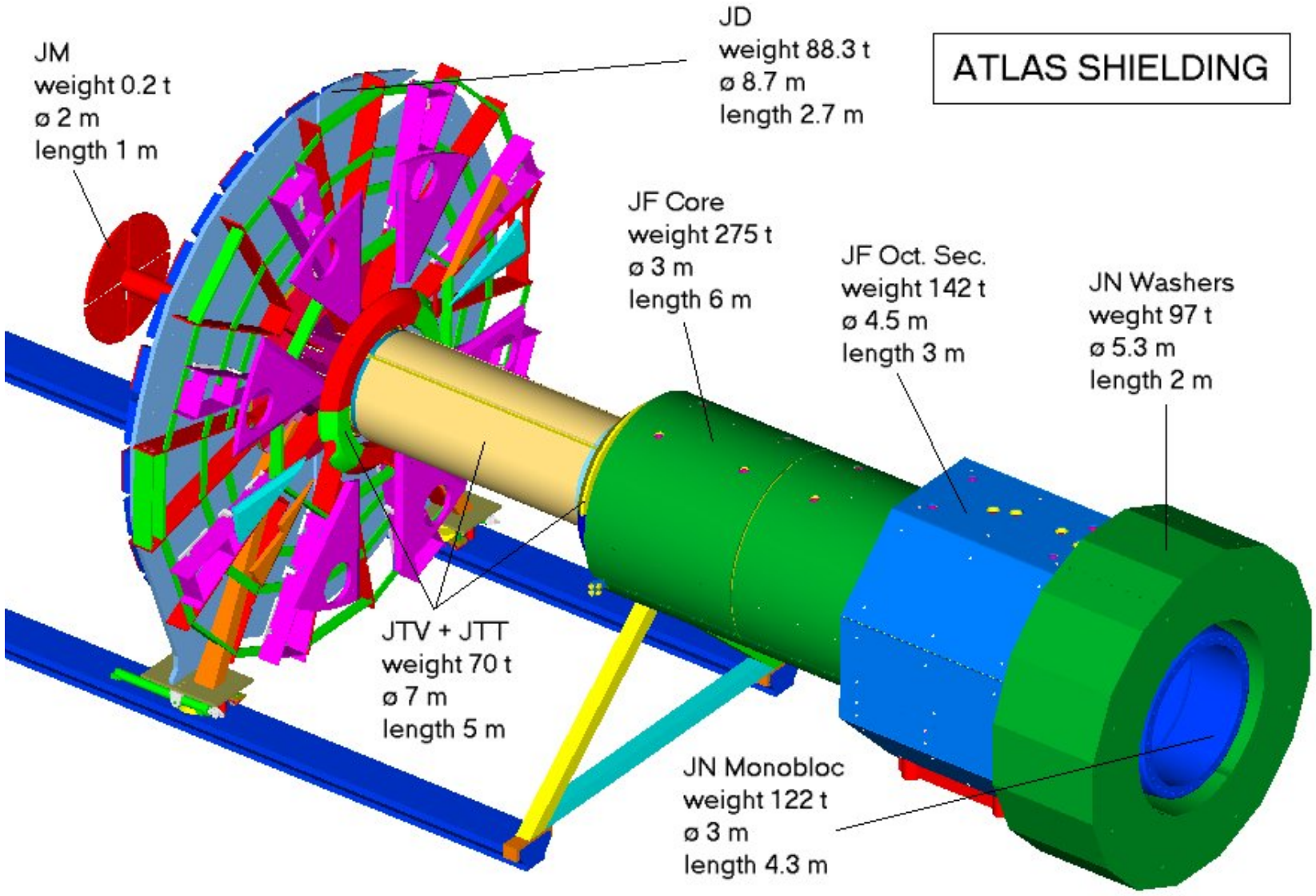


Magnets Summary

- Work on the Central Solenoid at CERN is progressing well
- The last big contracts were signed (warm structure, installation tools, cryoring, bus bars, switches and rundown units, proximity cryogenics) so procurements comes an end
- BT and ECT integration work is in progress and shows good progress in general
- Due to delivery problems with the thermal shield the schedule for BT integration is now late by 4 months delaying the test to October 03 and coil 1 delivery for installation just on time
- A recovery plan and new schedule is being studied
- The ECT schedule is fine today provided the cold mass production is not further delayed

Shielding projects

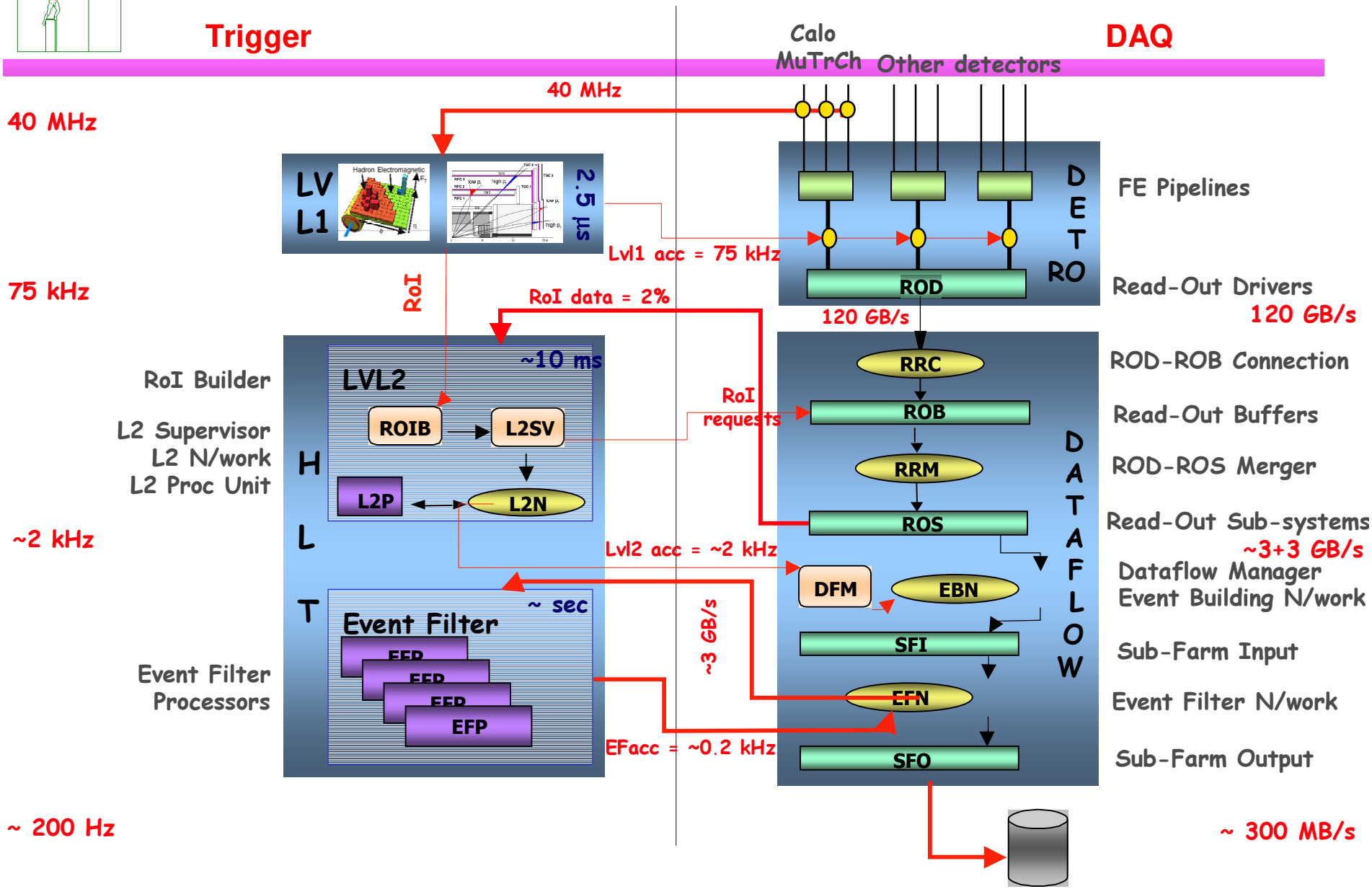
All components are under procurement (mostly in-kind contributions)



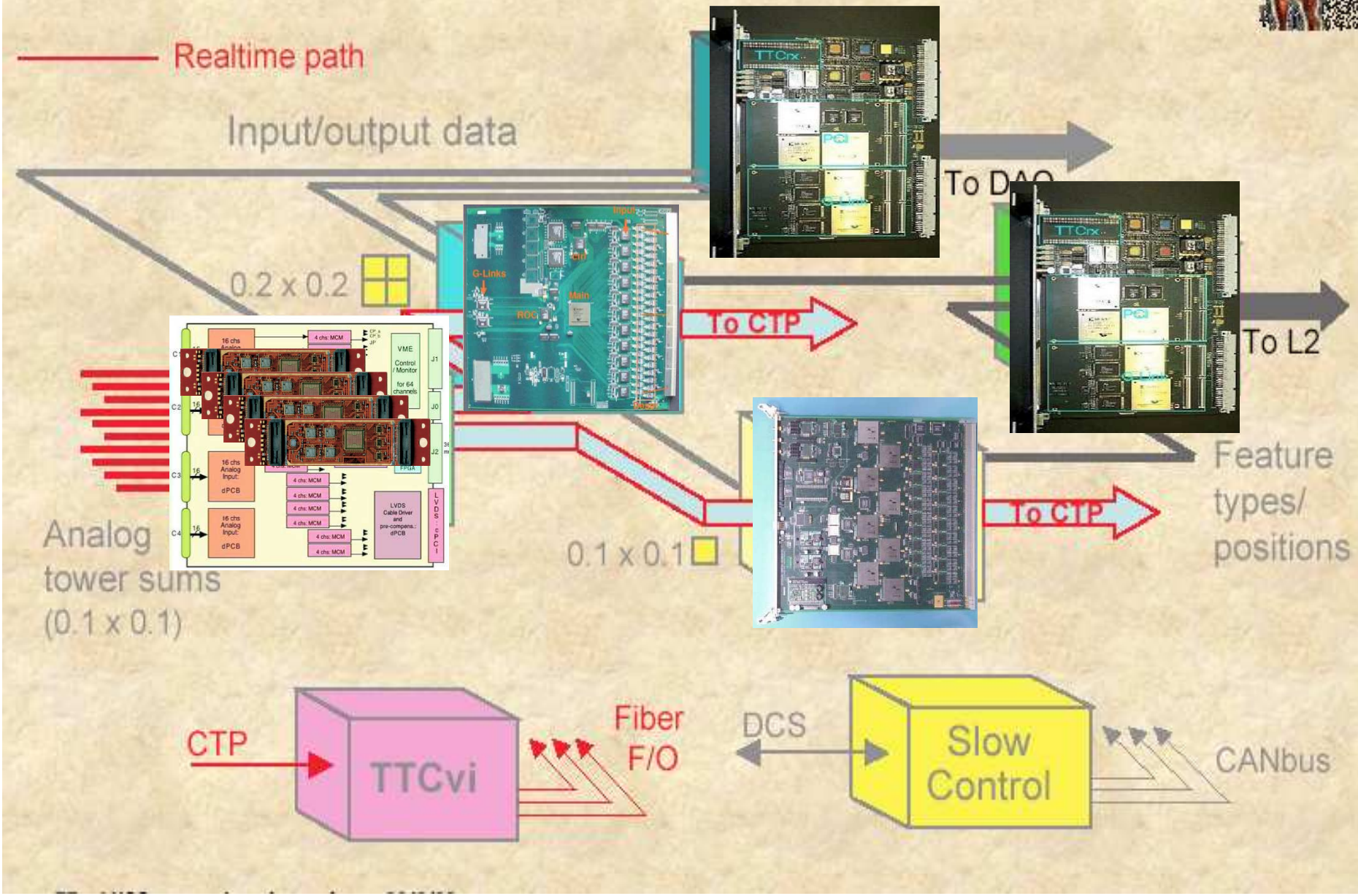
Forward shielding - JF

Acceptance of 1/2 of the cast iron part of the shielding in Skoda Plzen

Trigger / DAQ architecture



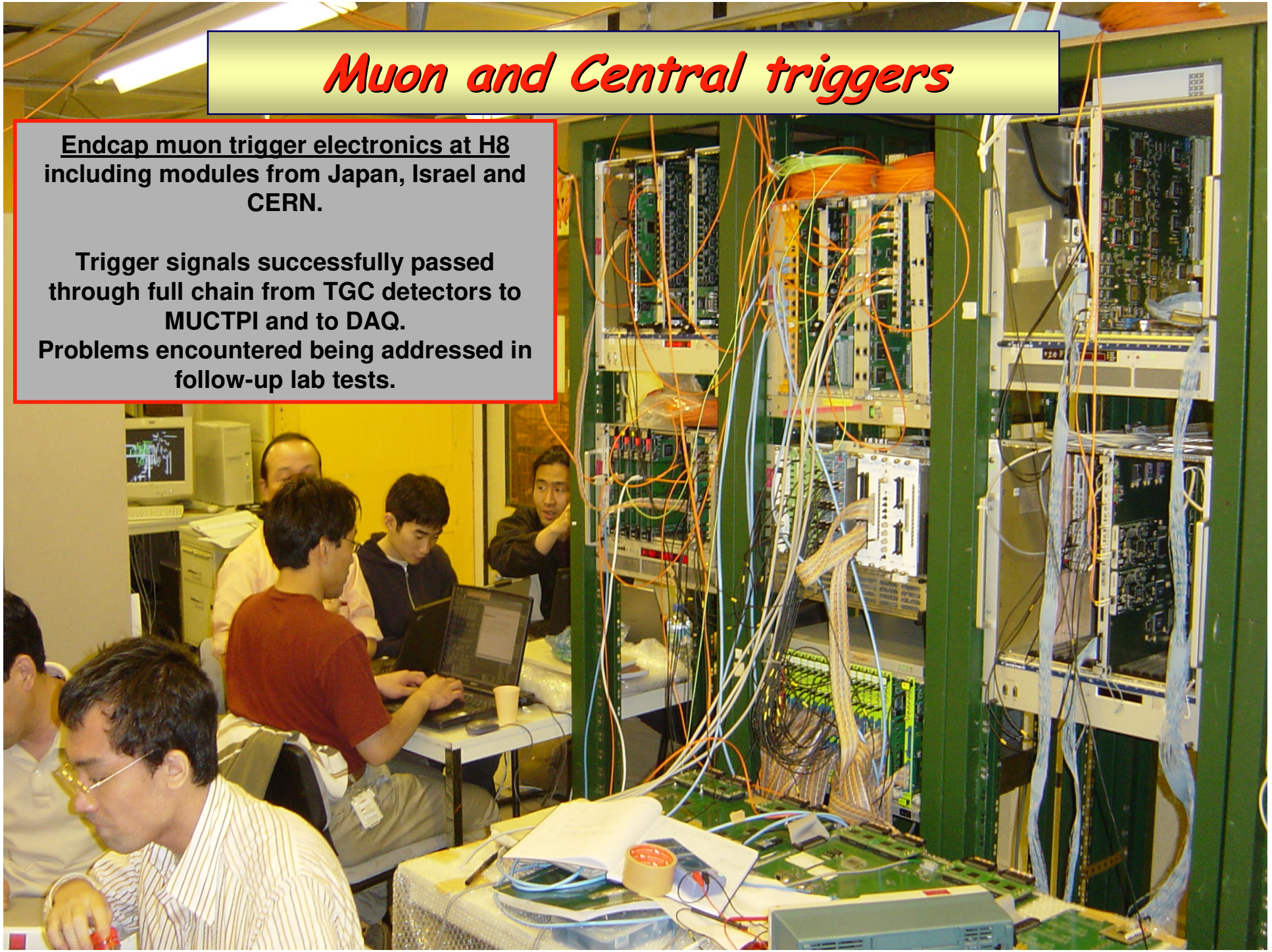
Calorimeter trigger



Muon and Central triggers

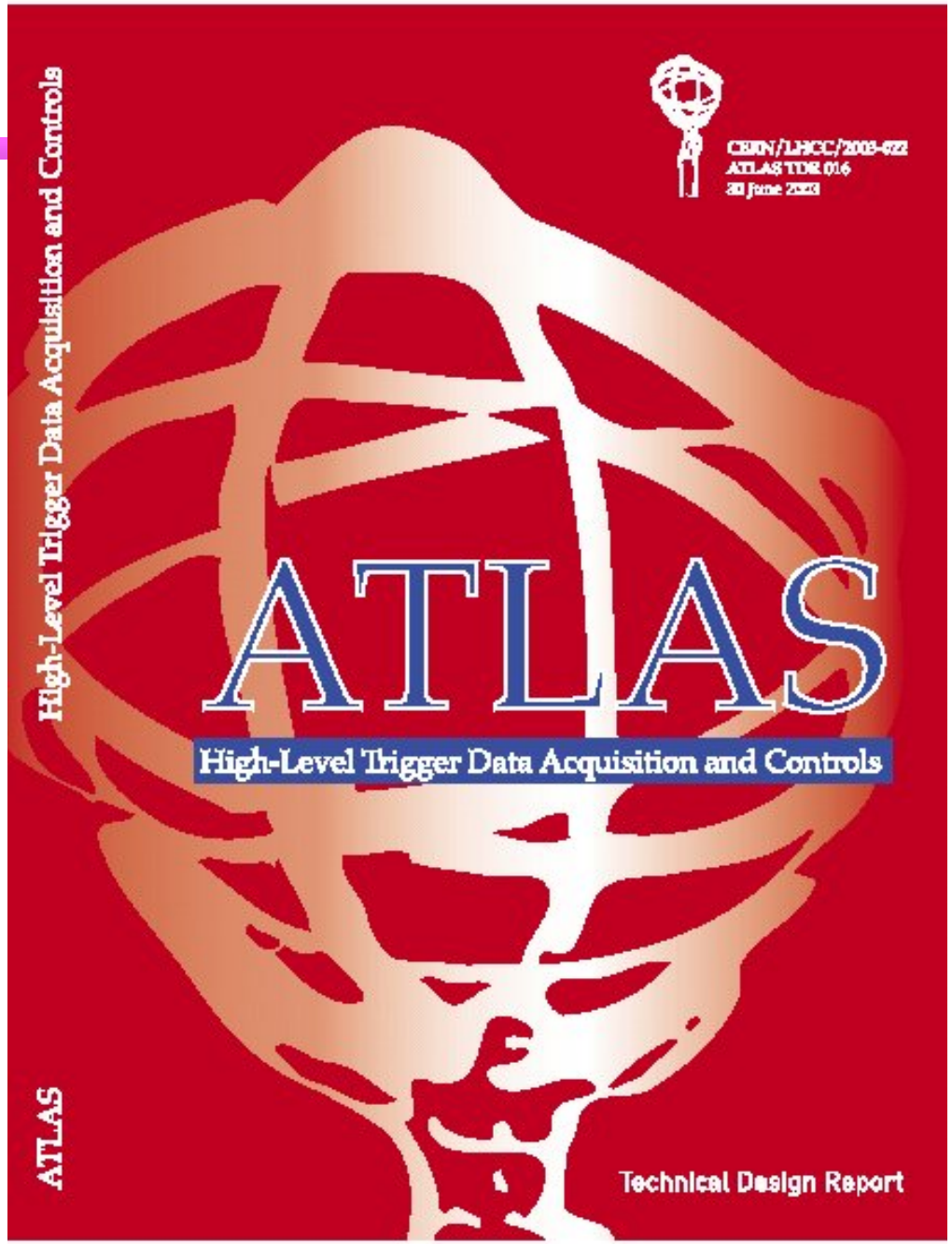
<u>Endcap muon trigger electronics at H8</u>
including modules from Japan, Israel and CERN.

Trigger signals successfully passed through full chain from TGC detectors to MUCTPI and to DAQ.
Problems encountered being addressed in follow-up lab tests.



HLT/DAQ/DCS TDR

Open presentation and review discussions expected for the September LHCC



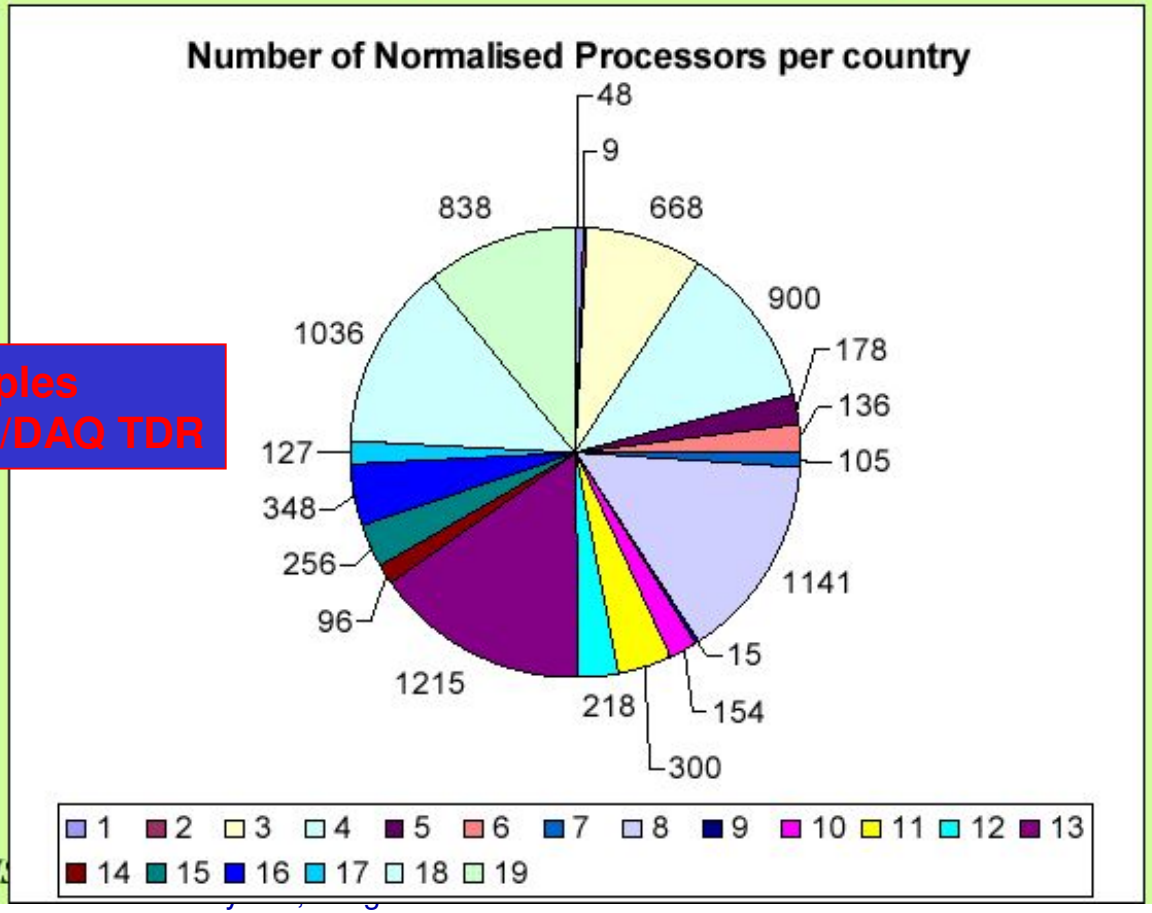
ATLAS DC1 Phase 2 : Nov-Dec 2002

7800 `CPU's`
170 kSI95

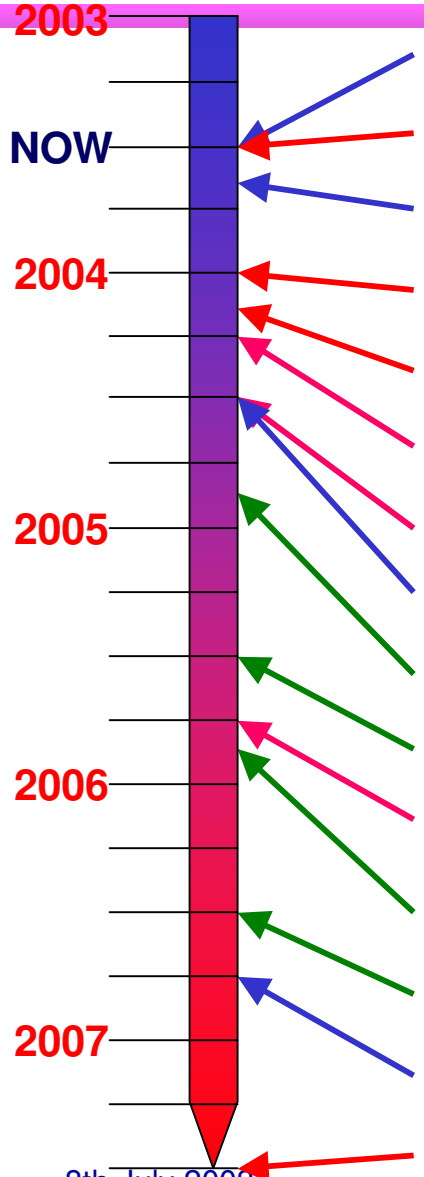
56 Institutes in 21 countries participate
20 Institutes use Grid middleware in production
In preparation for upcoming Grid tests : Grid middleware already installed at most places

1. Australia
2. Austria
3. Canada
4. CERN
5. China
6. Czech Republic
7. France
8. Germany
9. Greece
10. Israel
11. Italy
12. Japan
13. NorduGrid
14. Poland
15. Russia
16. Spain
17. Taiwan
18. UK
19. USA

More data samples
Pile-up for HLT/DAQ TDR



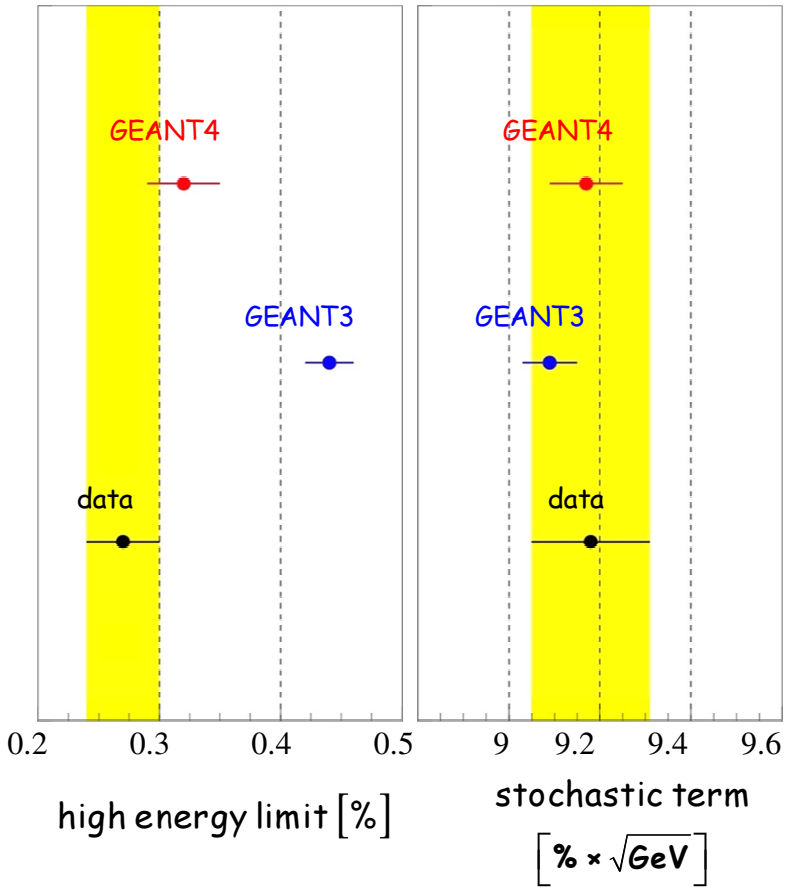
ATLAS Computing Timeline



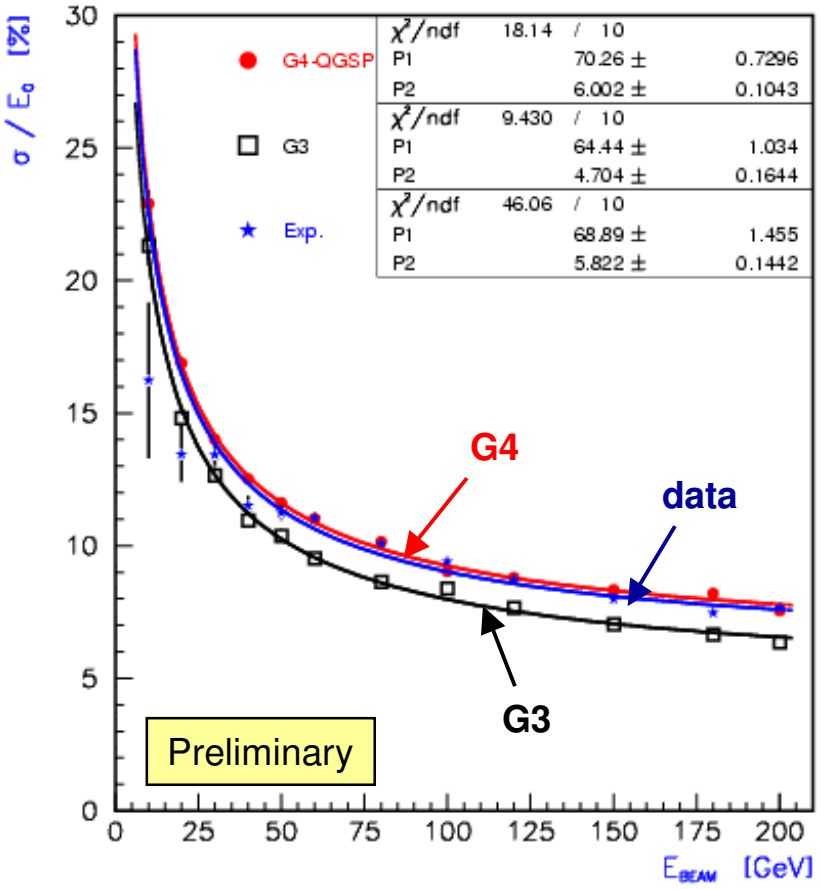
- POOL/SEAL release
- ATLAS release 7 (with POOL persistency)
- LCG-1 deployment
- ATLAS complete Geant4 validation
- ATLAS release 8
- DC2 Phase 1: simulation production
- DC2 Phase 2: intensive reconstruction (the real challenge!)
- Combined test beams (barrel wedge)
- Computing Model paper
- ATLAS Computing TDR and LCG TDR
- DC3: produce data for PRR and test LCG-n
- Computing Memorandum of Understanding
- Physics Readiness Report
- Start commissioning run
- GO!

Examples of GEANT 4 validation work

LAr EM barrel electron energy resolution



Pions in LAr HEC series modules

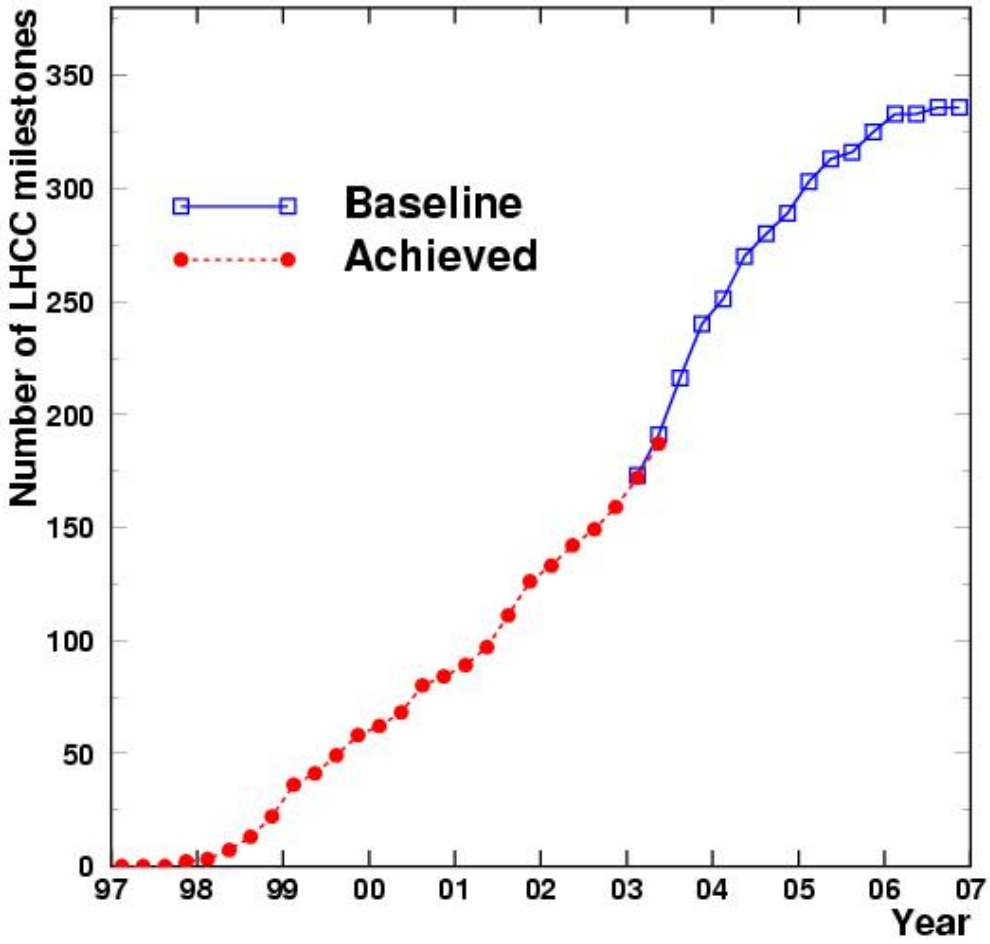


Extensive use is made of the ATLAS test beam data from all sub-systems (ID, LAr and Tile Calorimeters, Muons) in this validation process

Atlas progress in terms of LHCC milestones

Early this year we have revisited all the LHCC milestones which were then approved by the LHCC in its March meeting

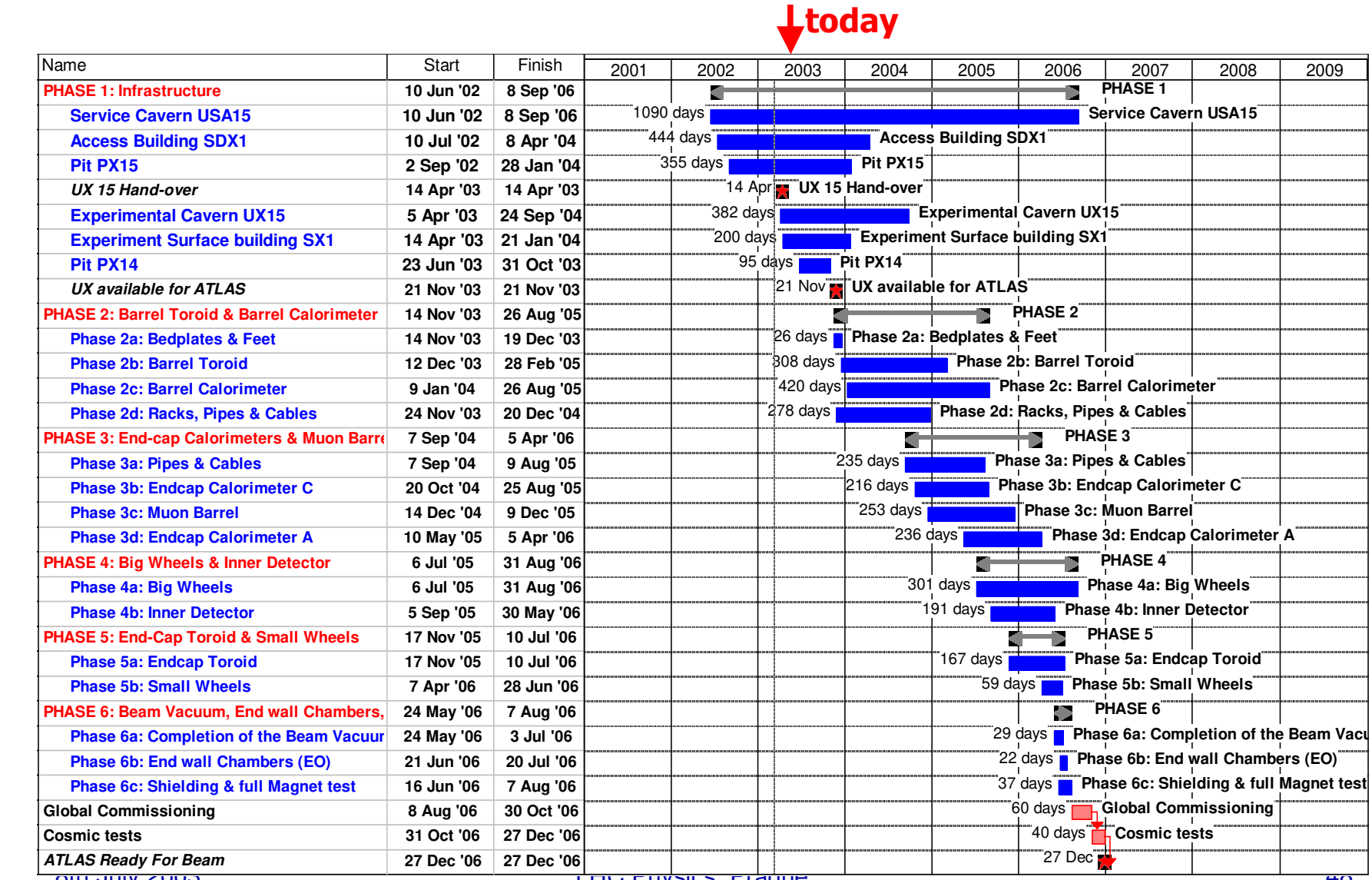
Integrated LHCC milestone plot with the latest follow-up point end of June



Details on the recent milestones, passed and expected for the coming months, are given in the following slides, more details are part of the system presentations at this CR

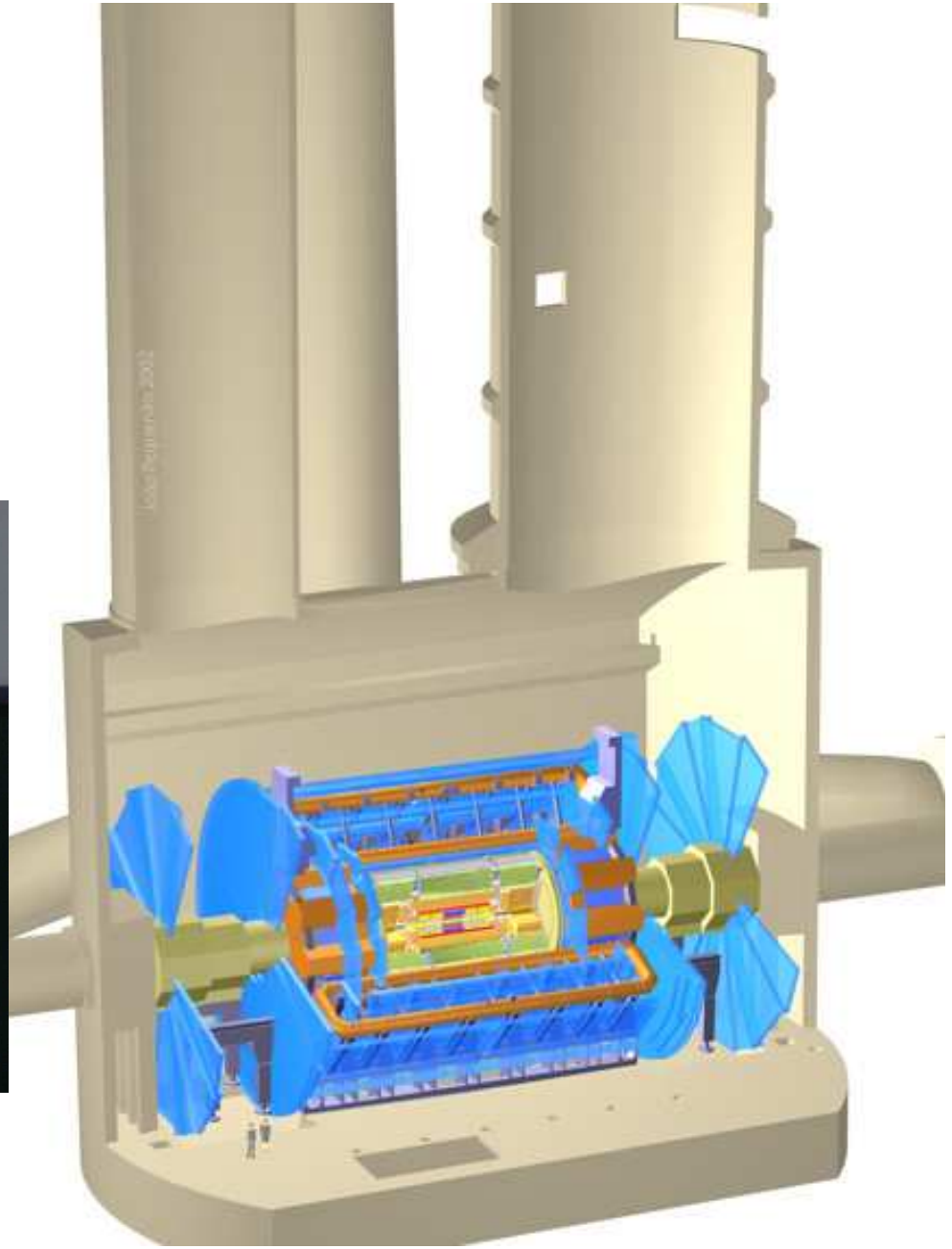
Installation schedule version 6.0.5

The construction and installation planning, as presented to the CERN+LHCC Installation Reviews in September 2002 and March 2003, foresees to have the initial staged detector installed in August 2006, ready to start commissioning



Name	Start	Finish
PHASE 1: Infrastructure	10 Jun '02	8 Sep '06
Service Cavern USA15	10 Jun '02	8 Sep '06
Access Building SDX1	10 Jul '02	8 Apr '04
Pit PX15	2 Sep '02	28 Jan '04
UX 15 Hand-over	14 Apr '03	14 Apr '03
Experimental Cavern UX15	5 Apr '03	24 Sep '04
Experiment Surface building SX1	14 Apr '03	21 Jan '04
Pit PX14	23 Jun '03	31 Oct '03
UX available for ATLAS	21 Nov '03	21 Nov '03
PHASE 2: Barrel Toroid & Barrel Calorimeter	14 Nov '03	26 Aug '05
Phase 2a: Bedplates & Feet	14 Nov '03	19 Dec '03
Phase 2b: Barrel Toroid	12 Dec '03	28 Feb '05
Phase 2c: Barrel Calorimeter	9 Jan '04	26 Aug '05
Phase 2d: Racks, Pipes & Cables	24 Nov '03	20 Dec '04
PHASE 3: End-cap Calorimeters & Muon Barre	7 Sep '04	5 Apr '06
Phase 3a: Pipes & Cables	7 Sep '04	9 Aug '05
Phase 3b: Endcap Calorimeter C	20 Oct '04	25 Aug '05
Phase 3c: Muon Barrel	14 Dec '04	9 Dec '05
Phase 3d: Endcap Calorimeter A	10 May '05	5 Apr '06
PHASE 4: Big Wheels & Inner Detector	6 Jul '05	31 Aug '06
Phase 4a: Big Wheels	6 Jul '05	31 Aug '06
Phase 4b: Inner Detector	5 Sep '05	30 May '06
PHASE 5: End-Cap Toroid & Small Wheels	17 Nov '05	10 Jul '06
Phase 5a: Endcap Toroid	17 Nov '05	10 Jul '06
Phase 5b: Small Wheels	7 Apr '06	28 Jun '06
PHASE 6: Beam Vacuum, End wall Chambers,	24 May '06	7 Aug '06
Phase 6a: Completion of the Beam Vacuur	24 May '06	3 Jul '06
Phase 6b: End wall Chambers (EO)	21 Jun '06	20 Jul '06
Phase 6c: Shielding & full Magnet test	16 Jun '06	7 Aug '06
Global Commissioning	8 Aug '06	30 Oct '06
Cosmic tests	31 Oct '06	27 Dec '06
ATLAS Ready For Beam	27 Dec '06	27 Dec '06

Inauguration of the ATLAS cavern by Mr. Pascal Couchepin, President of the Swiss Confederation, on 4th June 2003



8th July 2003

The installation of the main cavern infrastructure has started

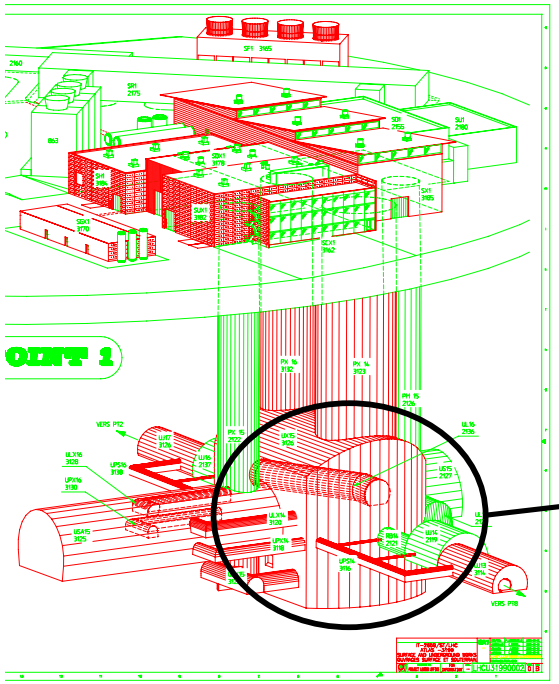
(Picture taken on 4th June with visitor groups during the inauguration event)

Experimental cavern UX15

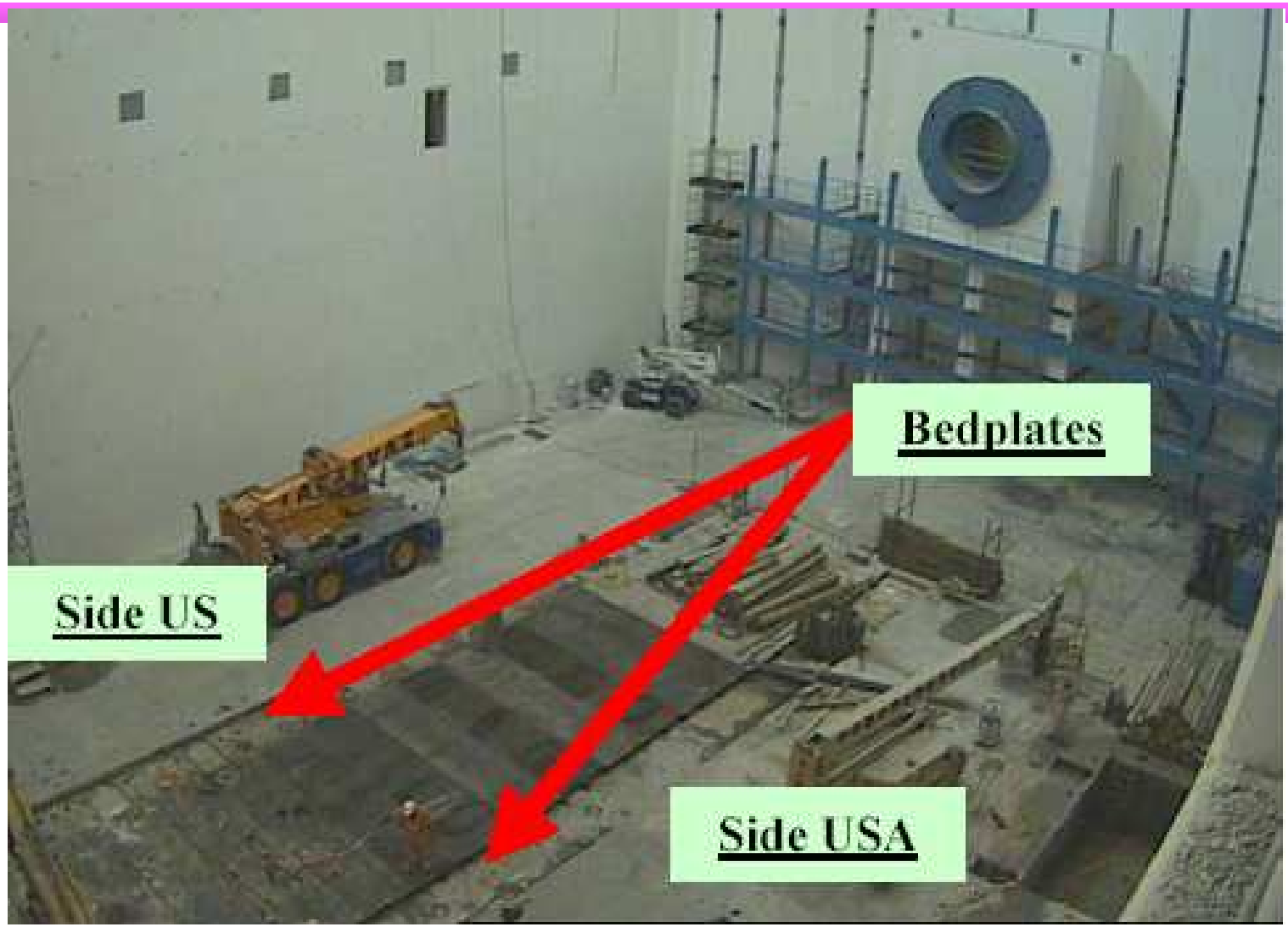
- Installation HO Structures sides A & C (completion July 4th)
- Installation cranes (completion July 20th)

Future work:

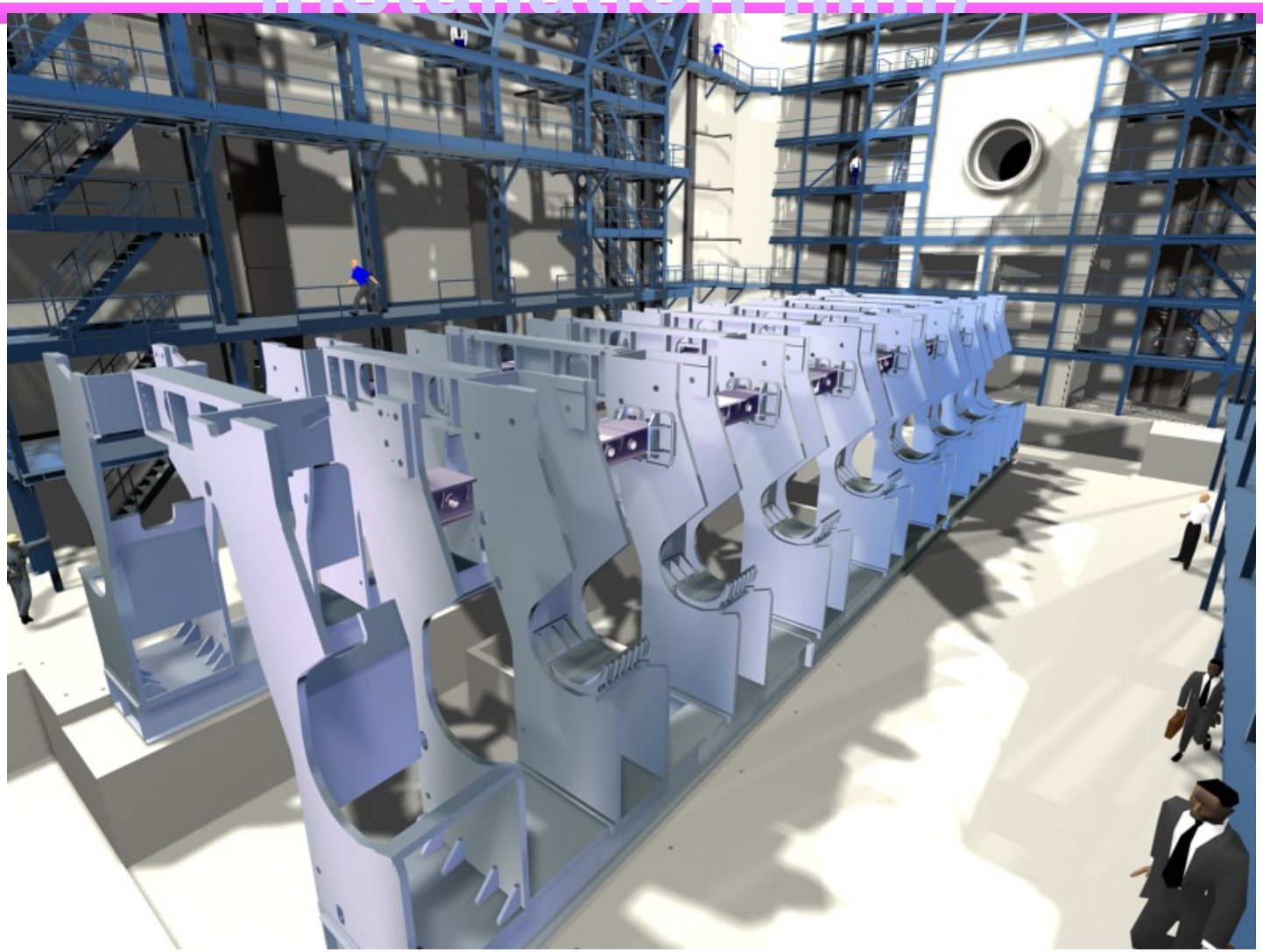
- Installation ventilation ducts & foam piping (July & August)
- Installation HS & HM Structures (September to Nov.)



Bedplate Positions on Cavern Floor



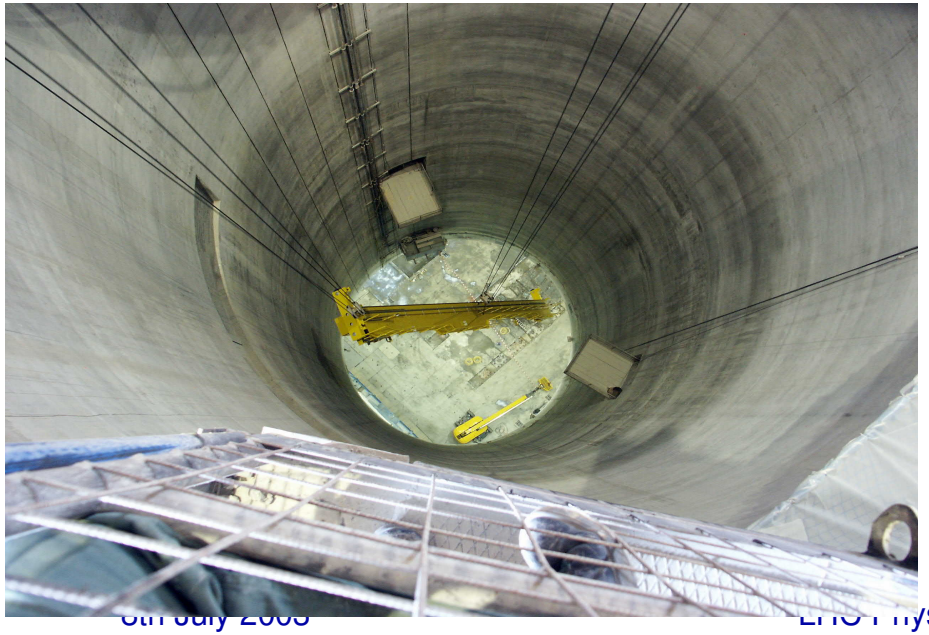
Bedplates and Feet (From installation film)



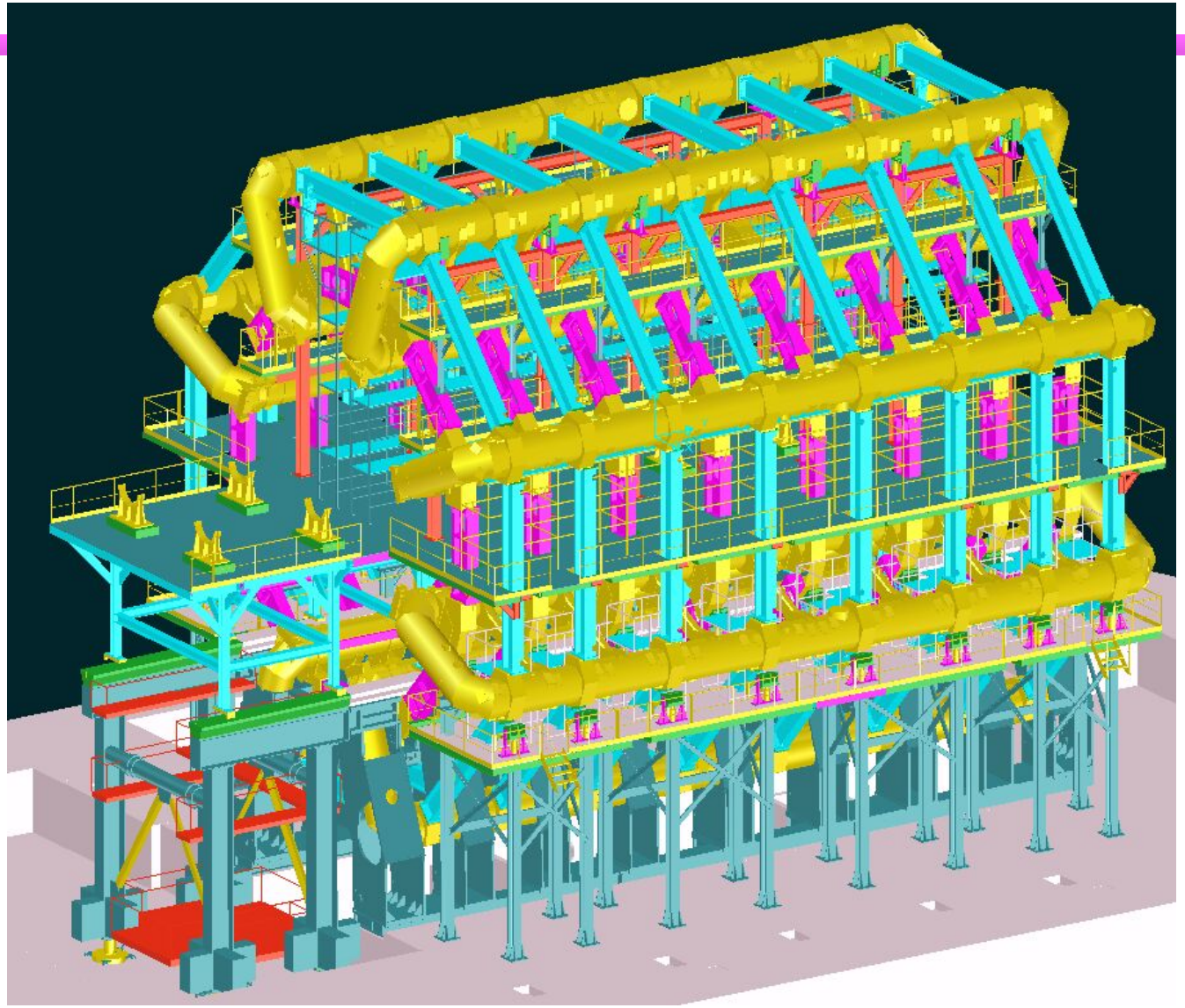
Bedplate

Feet at CERN

Crane installation in UX15

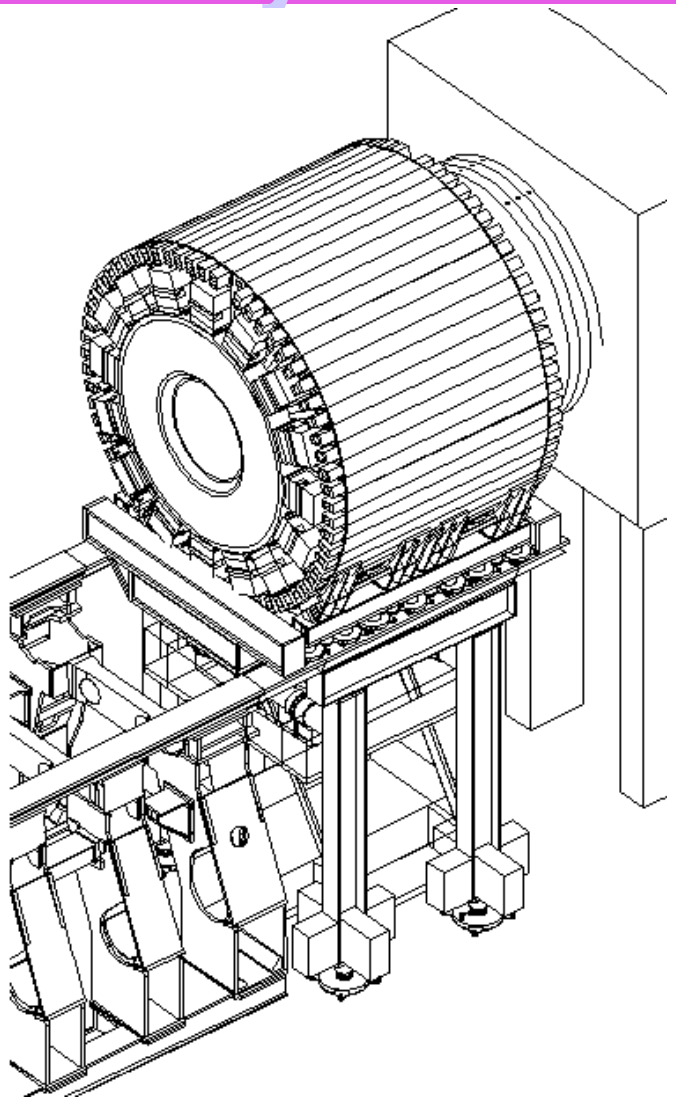


Barrel Toroid 3D model incl. Platforms

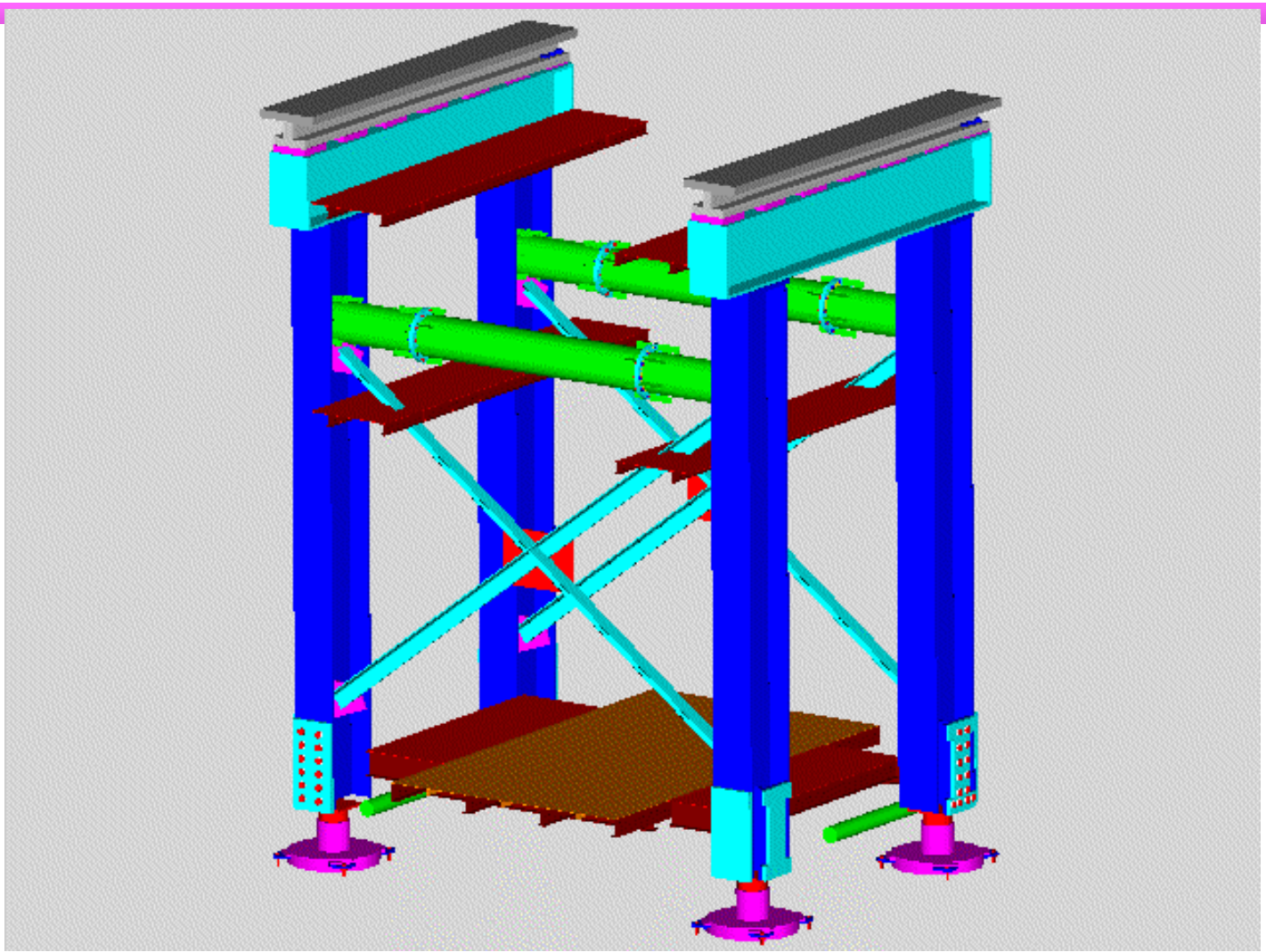


Calorimeter (End-cap)

Barrel Calorimeter Assembly on Truck

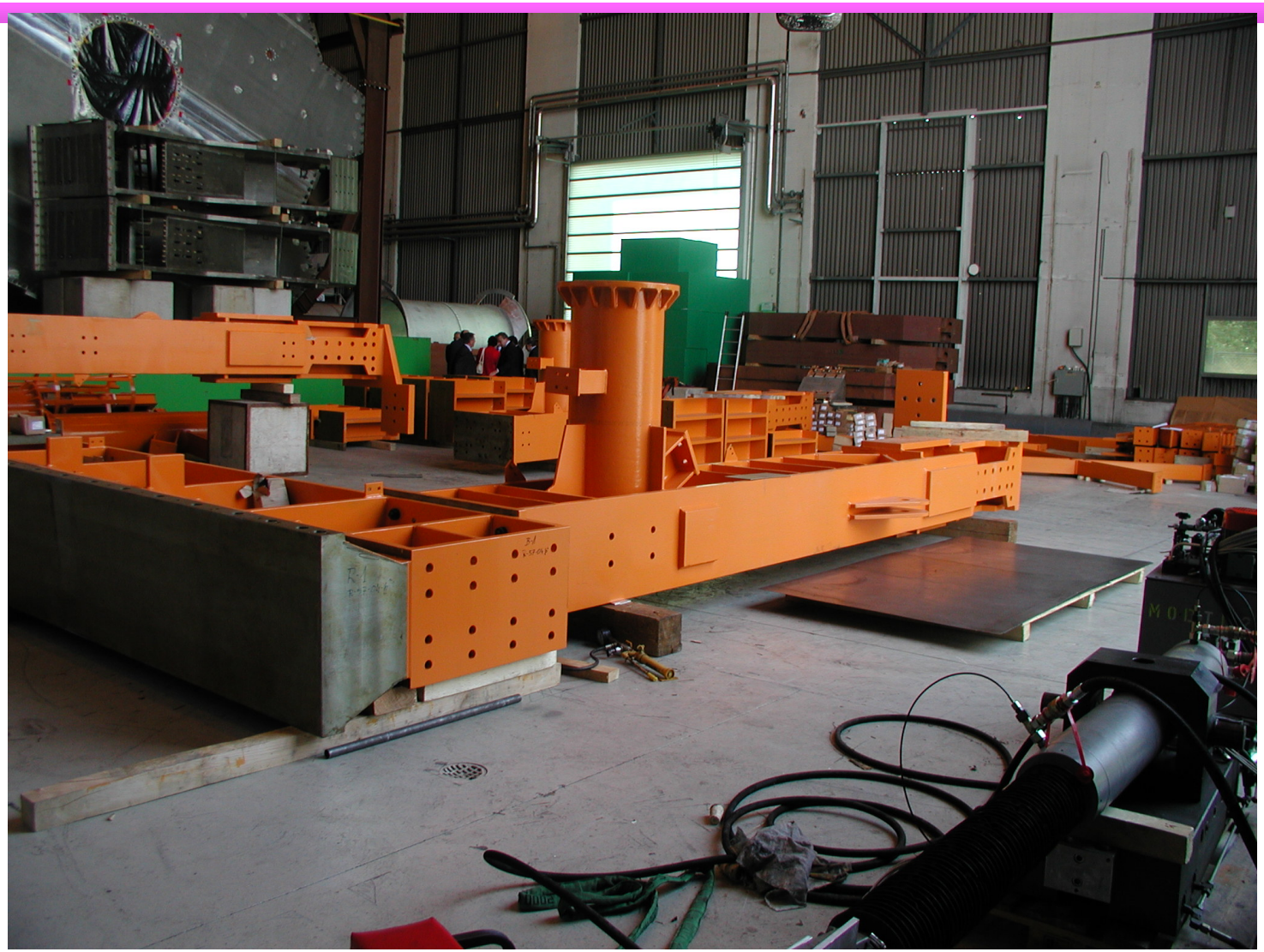


HF Truck Schematic



Air Pads 250 Ton

HF Trucks Components

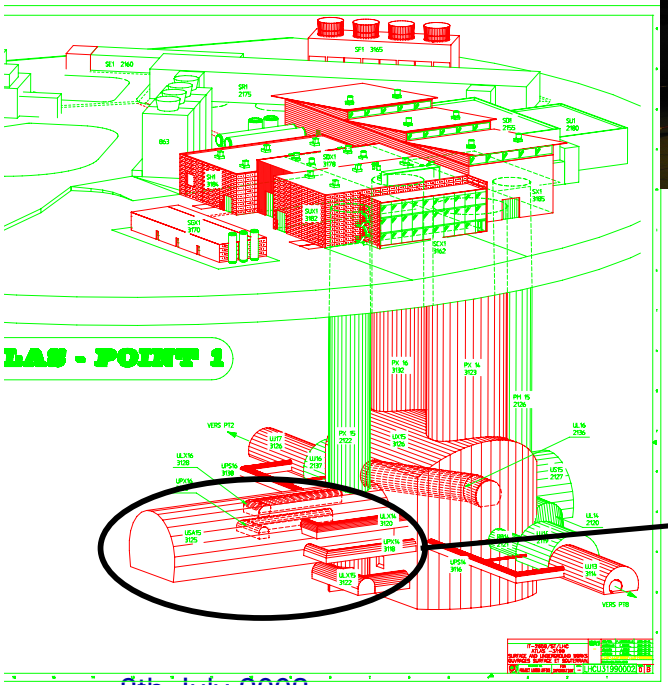


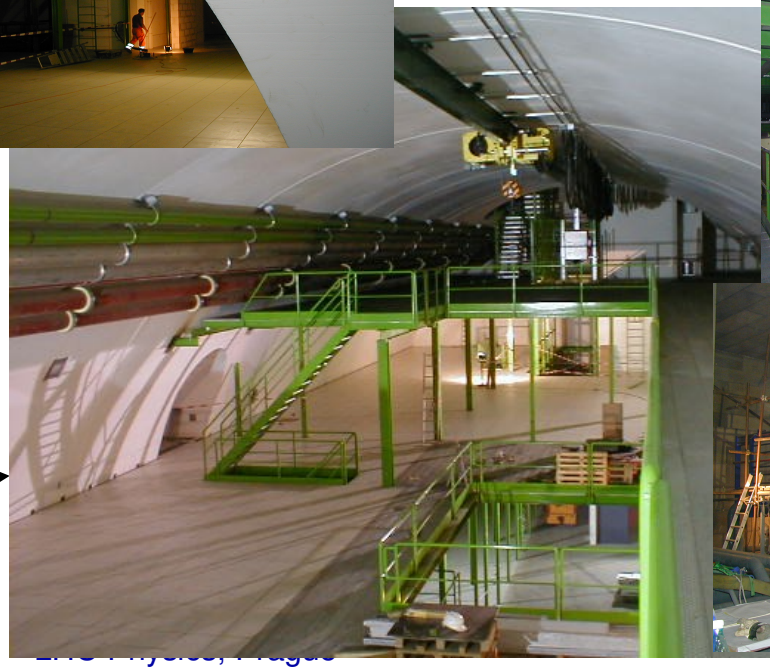
USA15

- Structures completed (shaft hoistway to be completed after lowering cold box) & walls racks area July-August
- Distribution piping (service galleries ULX) underway (-->July)
- Insulation primary piping underway

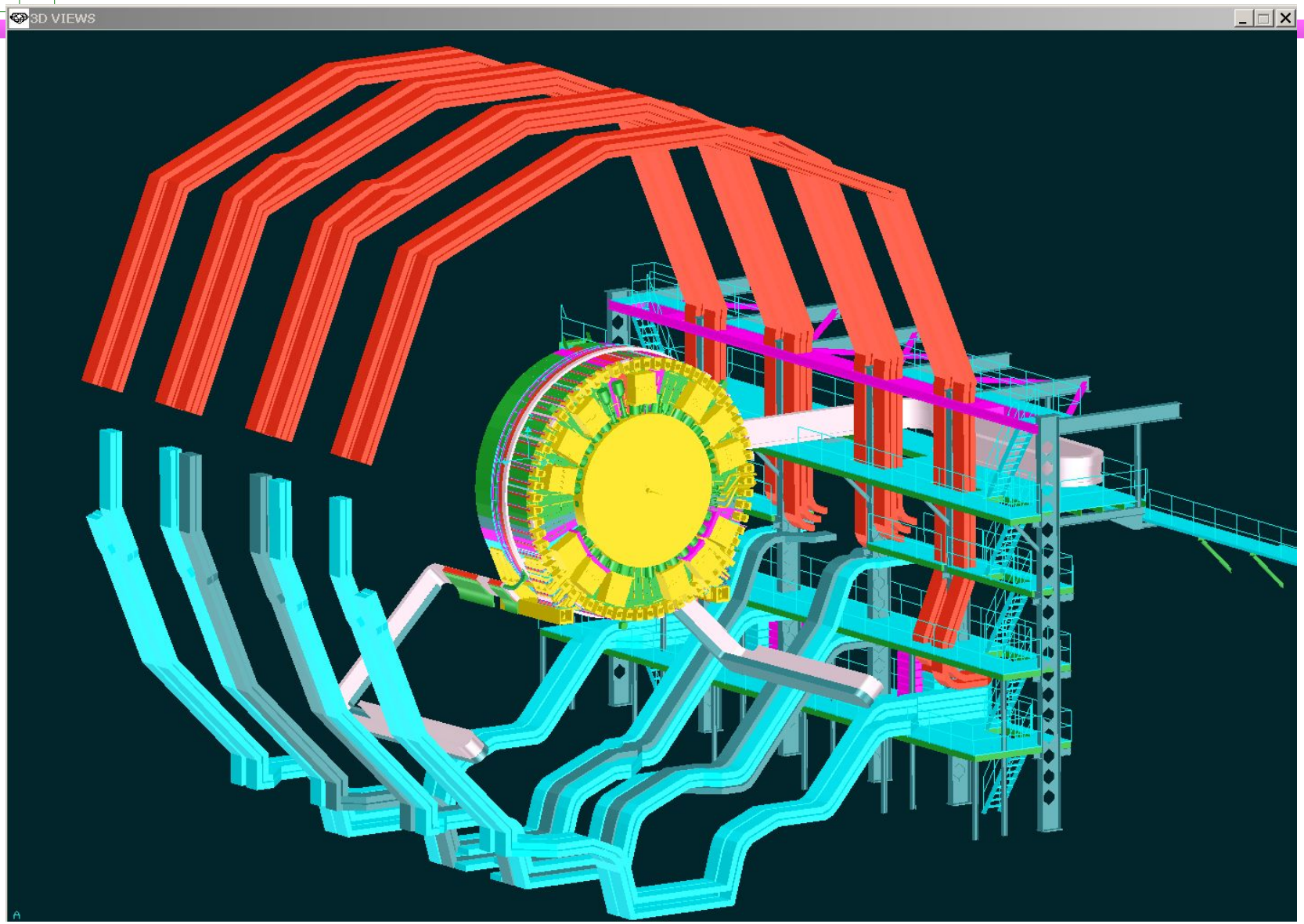
Near Future:

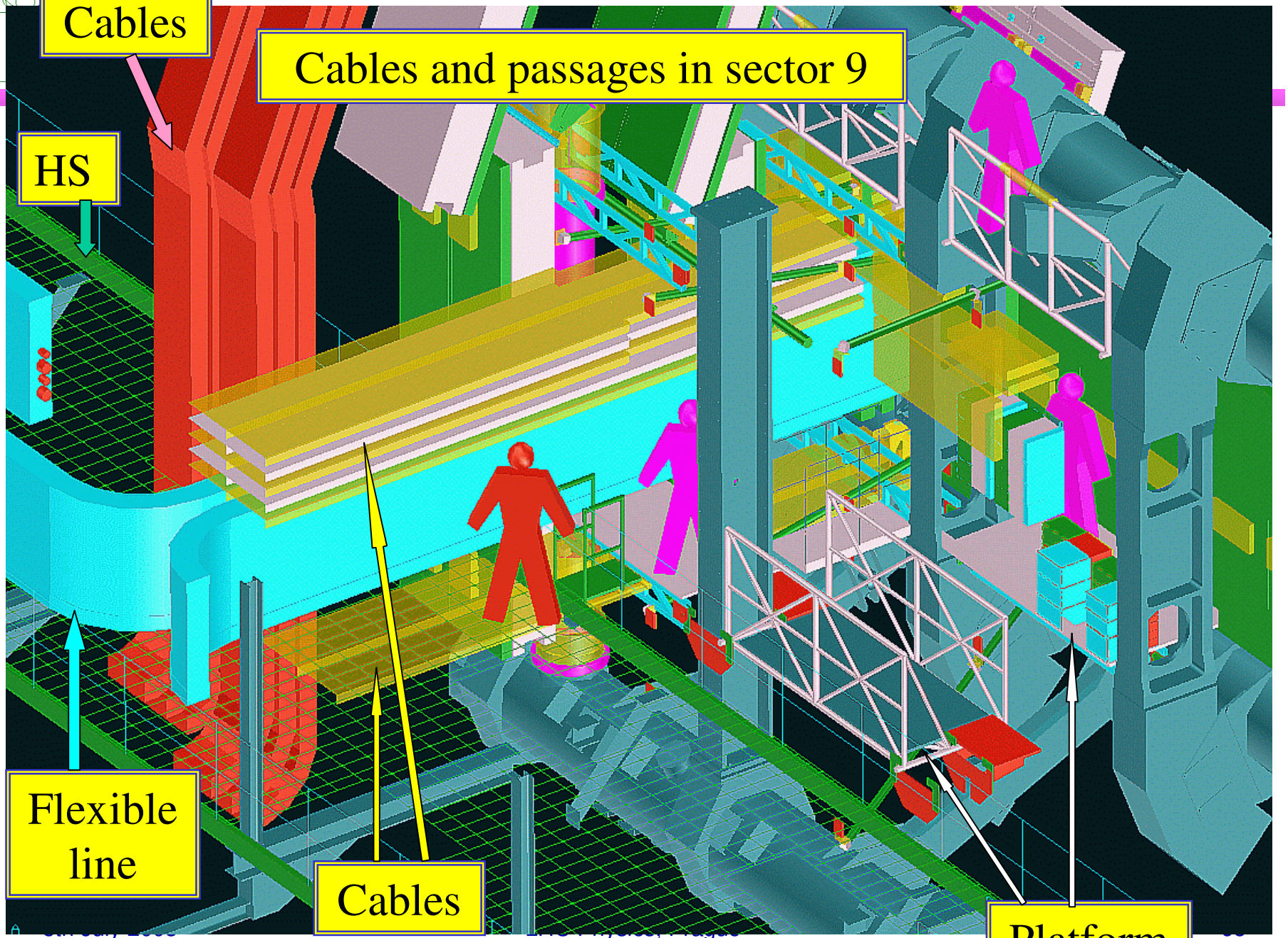
- Cryo piping at vault (July-August) and installation refrigerators
- Ventilation ducts (underway)
- Electrical substation





Services - Calorimeter end-cap chains




Cables
Cables and passages in sector 9
HS
Flexible line
Cables
Platform

ATLAS commissioning

Phase A
System at ROD level.
Systems for LVL1, DCS and DAQ.
Check cable connections.
Infrastructure.
Some system tests.

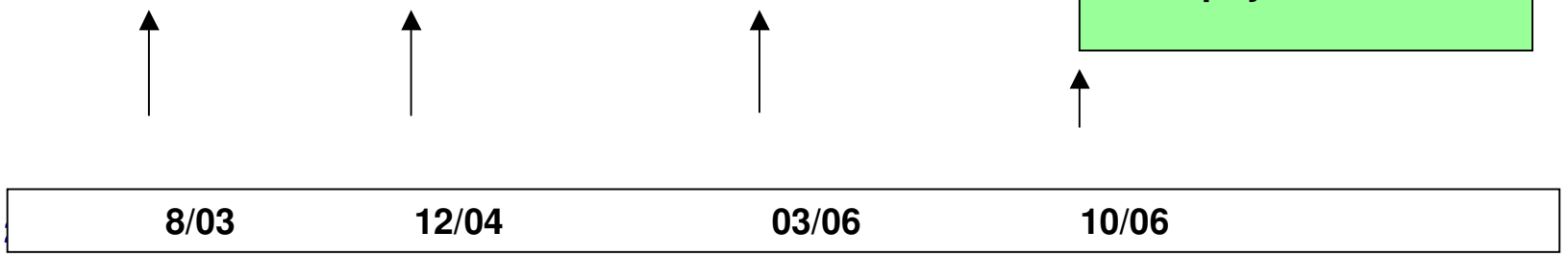
A full day workshop will be devoted to this topic also at the next ATLAS Week in Prague

Phase B
Calibration runs on local systems.

Phase C
Systems/Trigger/DAQ combined.

The discussions and the planning for the commissioning phases of the experiment have started in the Collaboration at many levels

Phase D
Global commissioning.
Cosmic ray runs.
Initial off-line software.
Initial physics runs.



Calibration and physics planning for the commissioning

The Physics Coordination is heavily involved in the planning for the commissioning

It was a major theme for the recent 4th ATLAS Physics Workshop (Athens, 21 – 25 May 2003)

Preliminary, but already quite detailed, plans exist for

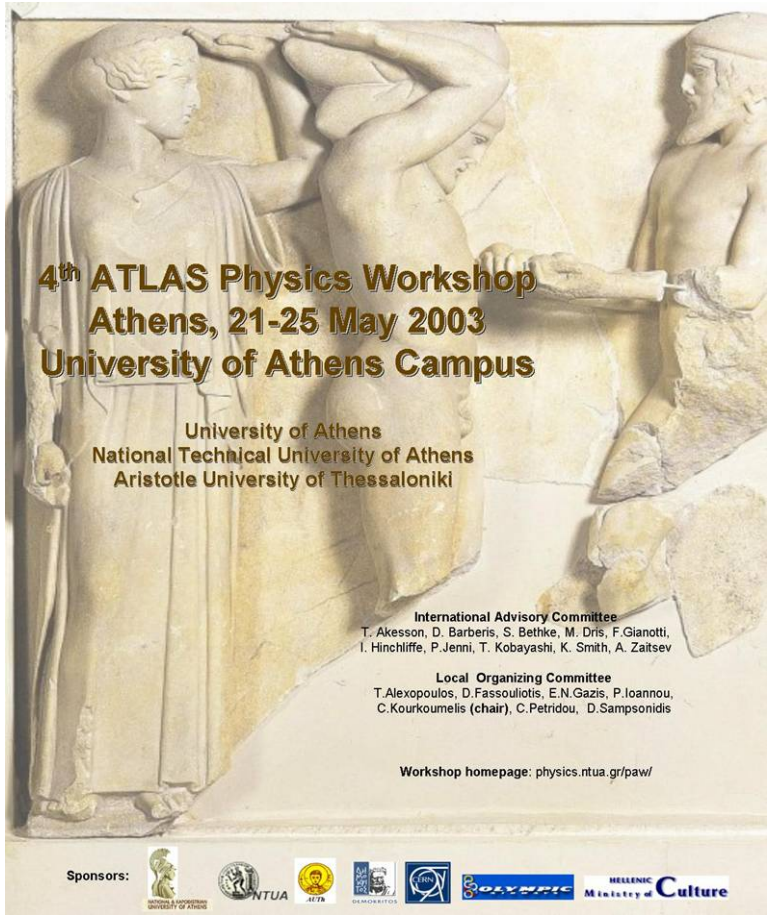
1) **Calibration and alignment with hardware systems, electronics noise studies**

2) **Cosmics run: Will be very important for a first complete 'shake-down' of the whole detector and computing**

3) **One beam LHC operation: Plan to profit from beam-halo and beam-gas interactions, first assessment of machine backgrounds**

4) **First collisions: The initial programme will include**

   - **Minimum bias events: First global debugging and timing of the detector with physics events**
   - **Set up of the level-1 triggers**
   - **Set up of the HLTs**



ATLAS combined test beam 2004

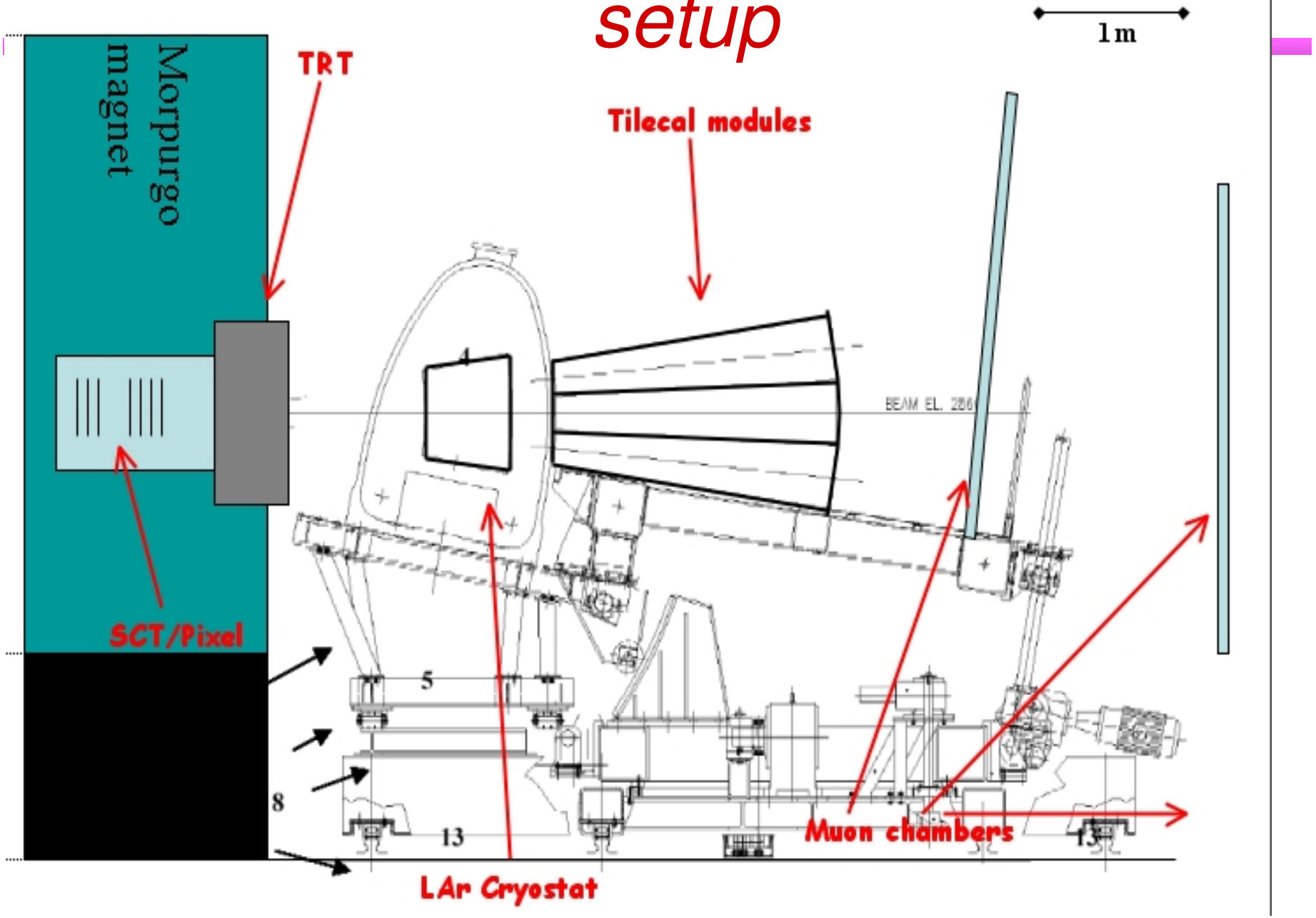
The setup is going to be finalized

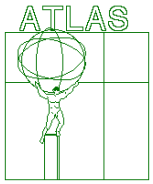
- **Inner Detector with realistic inter-spacing**
  - **3 Pixel planes**
  - **4 SCT planes**
  - **A TRT barrel wedge**
- **LAr Barrel Module-0**
- **3 Tile Calorimeter Barrel Modules**
- **Several MDT and MDT/RPC chambers**
- **In addition several MDT end-cap chambers**

First Combined Test Beam Workshop: July 8th and 9th 2003

Important step towards commissioning of the full ATLAS hardware and software chain

A sketch of the possible setup





Test programme

Calorimeter studies

- **Energy sharing, resolution, e/h, linearity**
- **Low energy hadrons in e.m. calo with TRT identification**

Inner Detector + Calorimetry

- **Electron reconstruction in e.m. calo with tracking from Inner Detector**

Muon + Calorimetry

- **Low momentum muons in Tilecal 3rd sampling**
- **Effect of the material on low momentum muon tracking resolution**

Inner Detector + Calorimetry + Muons

- **Tracking ID + Muon with Calorimetry particle identification**
- **Common Event Filter tasks for online calibration**

Calorimetry + LVL1-Calo

Muon + LVL1-Muon

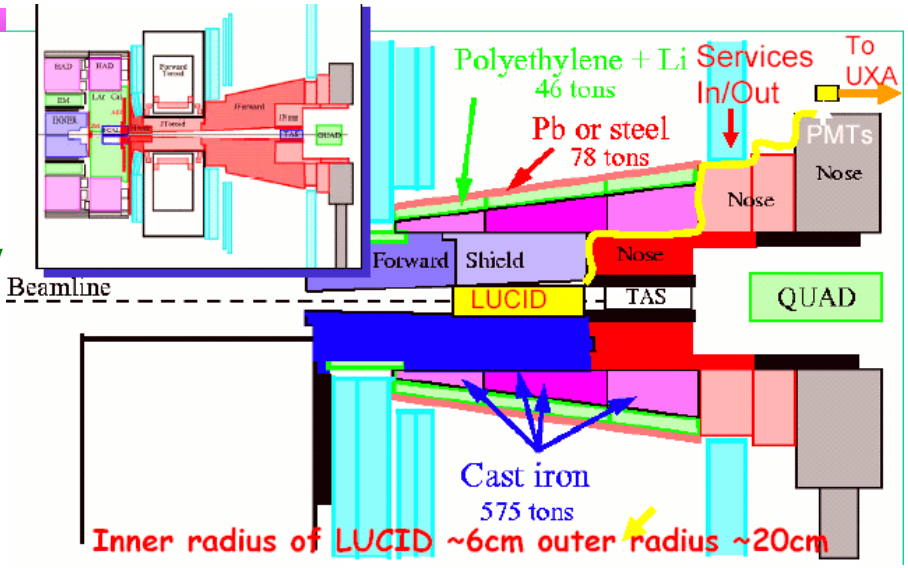
Common trigger

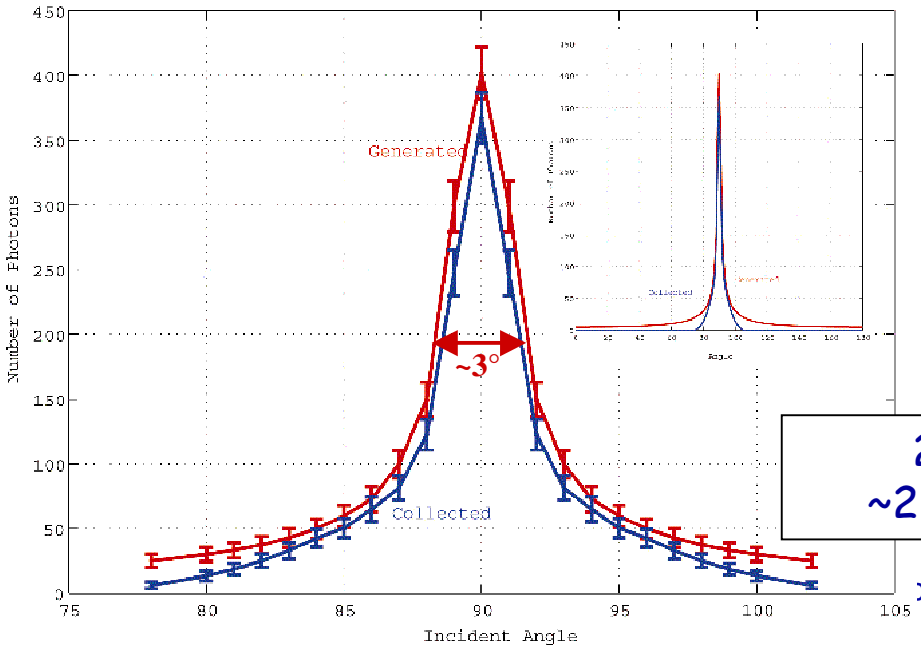
- **Event-by-event operations (normal beam trigger)**
- **Pipelined operations using the LVL1**

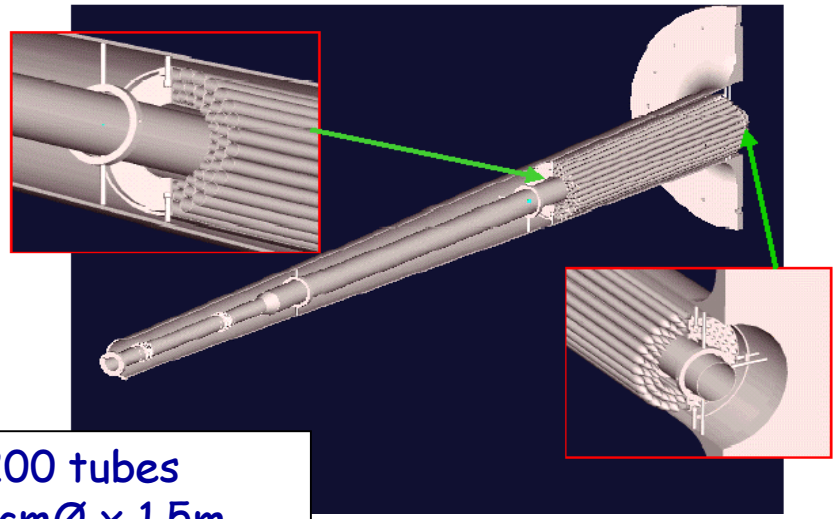
Luminosity monitoring and calibration (in preparation)

LUCID (monitoring)

- Cerenkov tubes around the beampipe
  - similar to CDF CLC system
- Rad hard, low mass, simple technology
- Excellent time resolution
- Sensitive only to particles from IP
  - Response proportional to interactions/crossing
- Useful in rapidity gap physics?







200 tubes
~2 cmØ x 1.5m

Luminosity calibration

- Use elastic scattering down to the Coulomb region in special runs with large beta and small emittance
- Coulomb normalization does not require measurement of the total inelastic rate
- Measurements of very small angles required

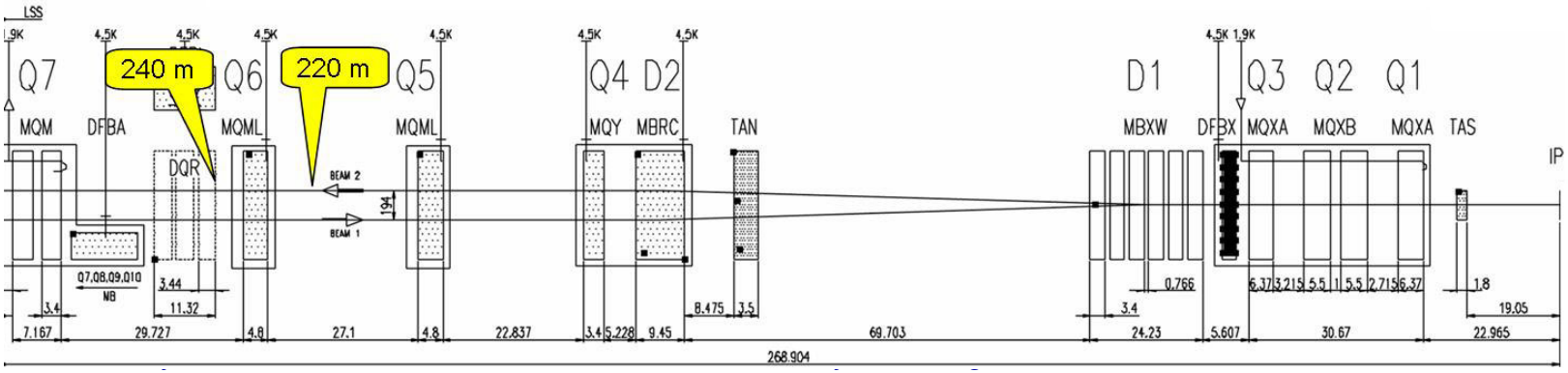
  ⇒ Roman pots far from the IP with “edgeless” detectors.

Road map

- Optics studies to be concluded in July
- Pot positions defined during summer followed by performance simulation
- Common TOTEM-ATLAS pot design preferable
- Convergence needed in fall 2003
- Document before end of year

Open Workshop on
Roman Pot Detectors
at LHC

CERN, 2-3 June ***2003***



(Forward) Physics Motivation:

- total cross-section
- elastic scattering
  - → $d\sigma/d|t|$, $\sigma_{el}/\sigma_{total}$, ρ parameter

} discussed earlier

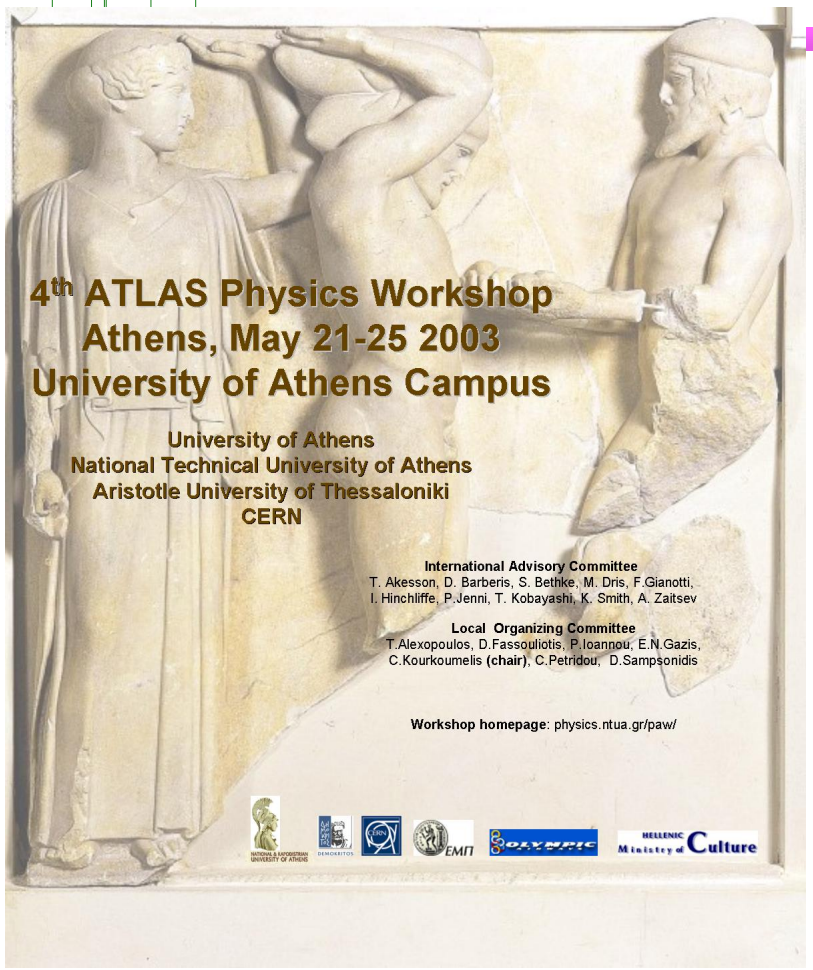
- diffractive scattering
  - → Soft processes: (differential) cross-sections, contribution to σ_{total}
  - → Hard processes: partonic structure (high p_T probes: jets, W/Z, γ, ...)
- exclusive production ($pp \rightarrow p + X + p$) via central diffraction
  - → Higgs bosons, SUSY particles, $t\bar{t}$ pairs, ...
  - → di-jets as gluon factory
- leading particle production (p-p and p-A)
  - → understand better cosmic ray induced air-showers
- photon-nucleus interactions
  - → ultra-peripheral collisions, two photon exclusive production

} mostly leading particle measure-ments

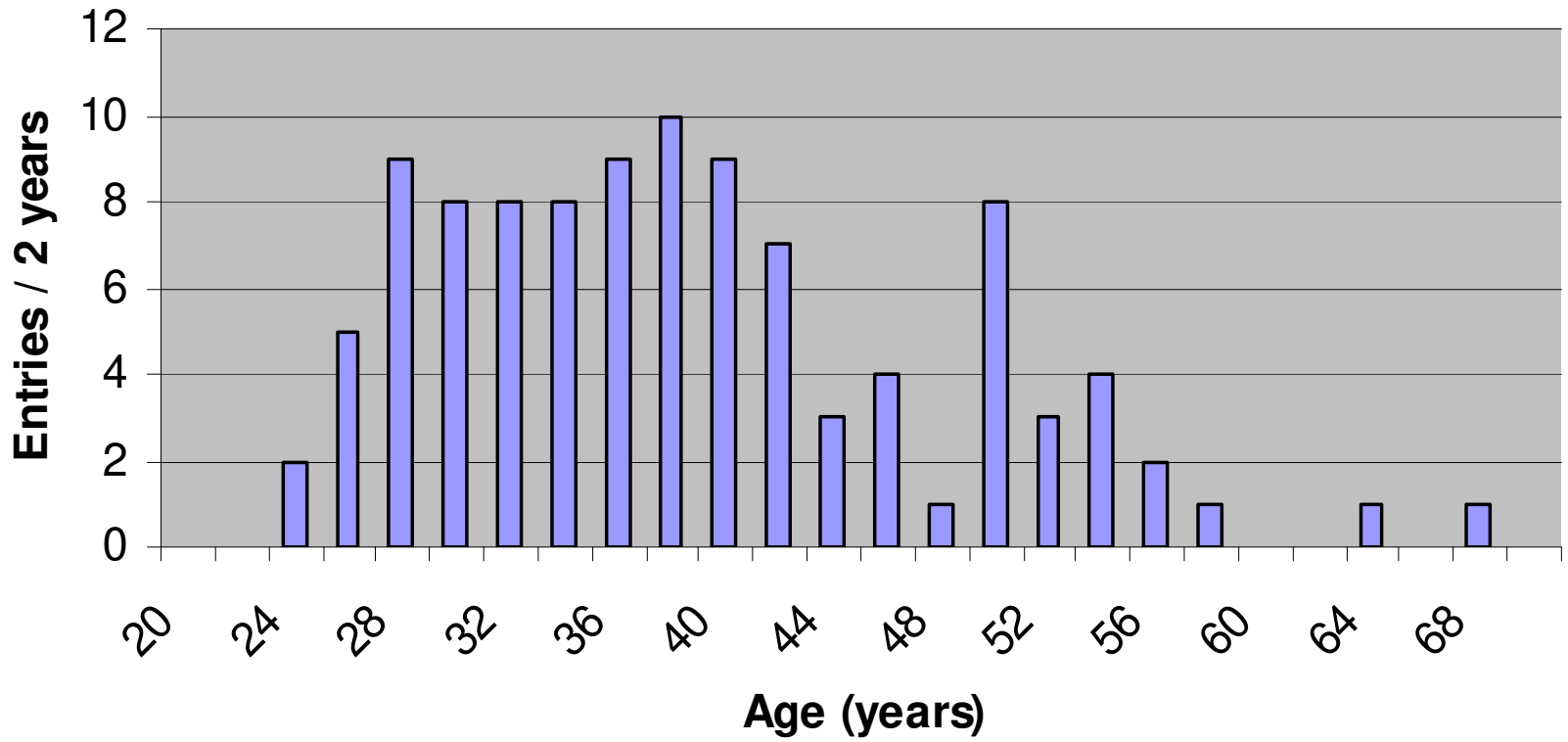
- minimum bias event structure
- properties of rapidity gaps
  - → survival probability, multi-gap events, ...
  - → rapidity gaps as tools for new physics
- low-x physics (in p-p, p-A and A-A collisions)
  - → parton distributions, QCD dynamics (BFKL, CCFM, ...)
  - → shadowing, multi-parton scattering

} extended coverage inside exp. cavern (?)

The 4th Physics Workshop was a highly motivating event



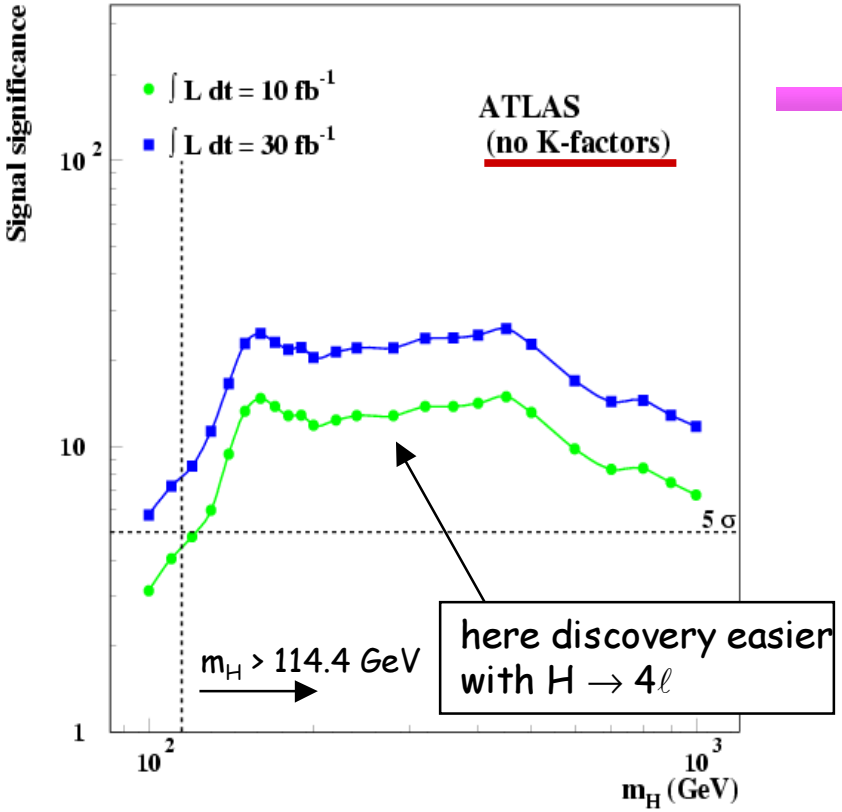
Speakers age distribution

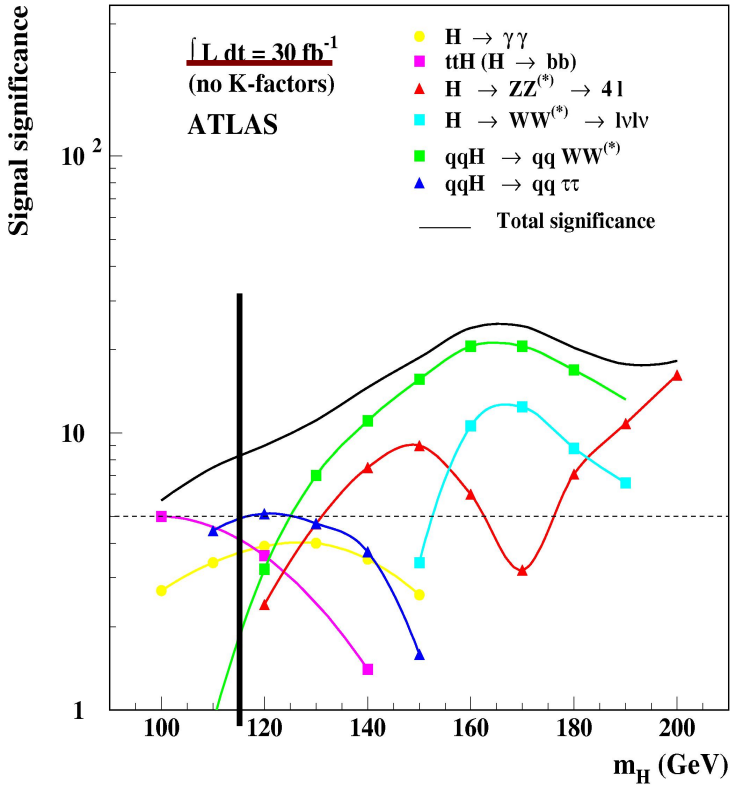


104 talks (not counting the welcome and conclusion talks)

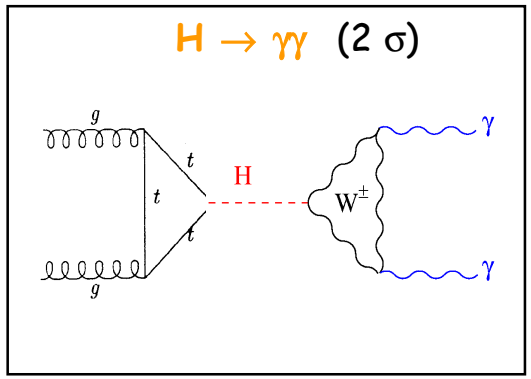
In general the talks were of remarkable quality, and highly motivating

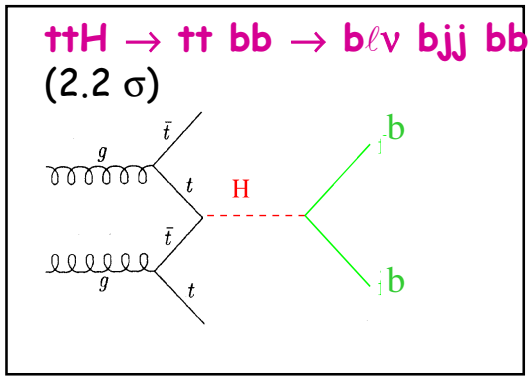
Standard Model Higgs

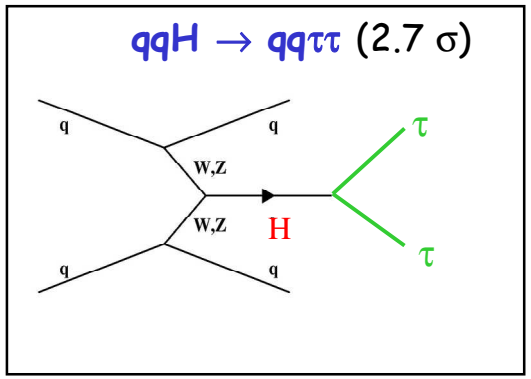




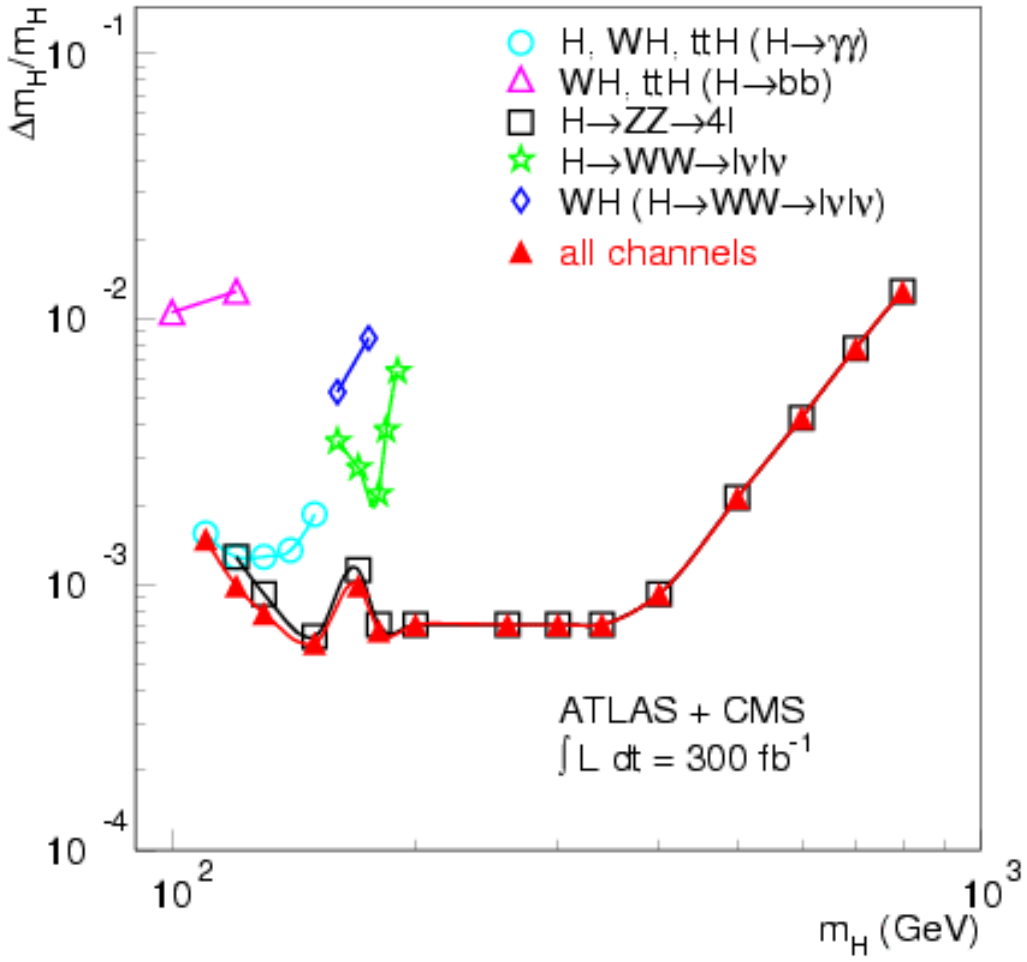
For m_H ~ 115 GeV and 10 fb^{-1}, 3 complementary channels accessible:



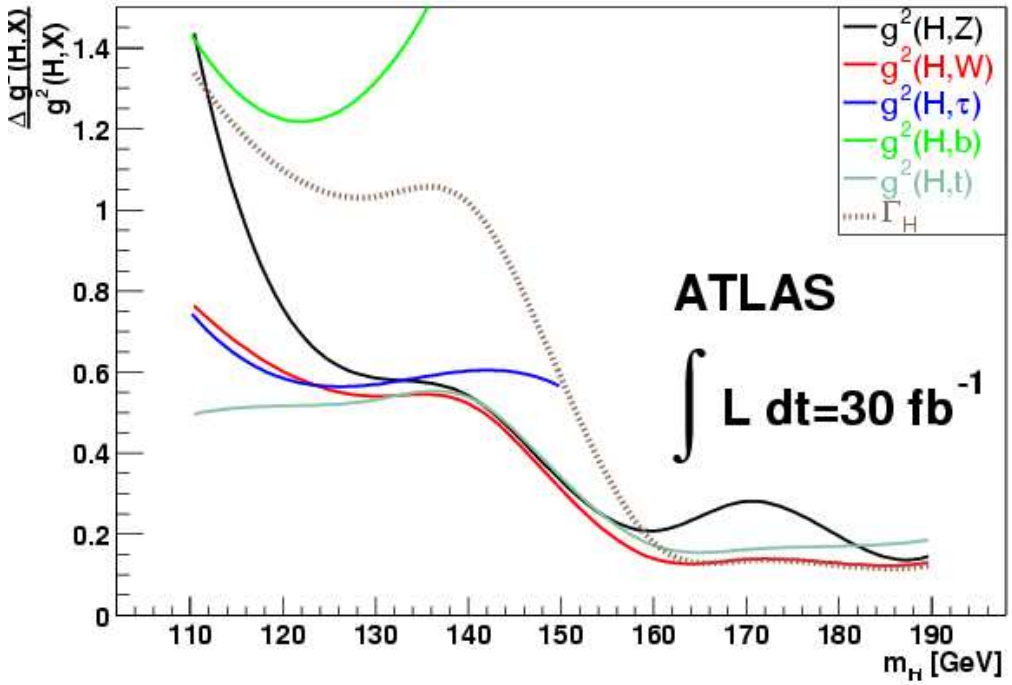




Measurement of the SM Higgs mass at the LHC (ATLAS study)

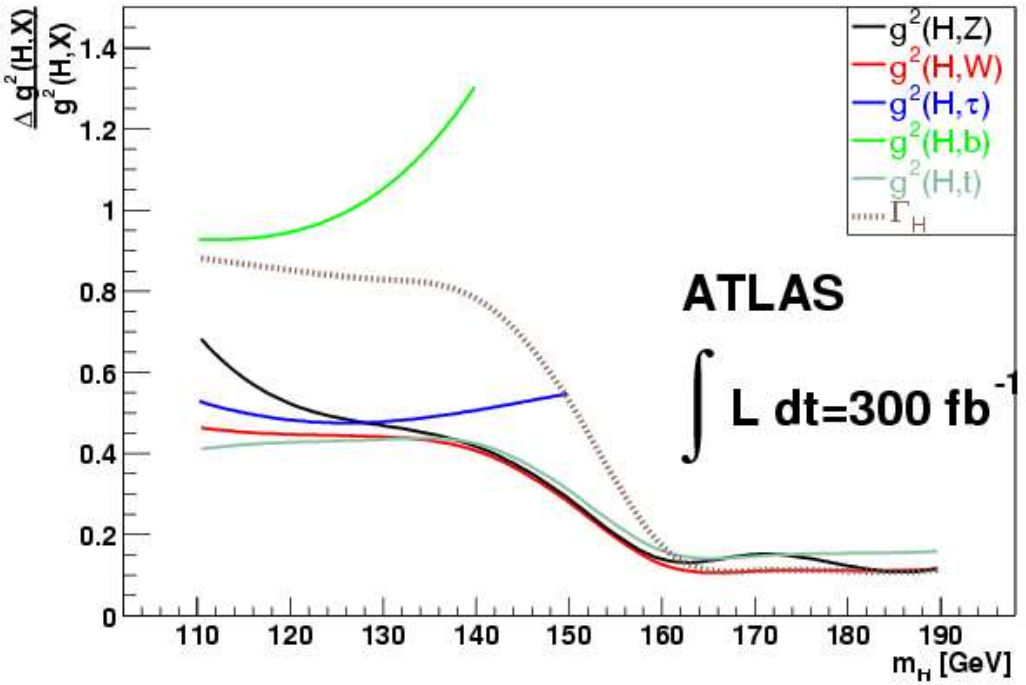


Expected experimental systematic errors included. No theoretical uncertainty

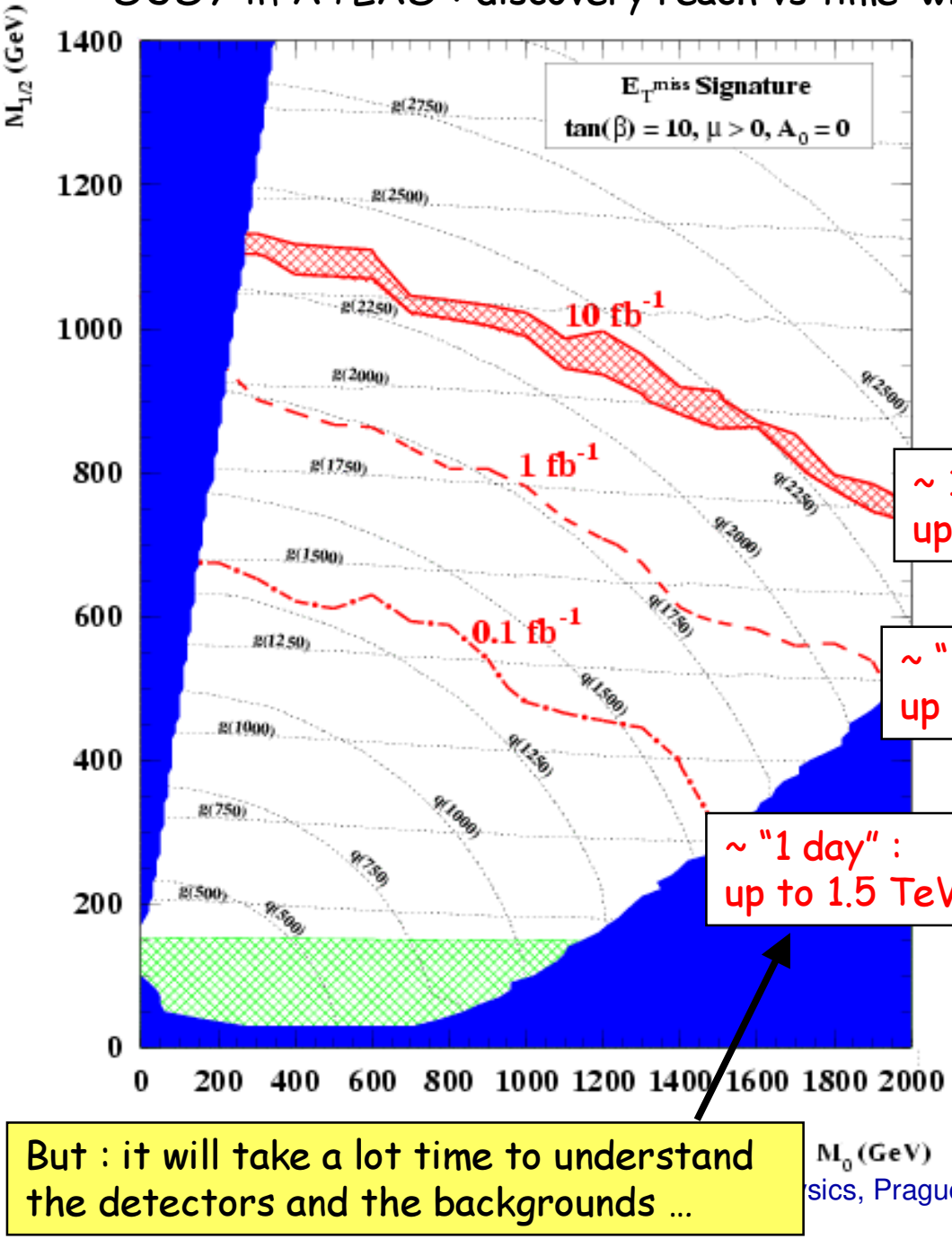


Measurements of the Higgs couplings and Higgs width in ATLAS

Systematic uncertainties included



SUSY in ATLAS : discovery reach vs time with most powerful Jets + ETmiss signature



ATLAS
5σ discovery curves

~ 100 days :
up to 2.3 TeV

~ "10 days" :
up to 2 TeV

~ "1 day" :
up to 1.5 TeV

But : it will take a lot time to understand the detectors and the backgrounds …

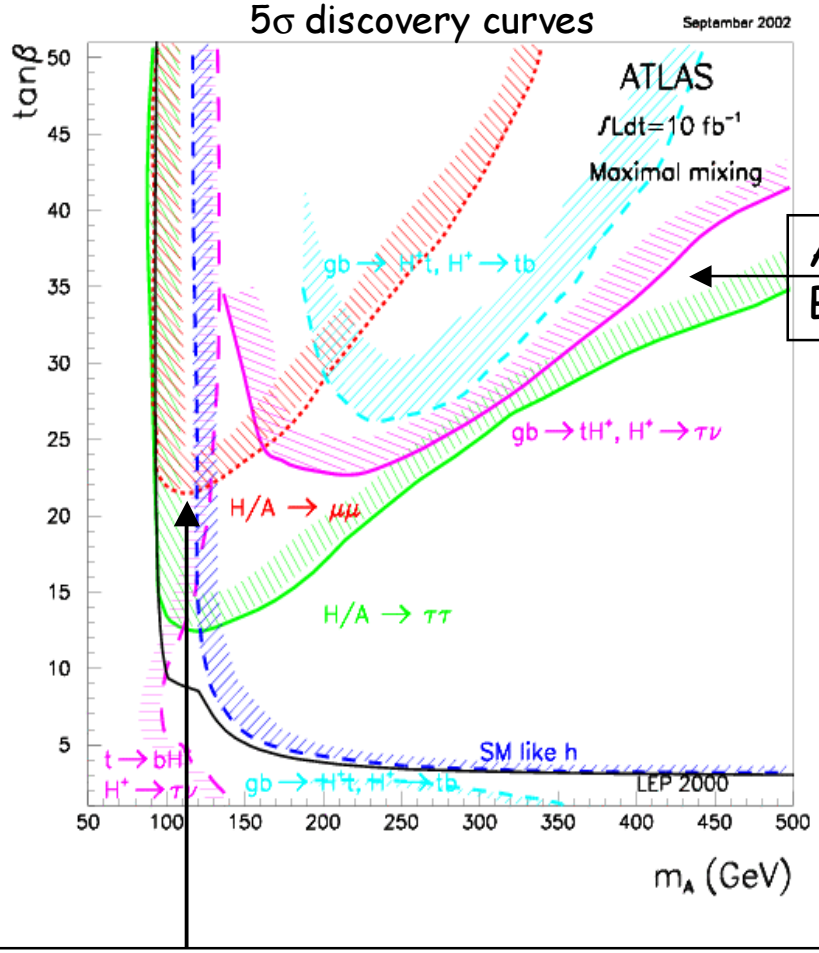
Discovery reach for squarks/gluinos

Time	mass reach
1 month at 10^{33}	~ 1.3 TeV
1 year at 10^{33}	~ 1.8 TeV
1 year at 10^{34}	~ 2.5 TeV
ultimate (300 fb^{-1})	~ 2.5 - 3 TeV

MSSM Higgs bosons h, H, A, $H^{\pm}$

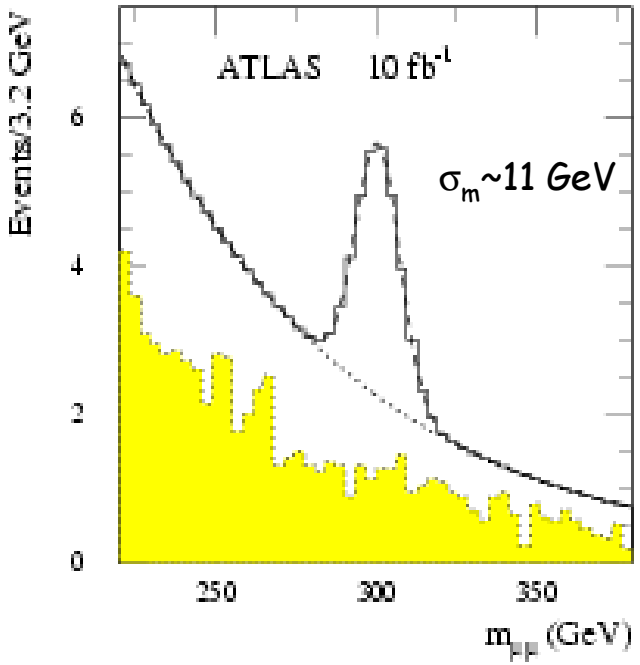
$m_h < 135$ GeV
$m_A \approx m_H \approx m_{H^{\pm}}$ at large m_A

5σ discovery curves



A, H, $H^{\pm}$ cross-section ~ $tg^2\beta$
Best sensitivity from $A/H \rightarrow \tau\tau$, $H^{\pm} \rightarrow \tau\nu$

$A/H \rightarrow \mu\mu$, tg β = 38

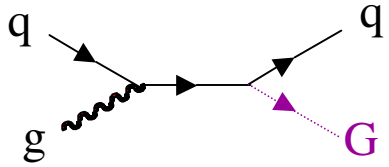


$bbA/H \rightarrow \mu\mu$:
-- covers good part of region not excluded by LEP
-- experimentally easier than $A/H \rightarrow \tau\tau$
(especially at the beginning)

Extra-dimensions

Production of a continuum of Graviton states :

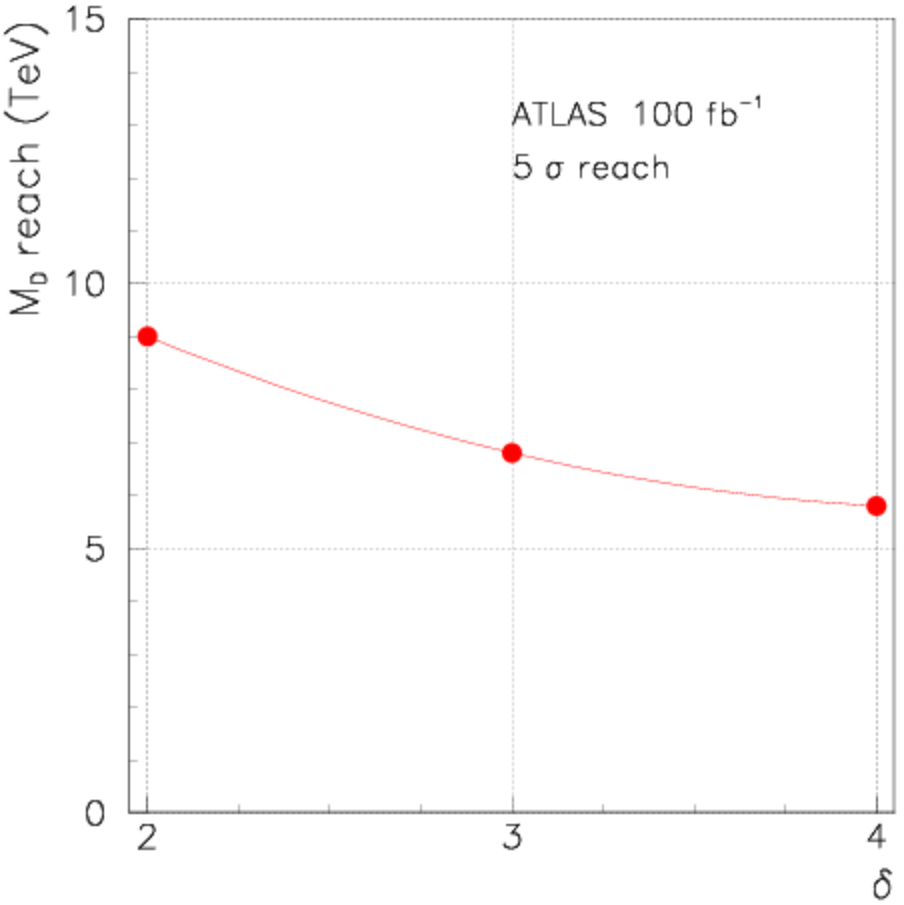
Arkani-Hamed, Dimopoulos, Dvali models



→ topology is jet(s) + missing E_T

$$\sigma \approx \frac{1}{M_D^{\ \delta+2}}$$

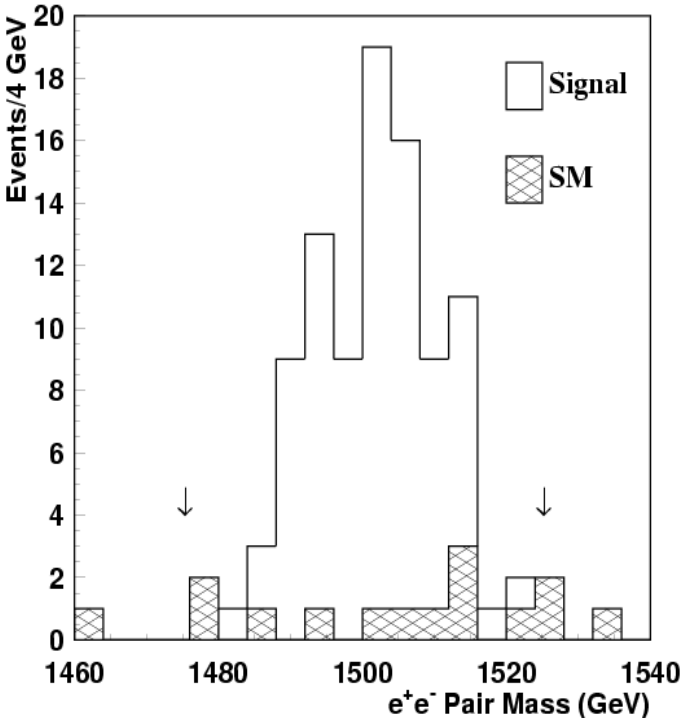
M_D = gravity scale
δ = number of extra-dimensions



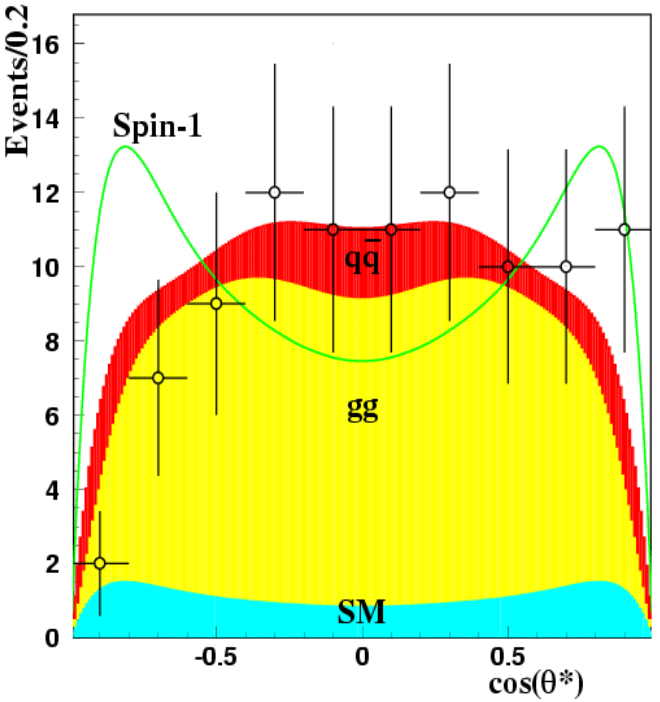
Production of narrow Graviton resonance :

$qq, gg \rightarrow G \rightarrow e^+e^-$ Randall Sundrum models

Allanach, Odagiri,
Parker, Webber



ATLAS
100 fb^{-1}



$q\bar{q} \rightarrow G$
$gg \rightarrow G$
} spin =2

ATLAS potential for heavy ions

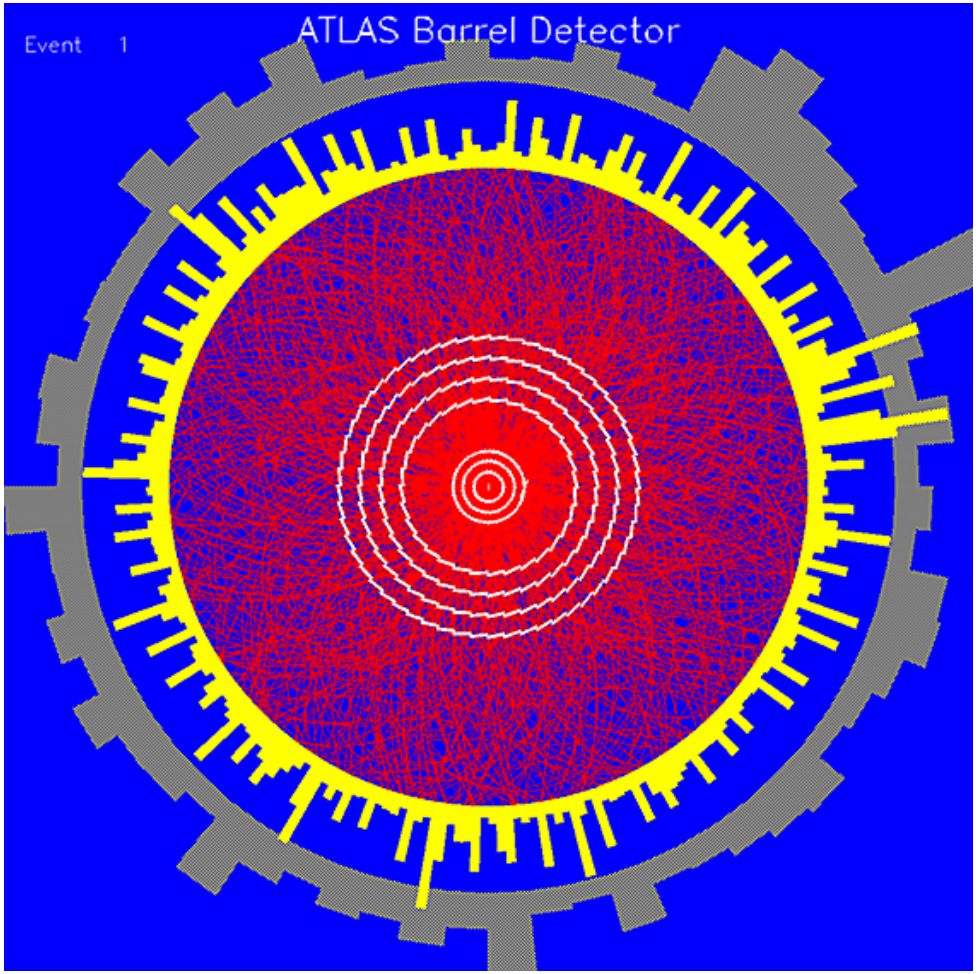
- First encouraging results available
- From 25'000 events, fully-simulated with Hijing + G3 and b = 0-15 fm (6 h/event)

- Occupancies (for Pb-Pb, b = 0) :
  - ~ 1% Pixels
  - ~ 15 % SCT 1
  - ~ 10% SCT 4

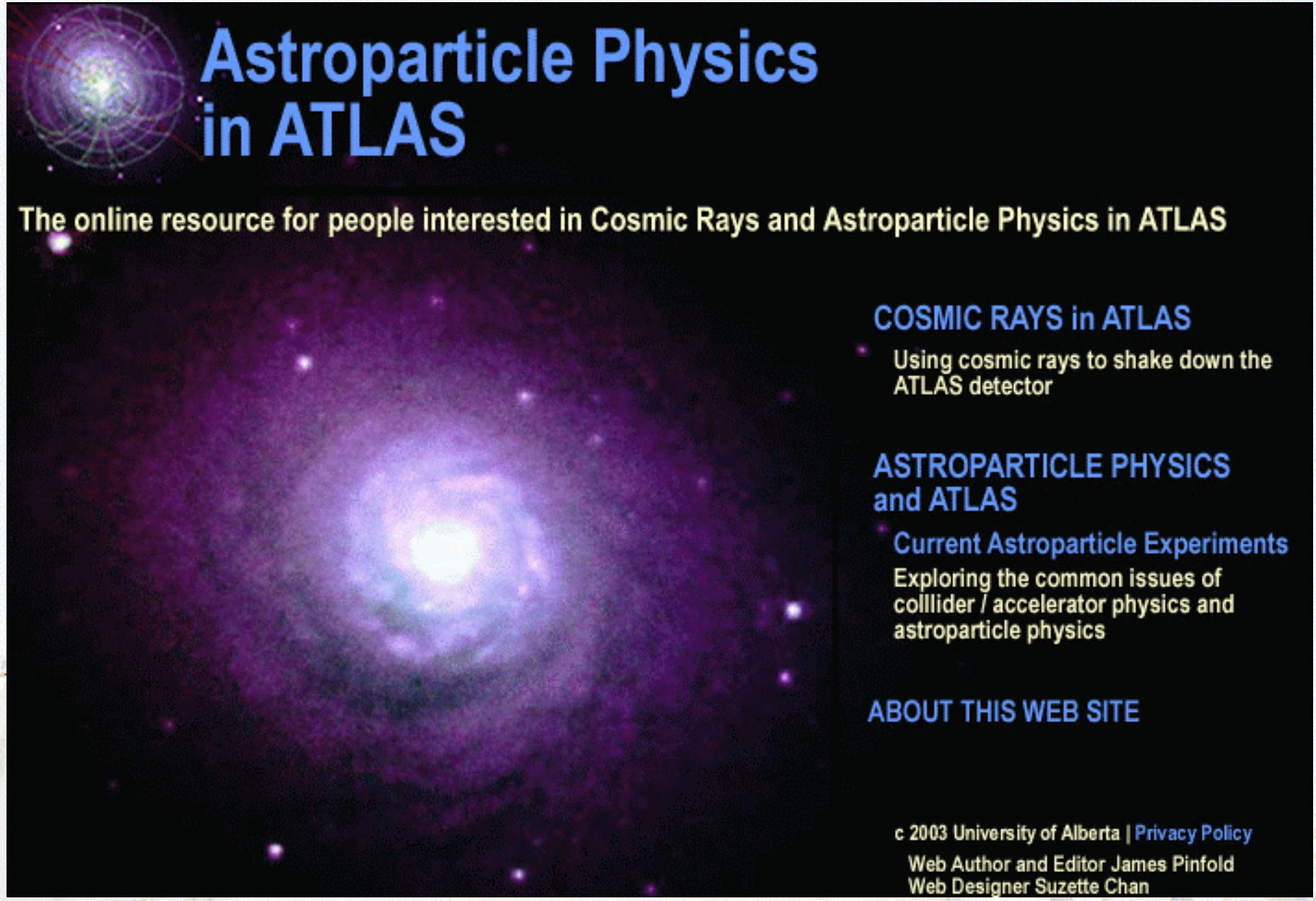
- Event size 5 MB

→ can run at ~ 50 Hz rate to storage

The plan is to document for the LHCC the ATLAS HI potential and ambitions after the Summer (work has started on the document)



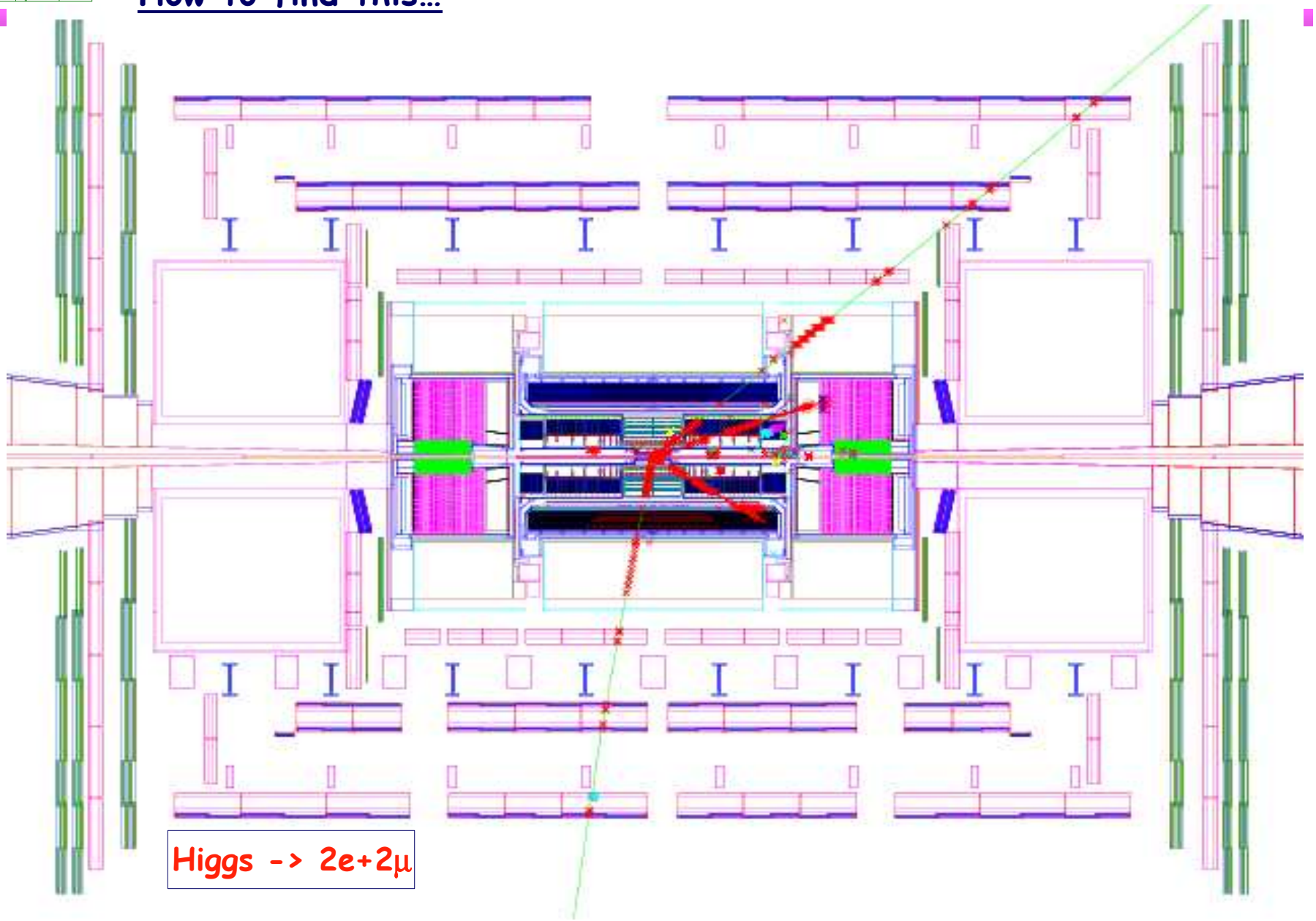
Pb-Pb collision
b = 0, dy = 0.5



http://csr.phys.ualberta.ca/astroATLAS/index.htm

The challenge of ATLAS…(L. Mappeli's talk)

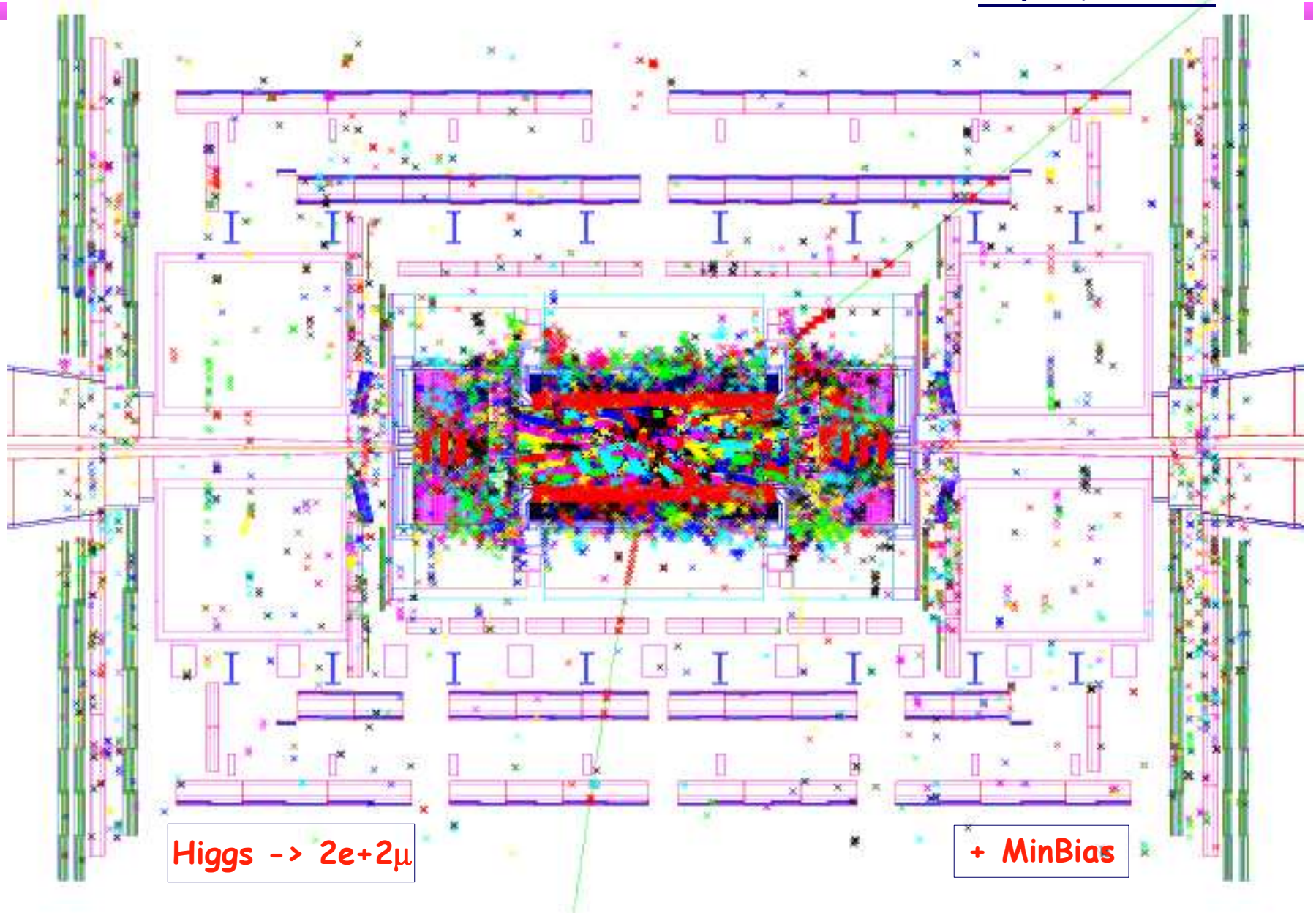
How to find this…

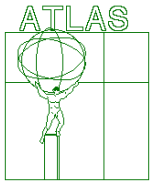


Higgs -> 2e+2μ

… the challenge of TDAQ!

… from this …





Conclusions

In general the detector construction progress very well

For several systems the emphasis in now shifted strongly to pre-assembly and integration

The installation phase, currently with the infrastructure, has started in pit-1

The list of remaining construction concerns is regularly reviewed within ATLAS and with the LHCC referees

Very major software and computing activities are ongoing, with one of the major focal points being given by the Data Challenges

The ATLAS construction is proceeding within the framework of the accepted Completion Plan

Serious discussions on the commissioning of the ATLAS experiment have been initiated in the Collaboration, with global detector commissioning starting in the second half of 2006

ATLAS' ambition is to be ready for the first collisions with a commissioned detector