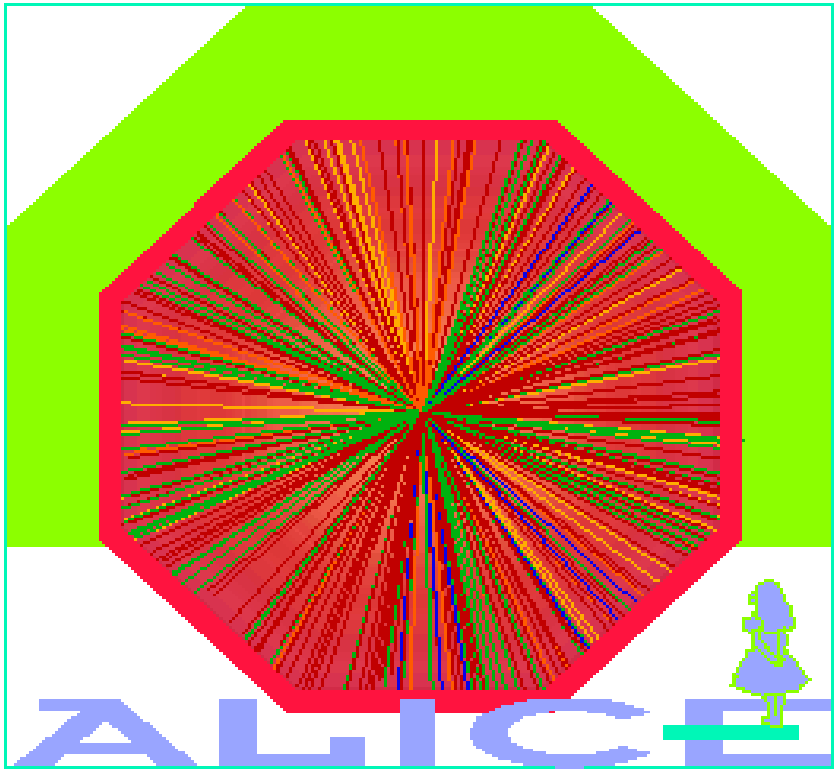
ALICE Status Report to LHCC January 2007

- Collaboration Status
- Project Status
- Overall Status & Planning



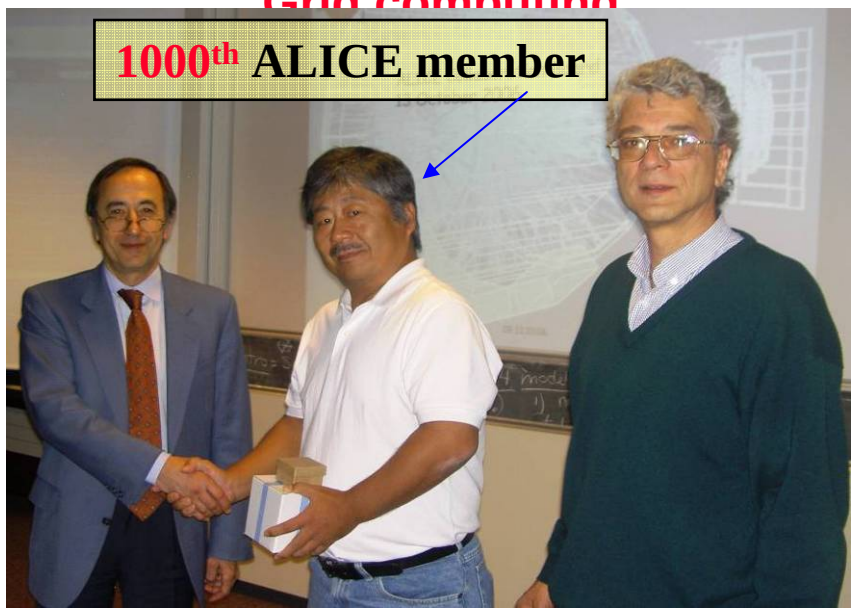
Organization News

- Elections in 2006
  - ⇨ C. Fabjan re-elected as Technical Coordinator until mid 2008
  - ⇨ F. Antinori (INFN Padova) elected as Deputy Spokesperson for 2 years (2007/8)
    - ✪ replaces H. A. Gustafsson, whose 2 year mandate ends Dec 2006
    - ✪ 2nd Deputy Spokespserson: P. Giubellino (INFN Torino)
- Organization
  - ⇨ under discussion: changes to adapt organization from construction to exploitation
    - ✪ composition of Management Board
    - ✪ Run Coordinator: data taking, detector operation
    - ✪ Data Production Coordinator: Data and MC scheduled GRID production, resources

Collaboration

- 14 new Institutes in 2006:
  - ⇨ **Italy**: **Frascati** — **EMCAL**
  - ⇨ **US:** 3 National Labs + 2 Universities — **EMCAL, GRID**
    - ✪ **LBNL** (Berkeley), **LLNL** (Livermore), **ORNL** (Oak Ridge)
    - ✪ **Yale** (New Haven), **Wayne State** (Detroit)
  - ⇨ **Japan:** change from 'associate' to 'full' member — **PHOS** (+TRD), **GRID**
    - ✪ **Hiroshima, Tokyo, Tsukuba**
  - ⇨ **Brazil:** single team from 2 Institutes — **offline**
    - ✪ Univ**.** São Paulo (**USP**), Univ. Estadual de Campinas (**UNICAMP**)
  - ⇨ **Spain**: single team from 2 Institutes
    - ✪ **CIEMAT** Madrid, Univ. **Santiago de Compostela** — **Grid computing**
  - ⇨ **Romania**: **ISS Bucharest**

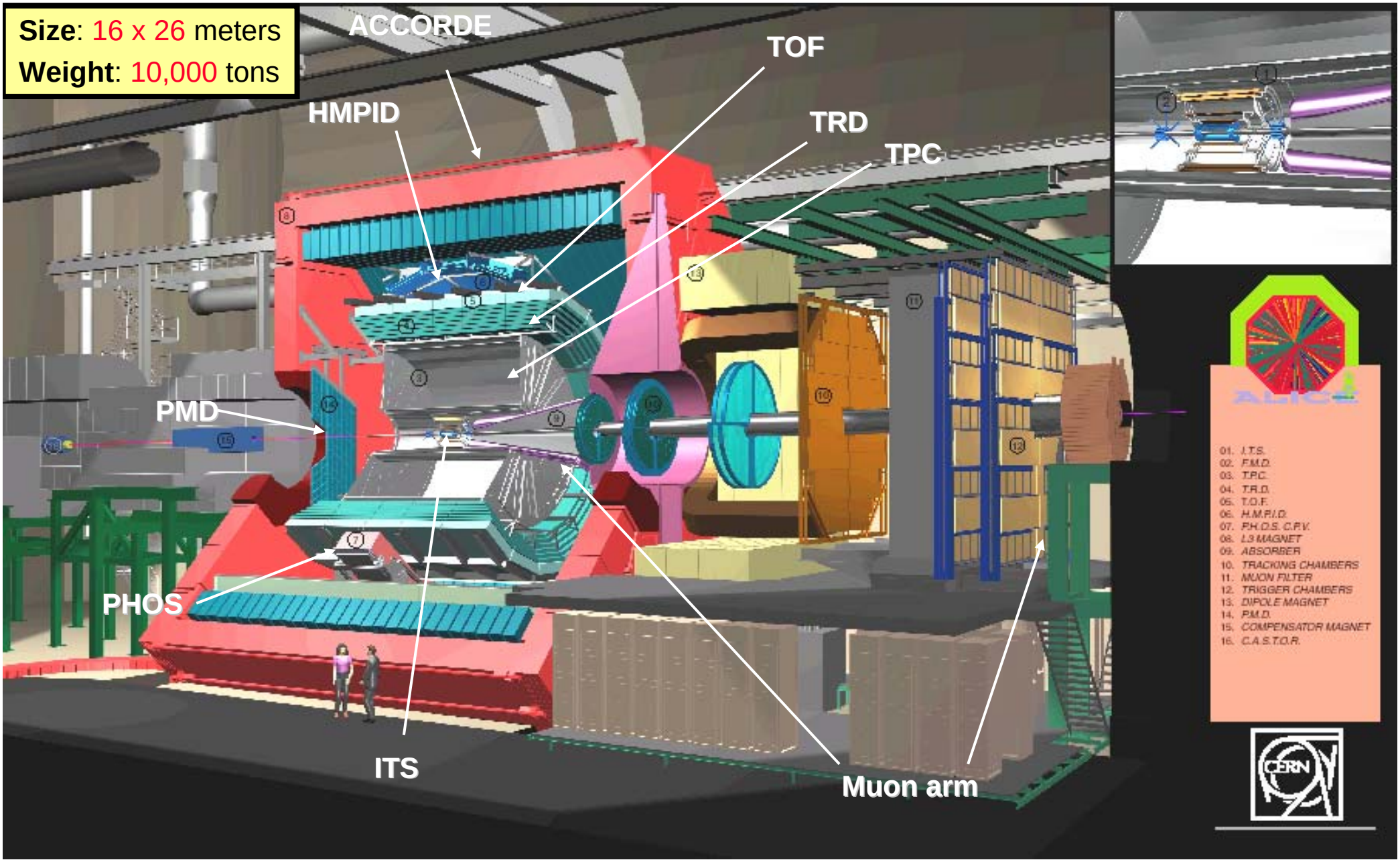
- ALICE Collaboration today:
  - ⇨ ~ **1015** Members, **97** Institutes, **30** Countries
- Institutes applying:
  - ⇨ **6 US Universities**, currently under review by DOE
  - ⇨ PUCP (**Peru**), Yonsei (**Korea**)
- Left: Lisbon (Portugal, was inactive, no MoU signed)



Funding News

- US participation: **EMCAL for jet physics**
  - ⇨ **LHCC: Technical Proposal** recommended for approval in September
  - ⇨ **DOE: Project Review (**Sept. 2006) recommends **CD1** approval
    - ✪ scope: 13-16 M$, 40-50 PhD,~10 new Institutes **(~ 10 MCHF CORE** value)
    - ✪ full project needs European participation, activities in France & Italy started
    - ✪ aim for completion before **2010 Pb run (**3rd HI run) (cash flow may be problematic)
  - ⇨ **EMCAL support structure** in production, installation June 2007

- Japanese participation: **PHOS funding approved** **(TRD funding not approved)**
  - ⇨ **~ 1.1 MCHF** for APD's/preamps + **150 kCHF** Common Fund
    - ✪ MoU signed Jan 2007
  - ⇨ PHOS status: 3 modules funded, 2 modules partially funded (FEE + APD)
    - ✪ crystals + mechanics for final 2 modules requested from Russia in 2007 – 2010
- Other funding news:
  - ⇨ **Germany (5 M €): TRD completion funds approved,** end of construction by 2009
    - ✪ funding and construction for staged TRD part started already in 2006
  - ⇨ **Korea (300 kCHF): TOF, Computing, Common Fund**.
    - ✪ MoU signed October 2006



ALICE Detector

Planning Update

- Physics
  - ⇨ 'day 1' physics in 2007 with pp: **global event properties** (**at 900 GeV**)
  - ⇨' early pp physics' 2007/2008: **detailed studies** of pp ('QCD at 14 TeV')
  - ⇨ first heavy ion run 'after first long pp run' (end 2008)

- work-plan in 2007, updated for LHC schedule released in June 2006
  - ⇨ shifted **ITS installation** back to give maximum time for construction and pre-commissioning
    - ✪ experiment closed by end August 2007
    - ✪ ~ 2-3 months for final commissioning w/o beam
  - ⇨ expected start-up configuration in 2007
    - ✪ **complete**: ITS, TPC, HMPID, muon arm, PMD, trigger dets (V0, T0, ZDC, Accorde),..
    - ✪ **partially complete**: PHOS(1/5), TOF(7-9/18), TRD (2-3/18), DAQ (30%)
    - ✪ **most time-critical**: SDD detector

- beyond mid 2007
  - ⇨ complete **DAQ** capacity (2008/9)
  - ⇨ parts of the modular detectors: **TOF (2008), TRD (2009), PHOS** (**2010**)
  - ⇨ **EMCAL (2010)**

Installation, Large Structures

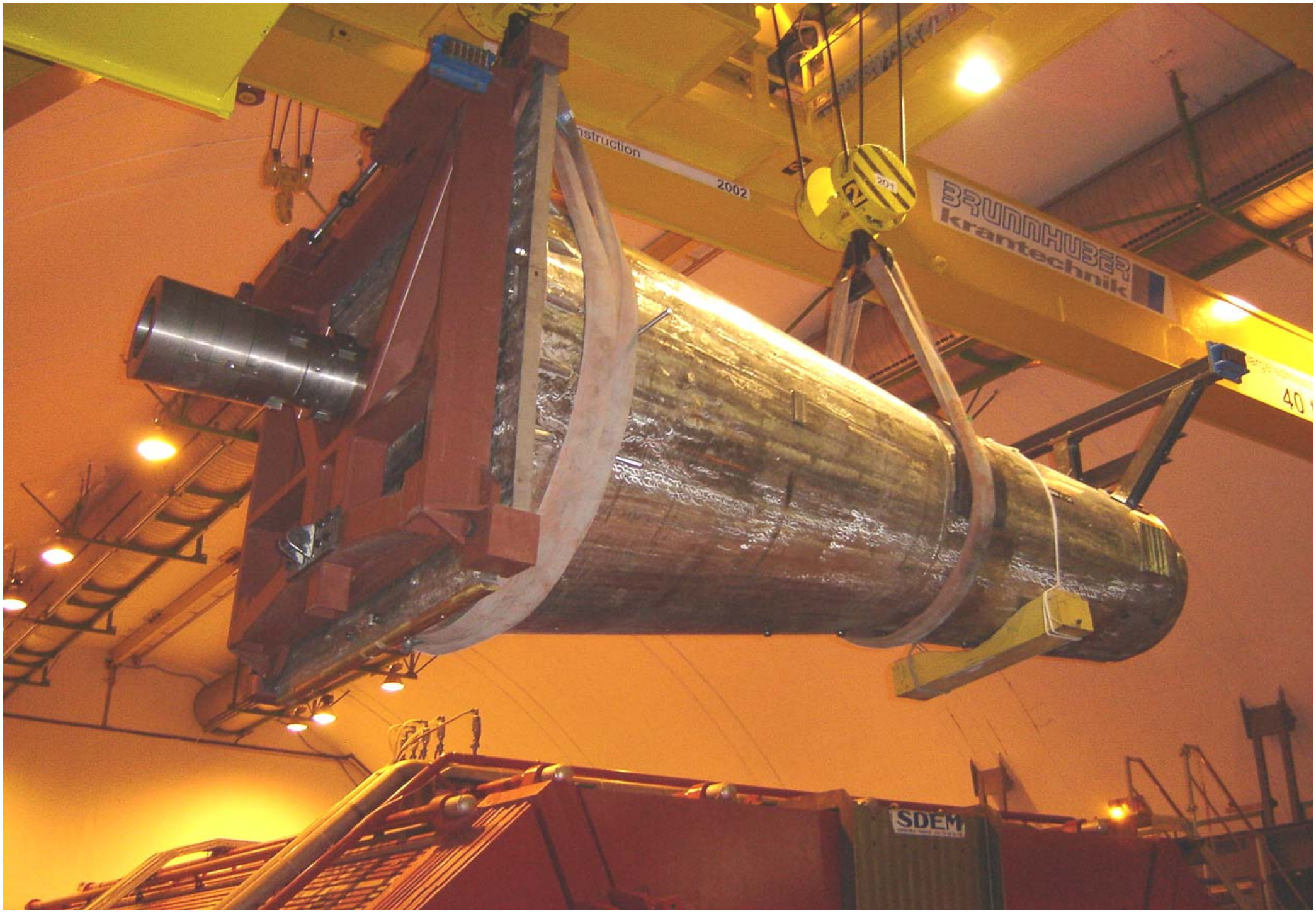
- Common support structures inside L3
  - ⇨ space frame & small support frame (‘Baby SF’) installed
  - ⇨ mini space frame completed. After successful load test mounting of services ongoing

- Muon wall, Muon Absorber & Vacuum pipe
  - ⇨ Muon Wall and the chamber support structure are in place
  - ⇨ Front Absorber, SAA1, SAA2 and SAA3 are installed (Positioning precision better than +/- 2 mm)
  - ⇨ muon side vacuum pipe is installed

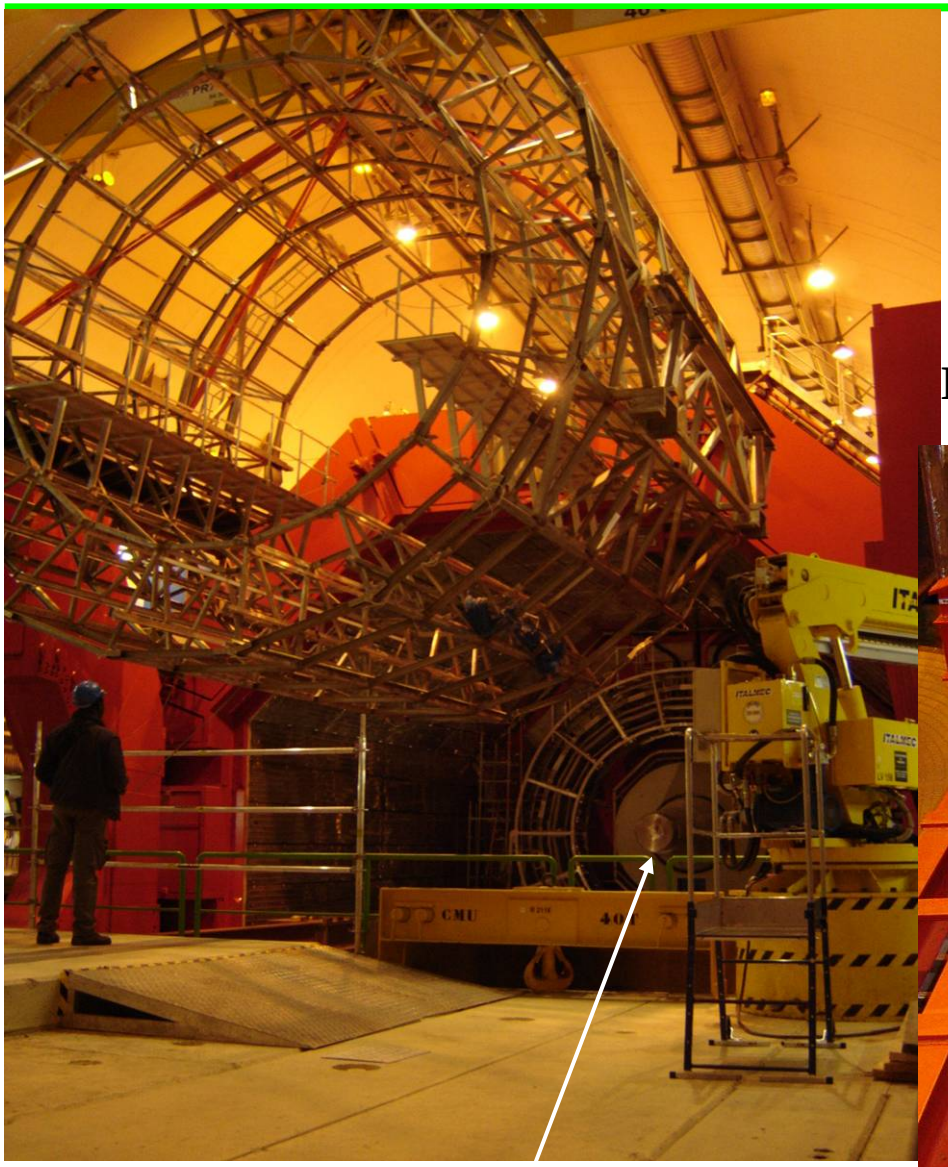
- EMCal support structure
  - ⇨ **under production**, delivery in February
  - ⇨ **construction** of the large **installation tools** ongoing

- Installation, services, infrastructure
  - ⇨ **installation** of racks, cables, pipes, bus bars, etc.. **ongoing**

- Overall Status
  - ⇨ **progress & performance satisfactory**
  - ⇨ **big structures are almost completed. The EMCal has a tight installation window.**
  - ⇨ **large effort ongoing for service installations !**


2002
BRUNNHUBER
krantechnik
SDEM

Installation of Space frame



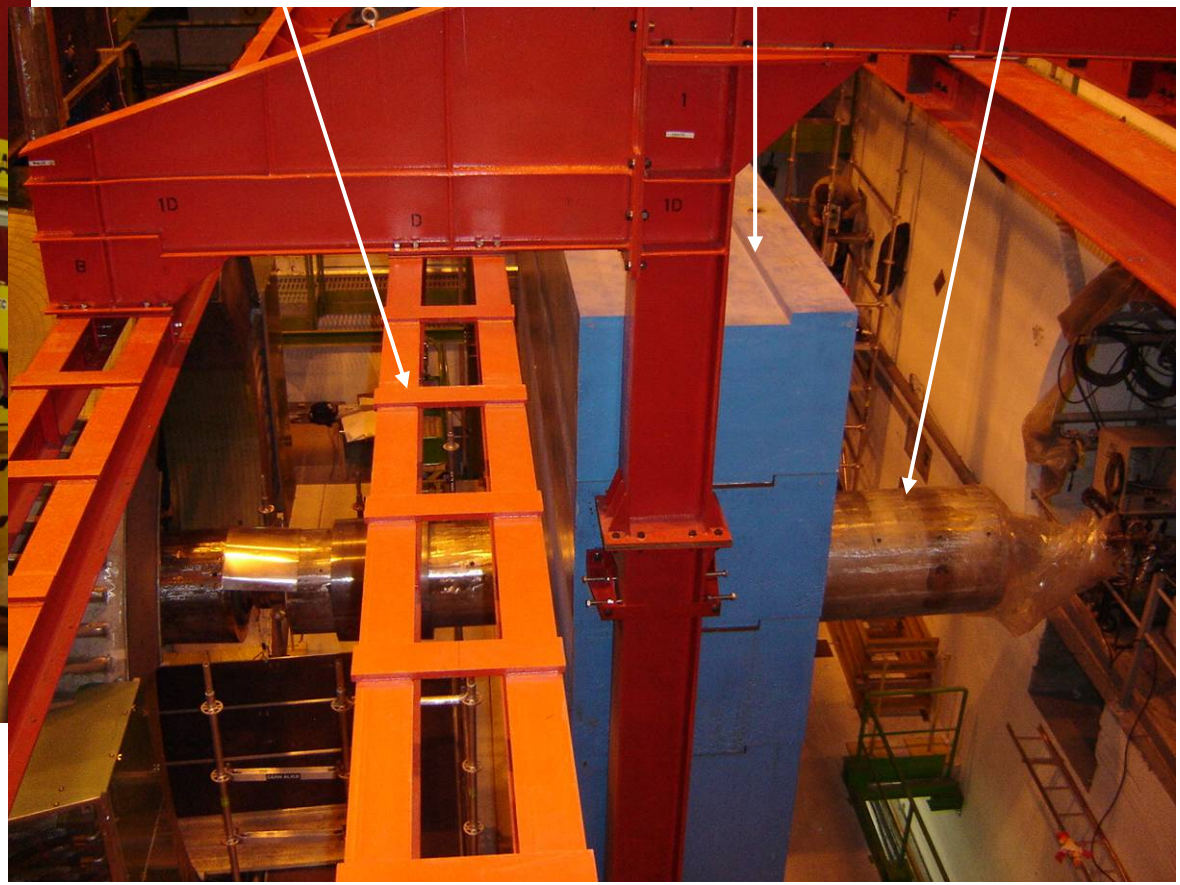
Muon Front Absorber

Muon Structures

Muon Chamber Support

Muon Wall

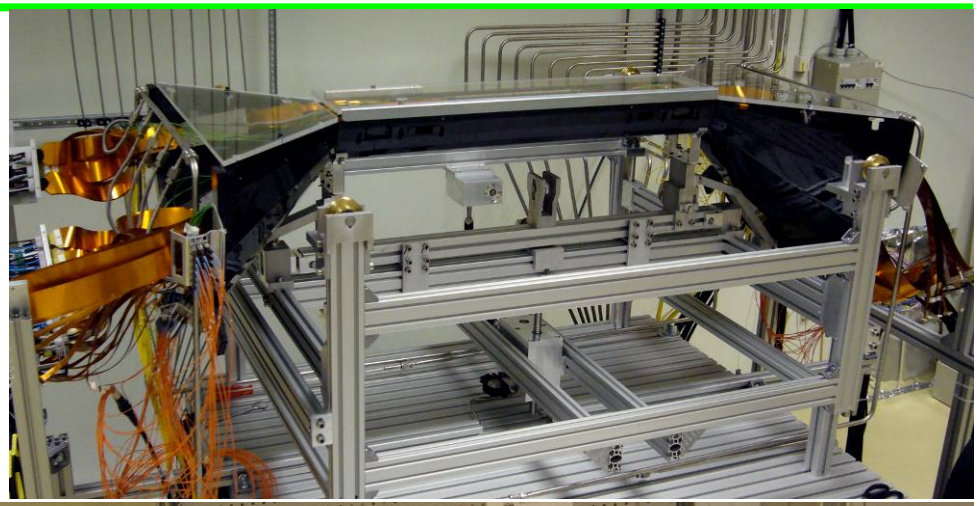
Beam Shield

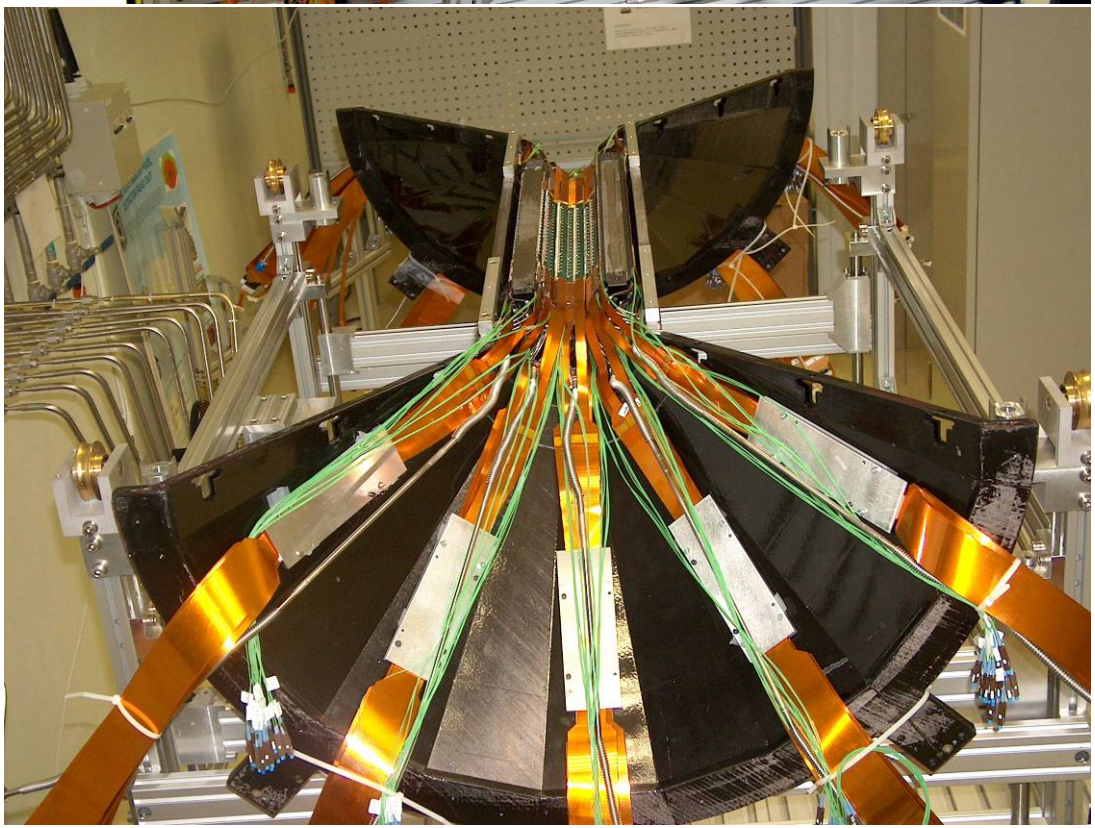



EMCAL Support

Silicon Pixels SPD

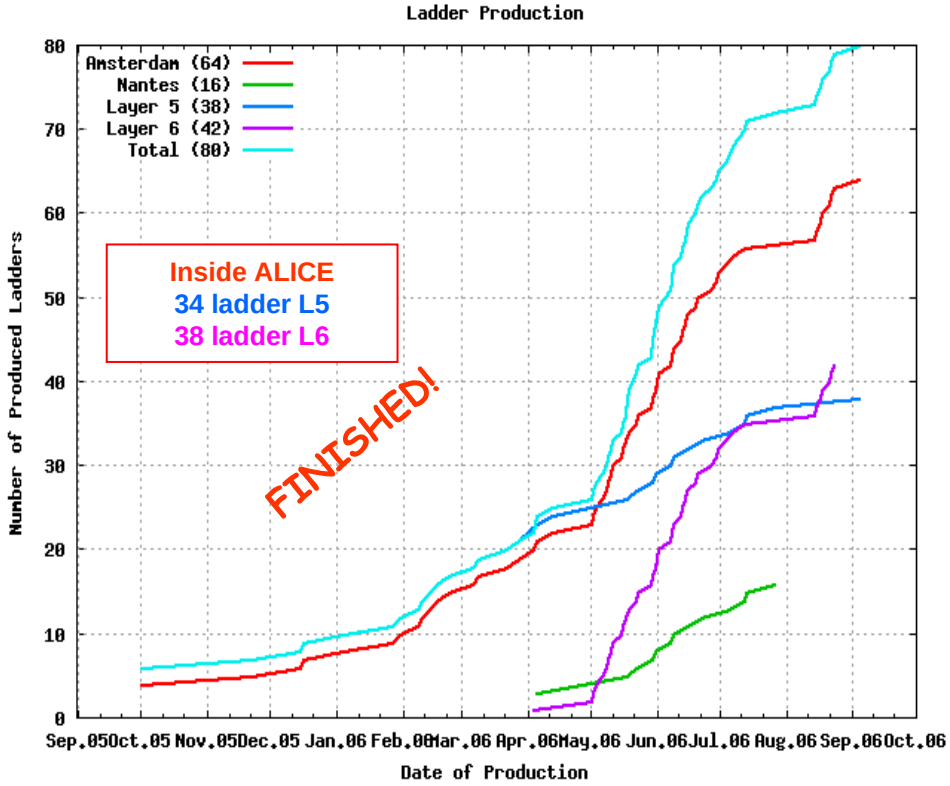
- **1st half-barrel completed**
  - ⇨ fully integrated (cooling, electronics, DAQ, DCS,..)
  - ⇨ under test in CERN DSF
- 2nd half-barrel in progress
  - ⇨ 10 sectors assembled and tested
  - ⇨ one HS being replaced in one sector
  - ⇨ production of additional sector to replace sector 0 (mixed Cu/Al bus) is under way
- read-out, services
  - ⇨ DAQ and DCS systems fully operational
  - ⇨ FastOR trigger system prototypes under test
  - ⇨ cabling in the experimental area well advanced
  - ⇨ **detector ready for installation: 23 March**
- concerns
  - ⇨ **delicate** final **installation**
  - ⇨ late **delivery** of LV **power supplies**





Silicon Strip Detector SSD

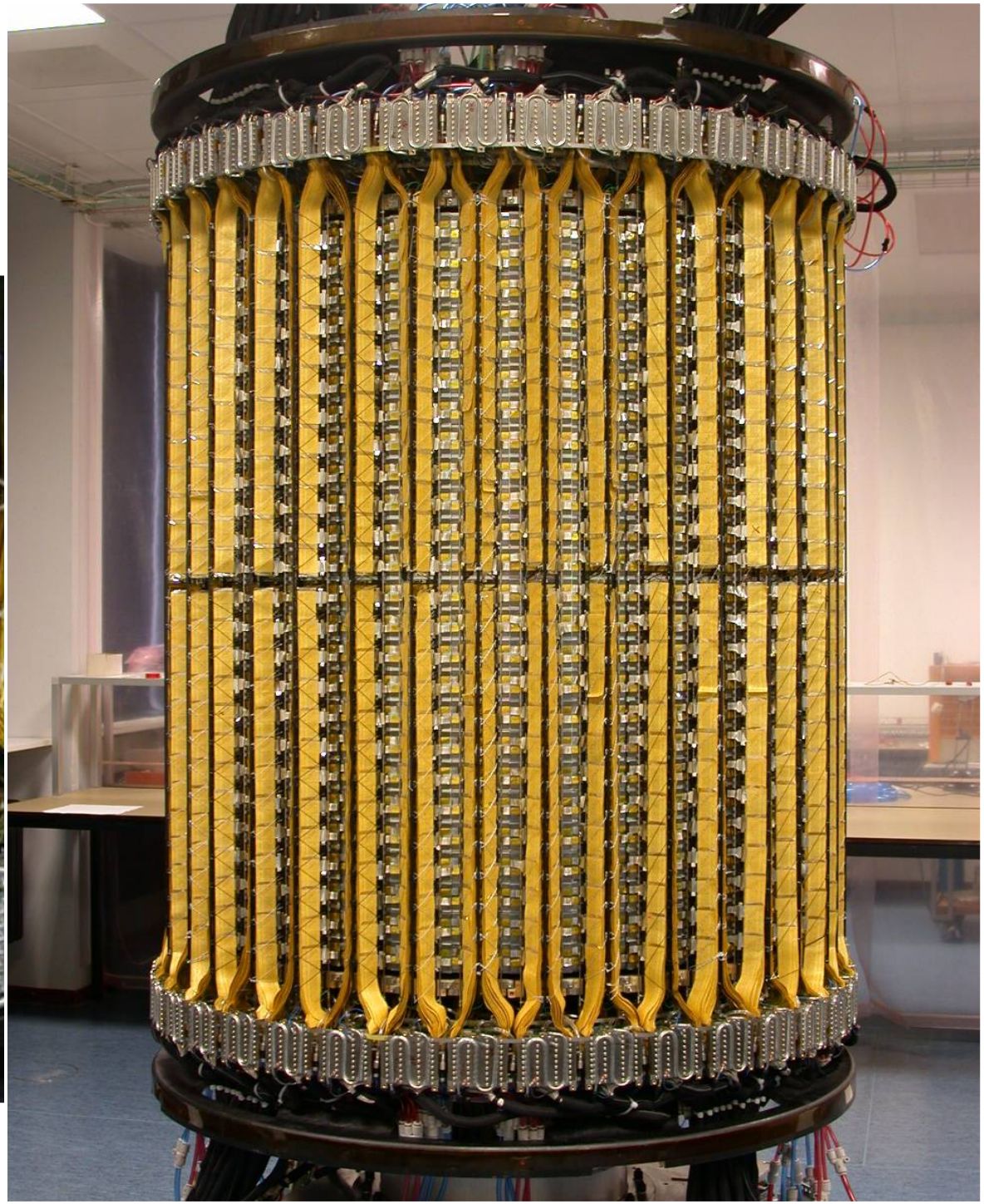
- Detector Status
  - ⇨ module assembly **completed**
  - ⇨ ladder assembly (80 ladders) **completed**
  - ⇨ Ladder mounting on SSD cone **completed**
  - ⇨ FEROM (read-out crates)
    - ✪ 4 (of 8) ready for installation, other 4 in test
  - ⇨ cables and patchpanels on C-side **installed**
    - ✪ A-side: ready for installation



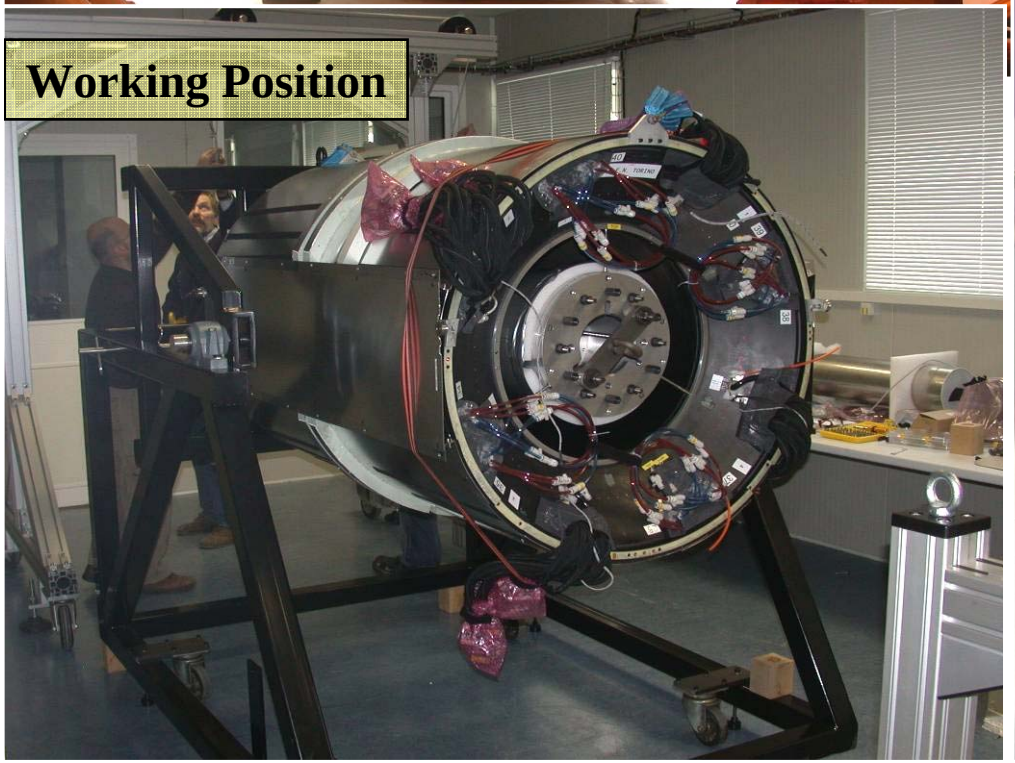
- **Ready for Installation**
  - ⇨ **transport** to CERN **14 December**
  - ⇨ tests after transport completed
    - ✪ one broken connection repaired

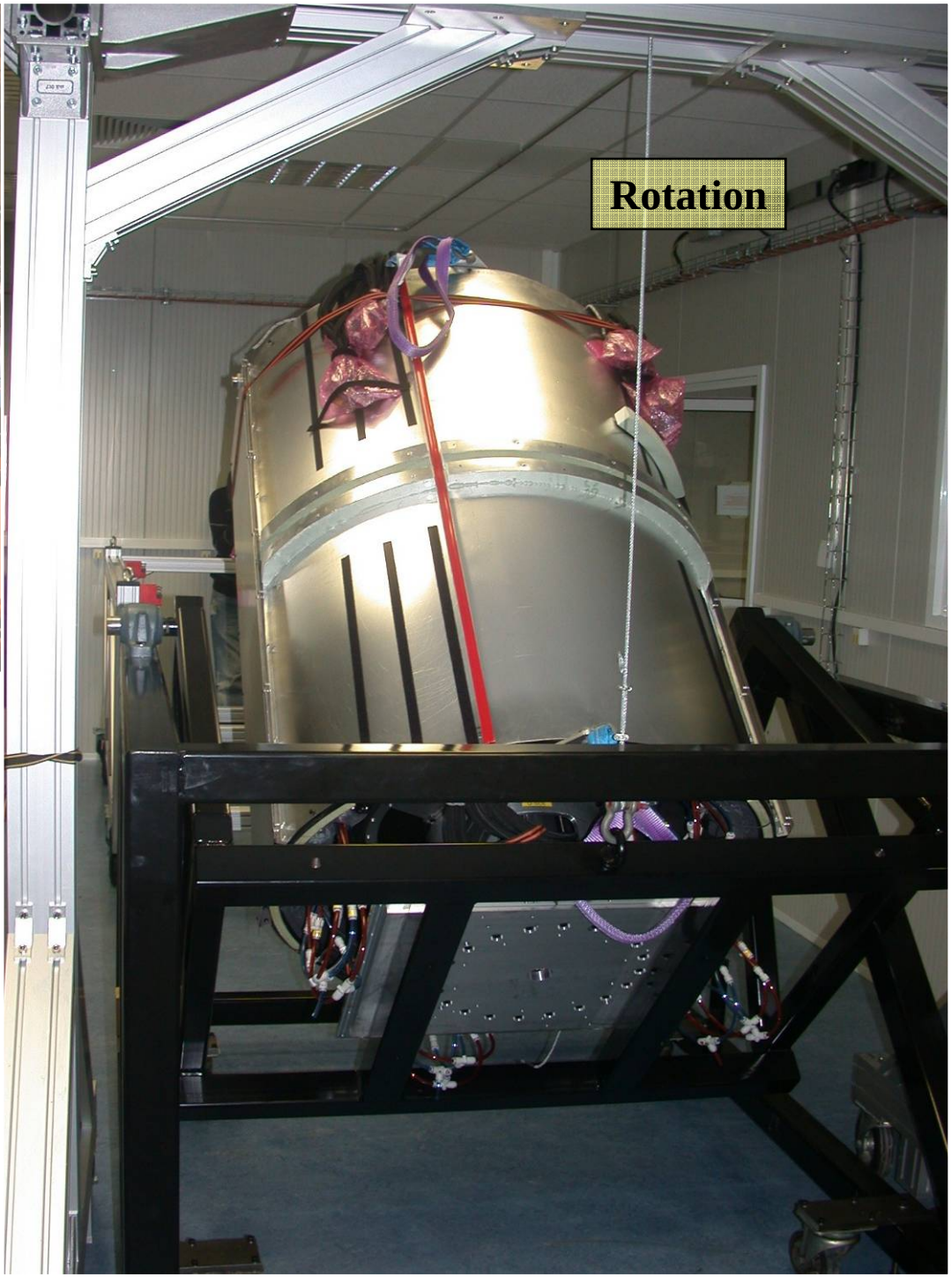
- Concerns
  - ⇨ **delivery of LV power supplies** (CAEN)

SSD assembly completed
Layer 4 & 5




SSD arrival


Working Position


Rotation

installing C-side SSD cables and patchpanels

difficult environment...

...helmet without head

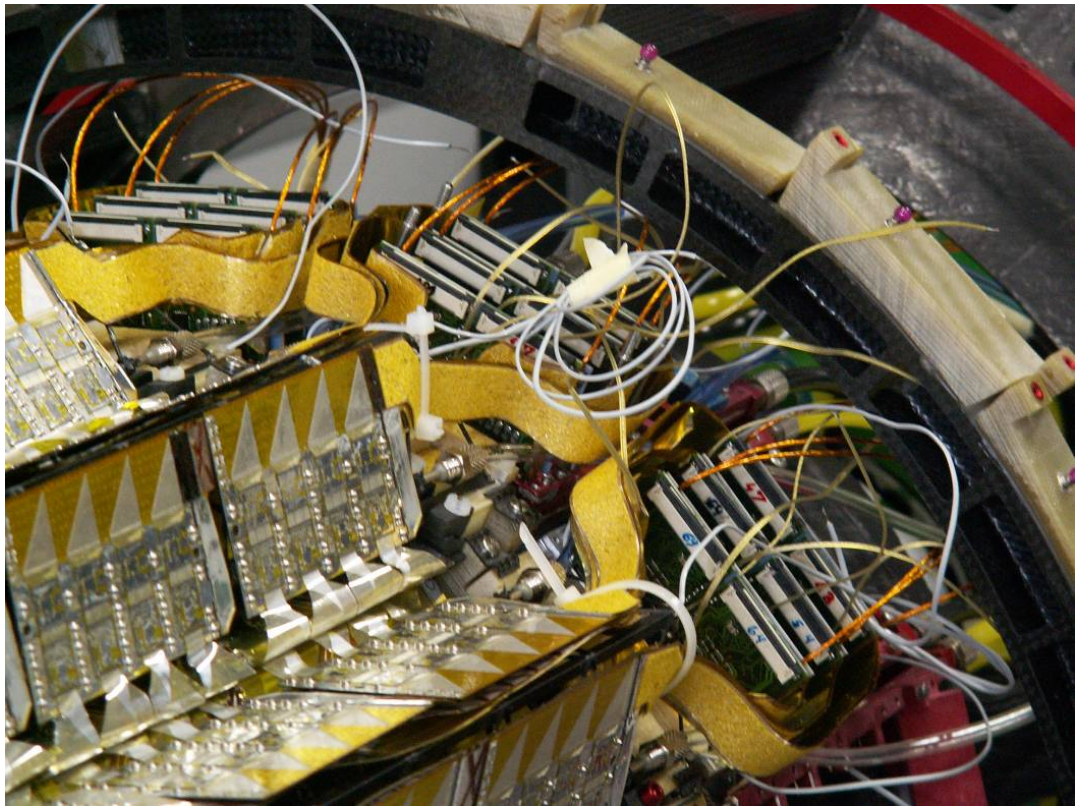
...person without head

Silicon Drift Detector SDD

- Status
  - ⇨ detector production **(including spares)** **completed**
  - ⇨ modules assembly & cable connections: **completed**
  - ⇨ ladder Assembly & test:
    - ✪ layer 3 completed end 2006
    - ✪ layer 4: completed end Jan 07

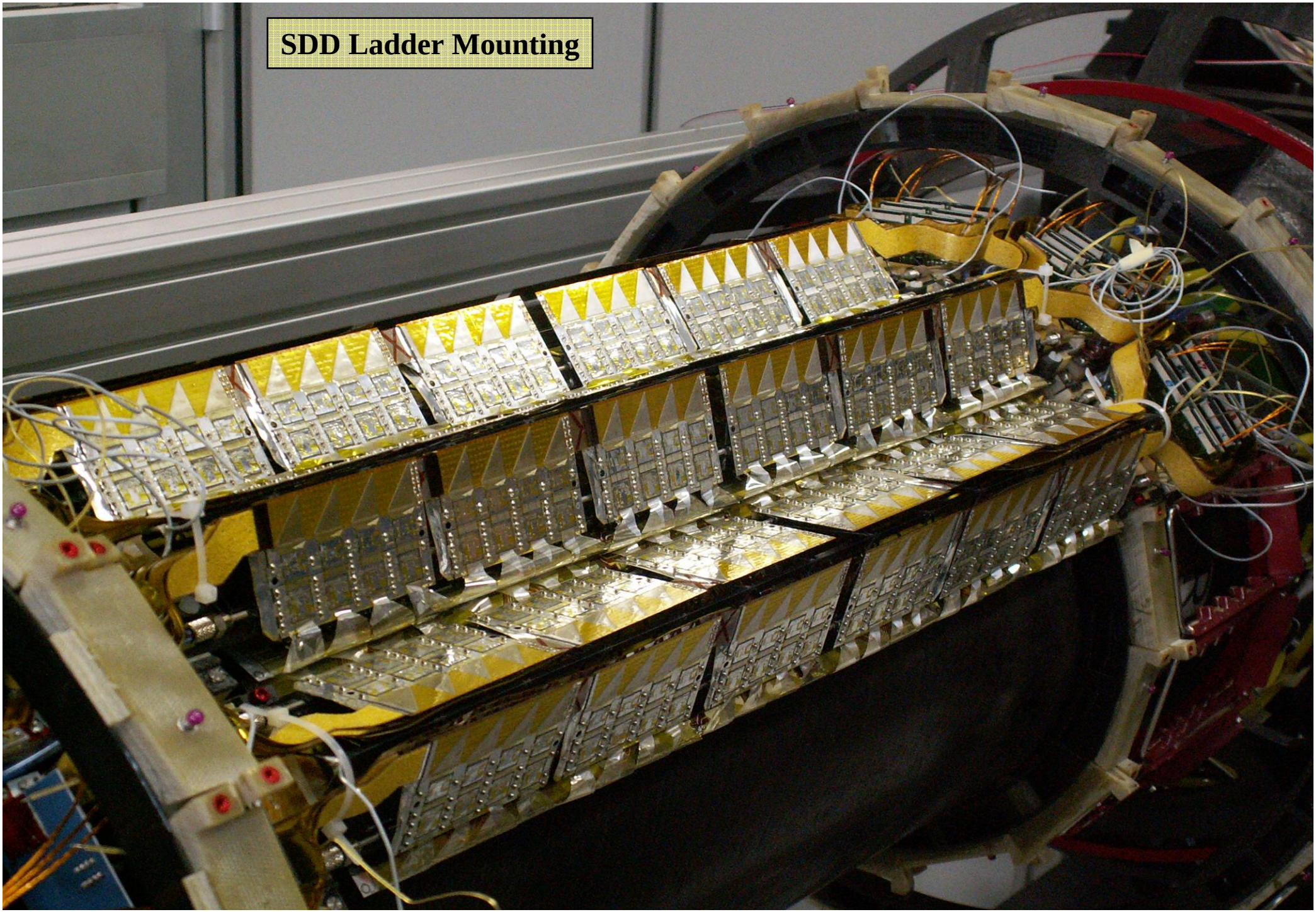
- Schedule
  - ⇨ transport to CERN week 5
  - ⇨ integration & testing with SSD : ~3 weeks
  - ⇨ **installation of ITS starting March**

- Concerns
  - ⇨ **no contingency in case of problems during ITS integration at CERN**



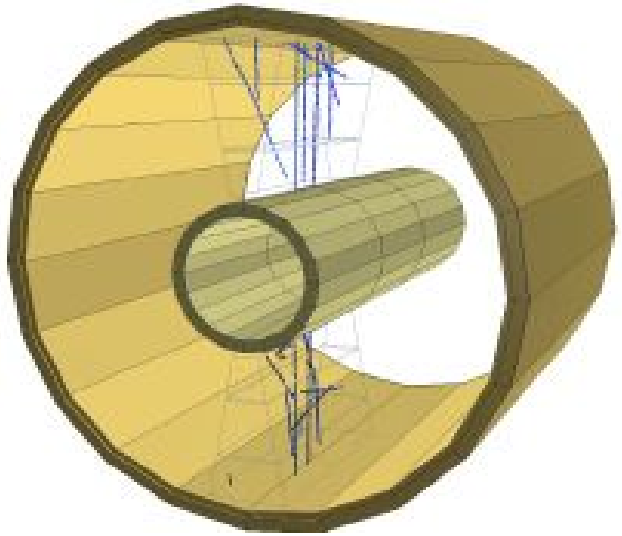
SDD Endcap Electronics

SDD Ladder Mounting

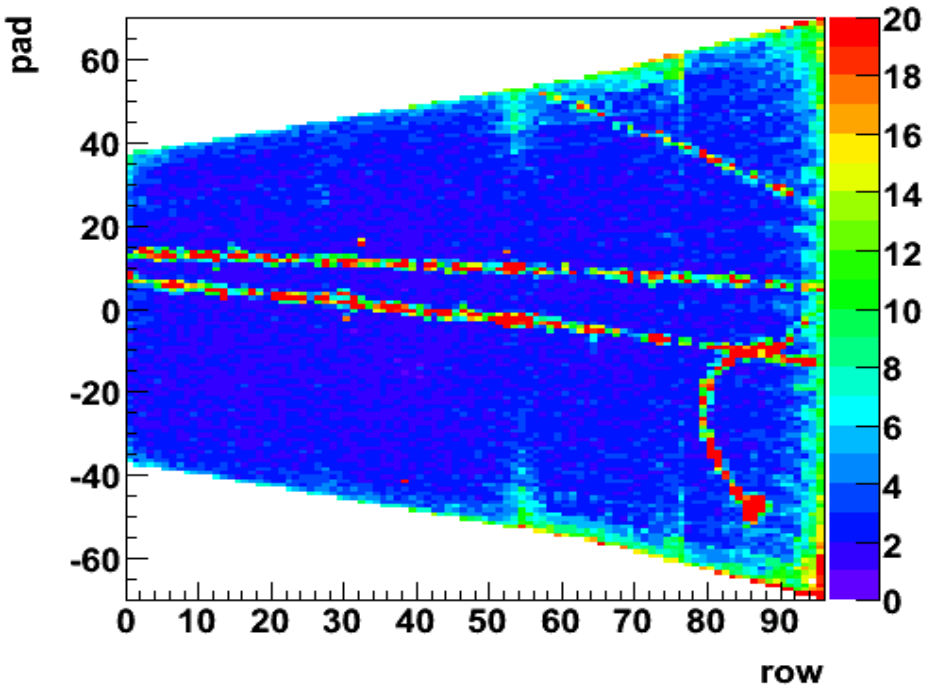


TPC Status

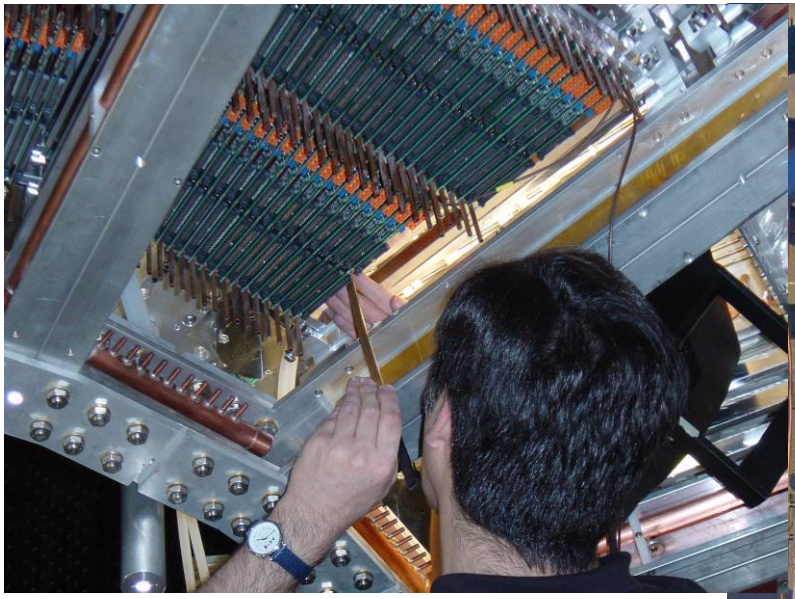
- 2006 Milestones
  - ⇨ **FEE card installation** (incl. test in situ)
  - ⇨ Commissioning of HV, FEE, gas and cooling system
  - ⇨ **System commissioning**
  - ⇨ transport to pit early January 2007

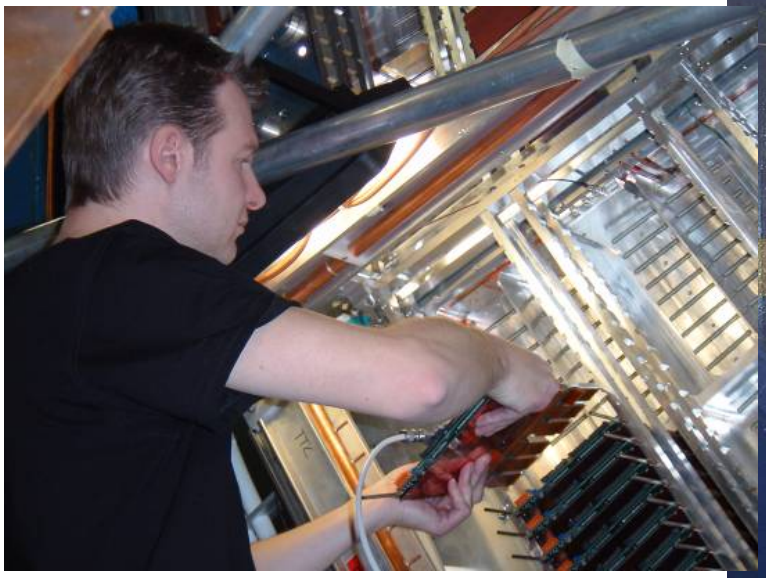


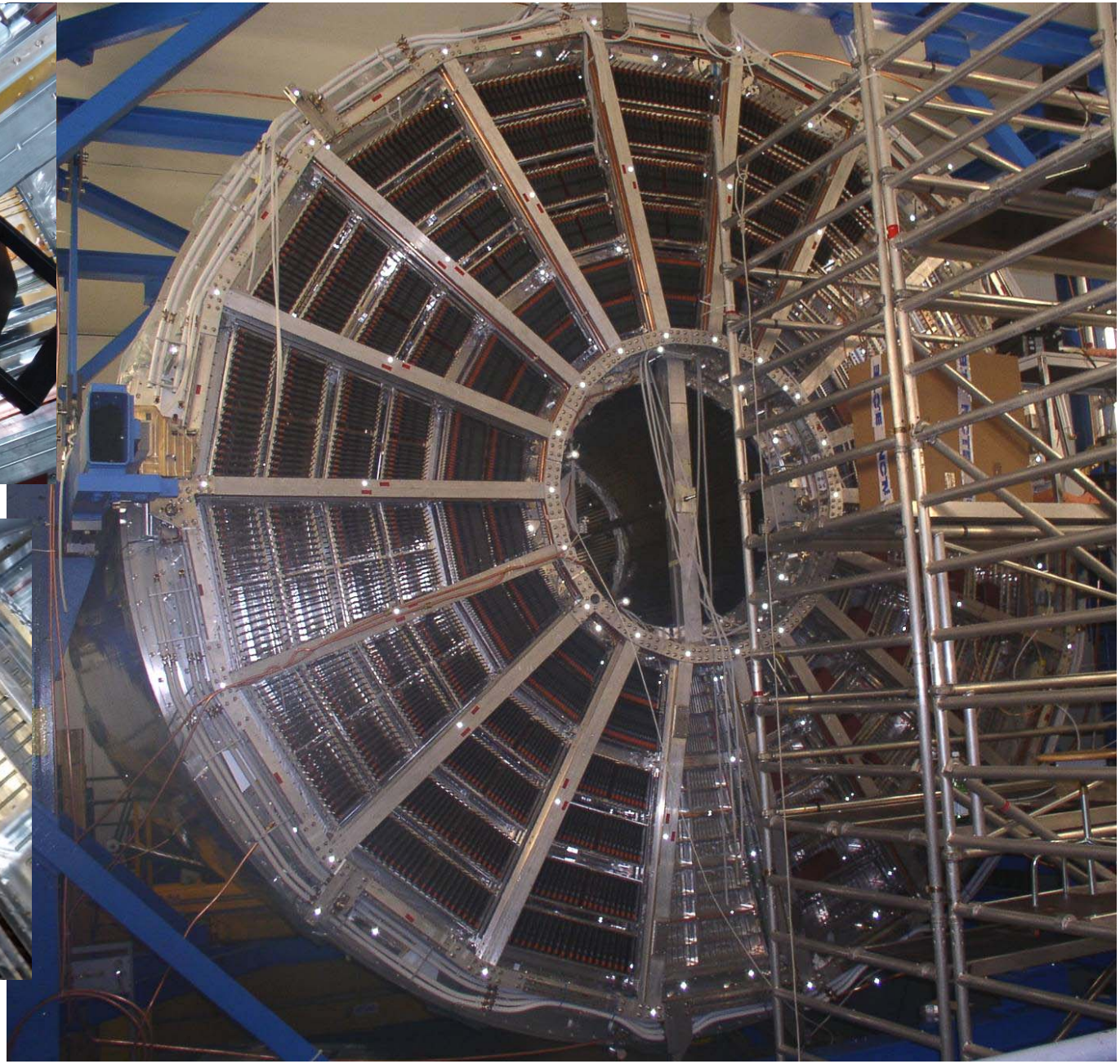
- ~ 7 month commissioning with cosmics & laser
  - ⇨ including DCS, Trigger, HLT, final DAQ system
    - ✪ first tracks observed 16 May 2006
    - ✪ very time consuming (2 sectors at a time)
    - ✪ 2 complete rounds of tests for all chambers
  - ⇨ several faulty cards/connections repaired
  - ⇨ exercised laser calibration system
  - ⇨ **one OROC chamber had to be replaced**
  - ⇨ **resolutions according to specifications**
    - ✪ FEE actually better than specs !

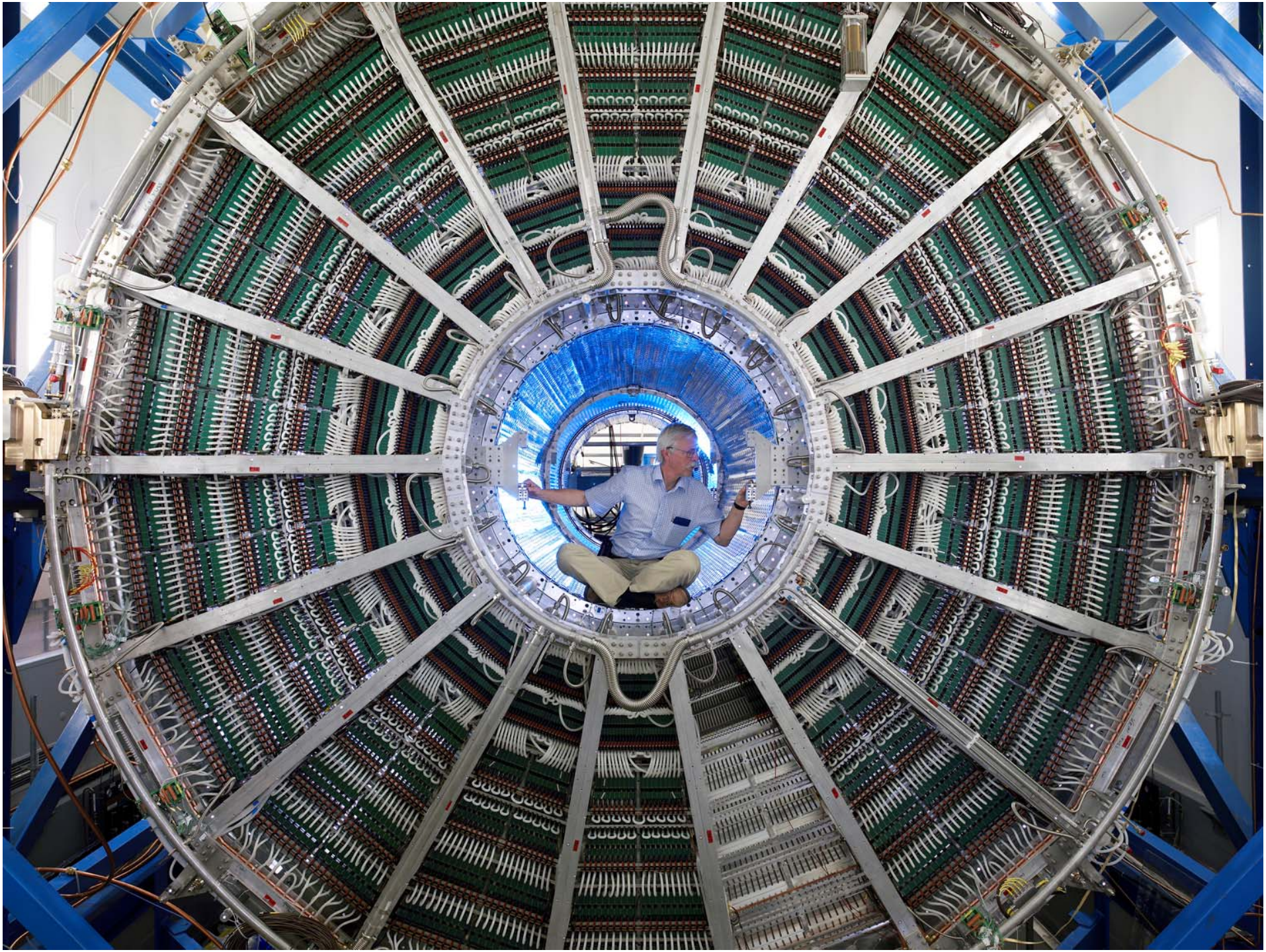


FEE installation



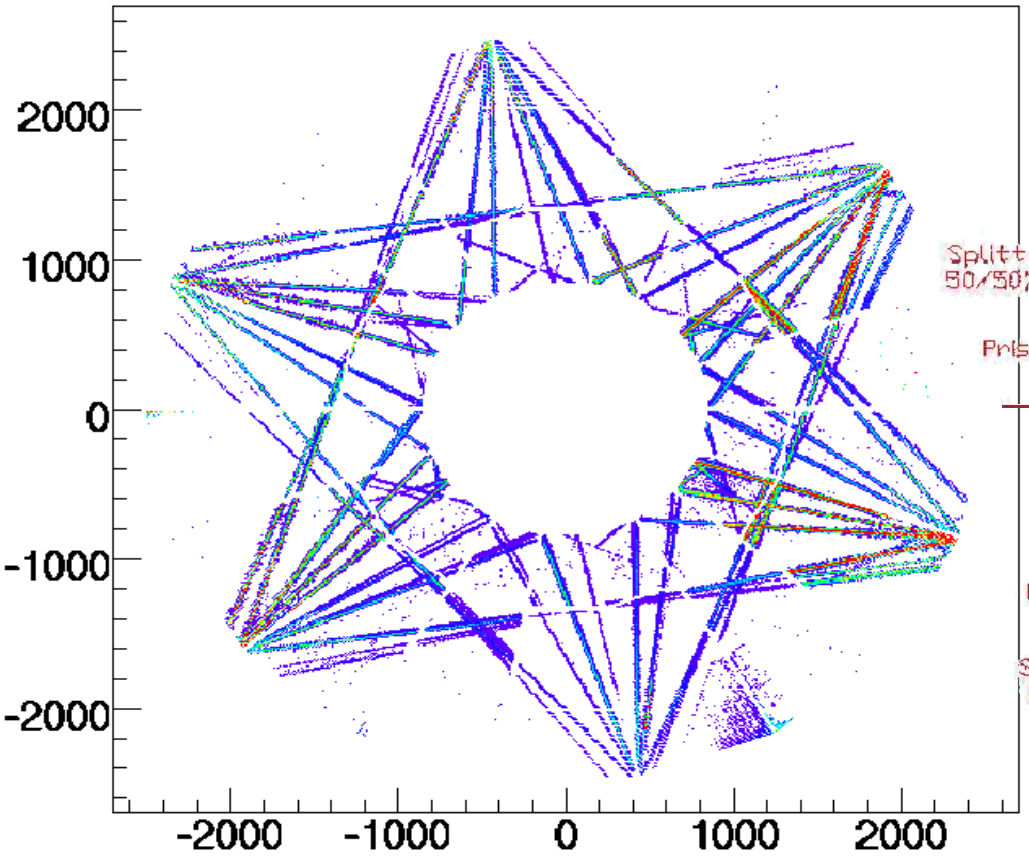




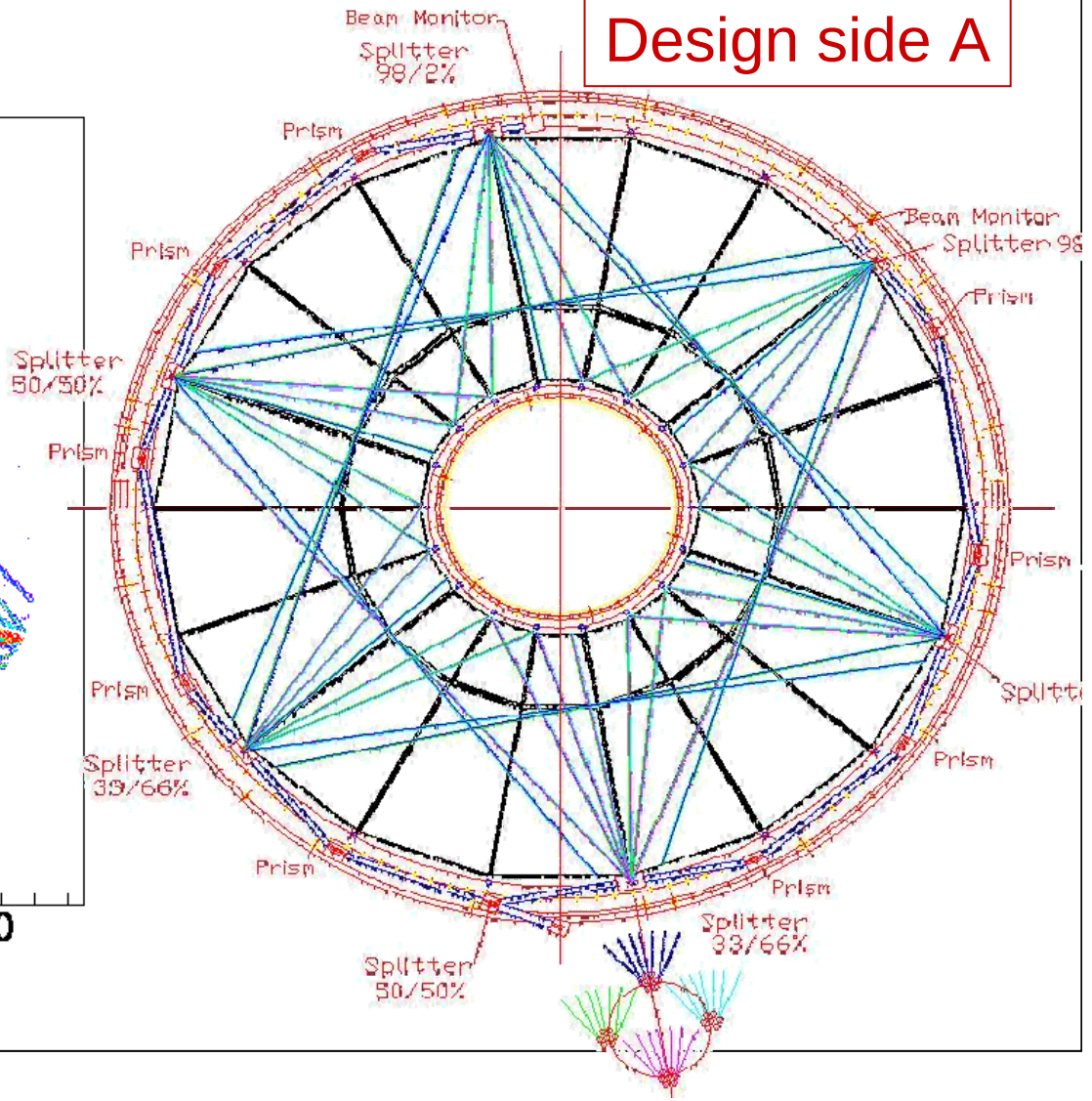


TPC Laser system

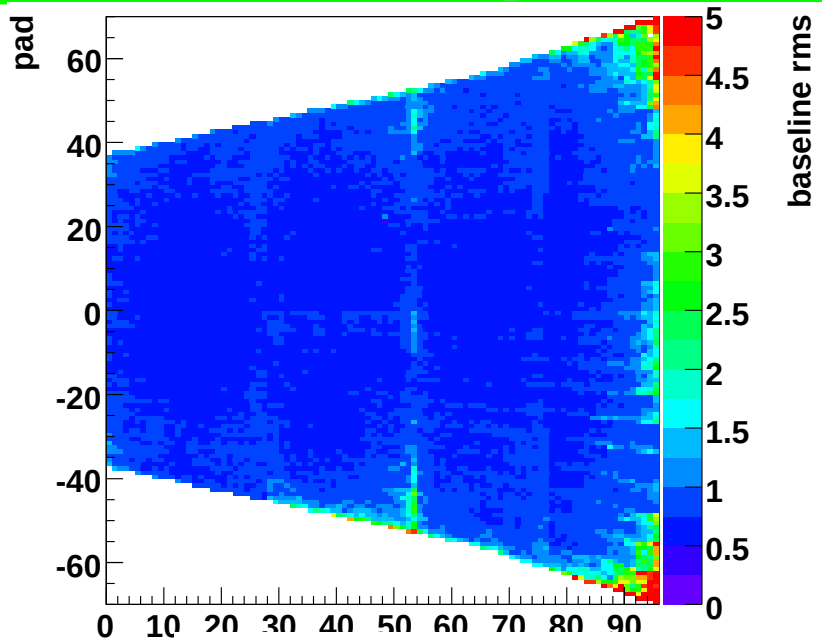
Measured side A

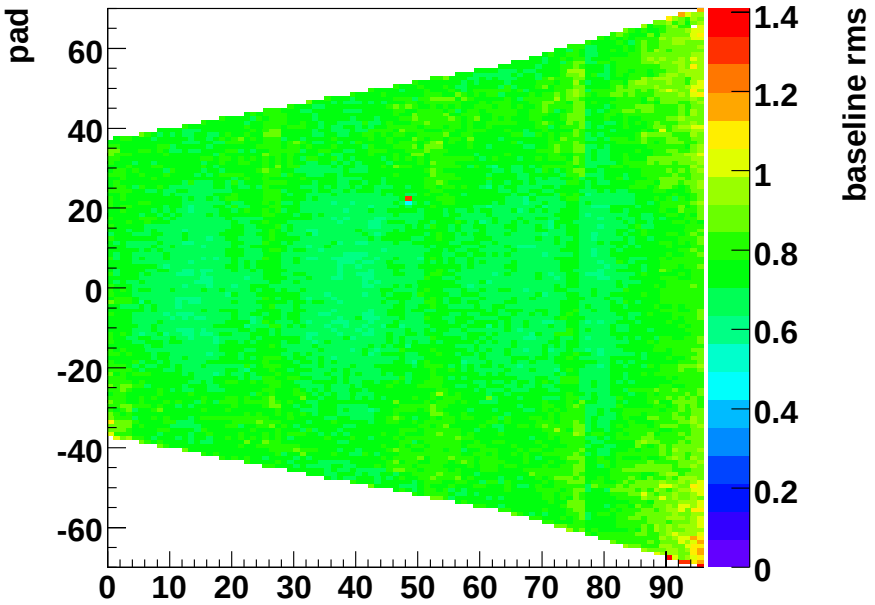


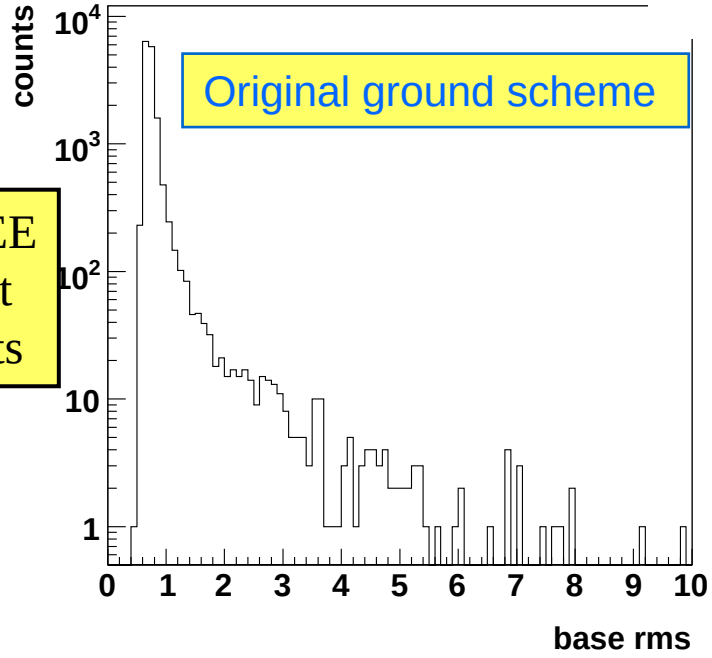
Design side A

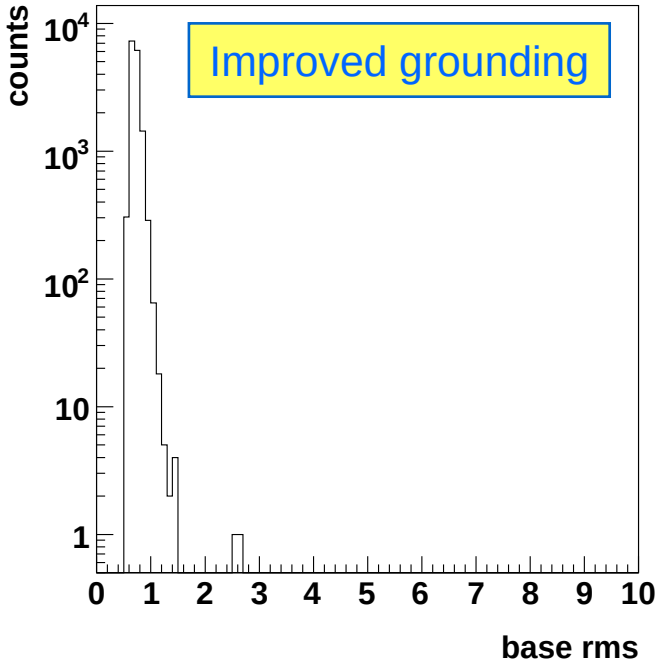


TPC performance







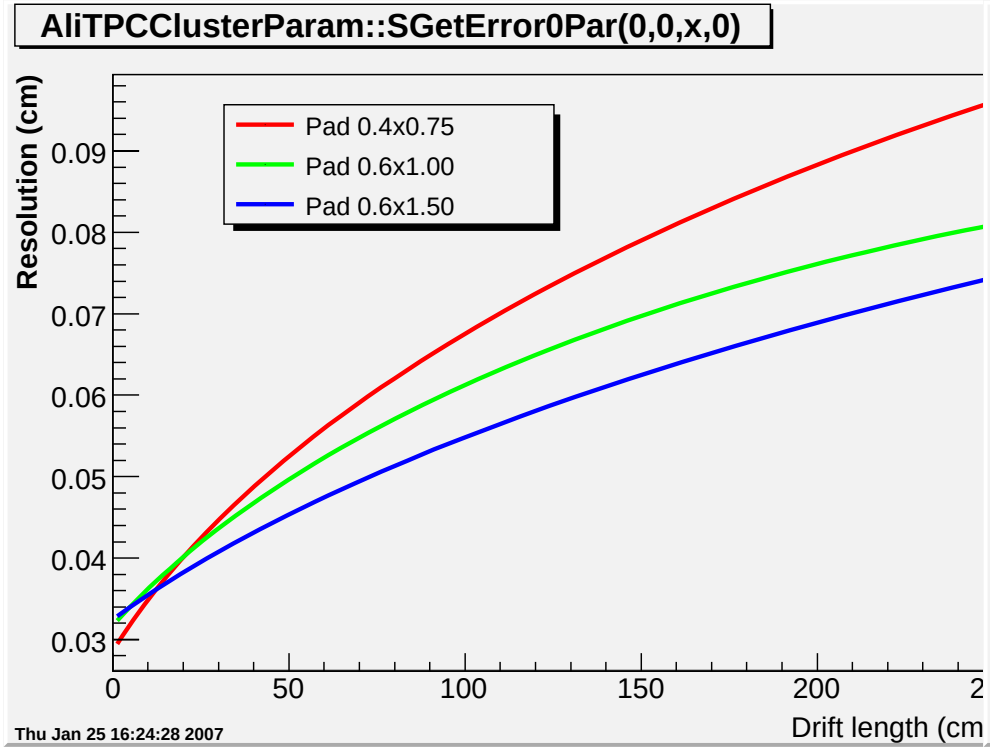


Noise performance of FEE close to theoretical limit after some improvements

TPC Space Resolution

- resolution extracted from cosmic ray test
  - ⇨ agrees to better than a few percent with TDR specifications

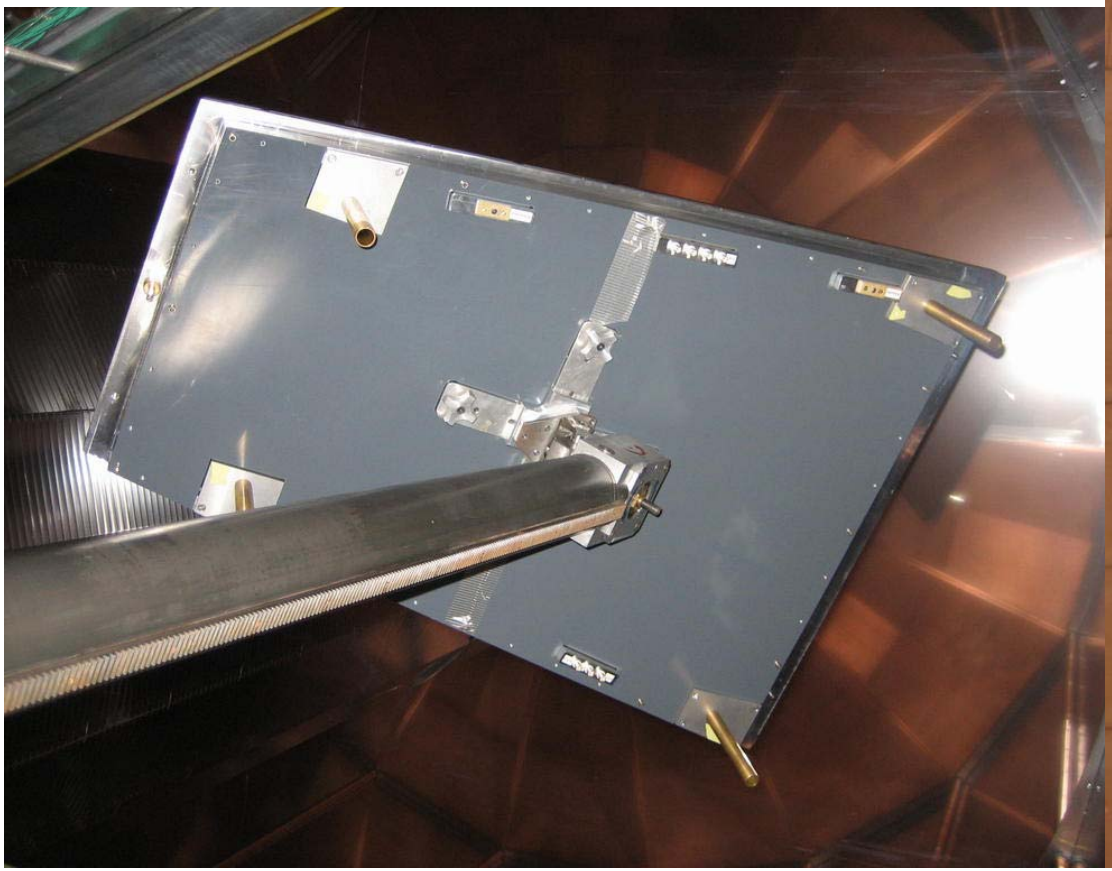
Space point resolution (bending direction) as function of drift length

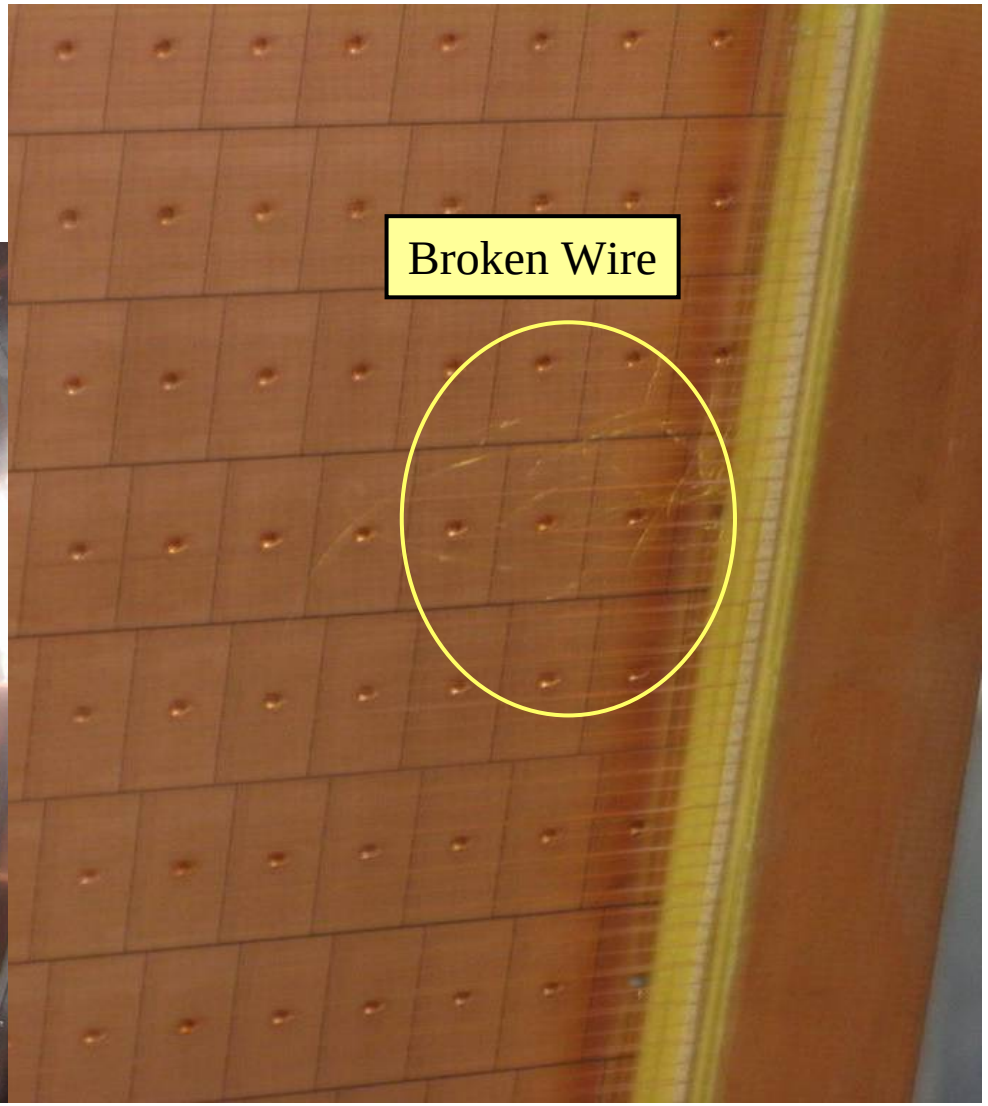


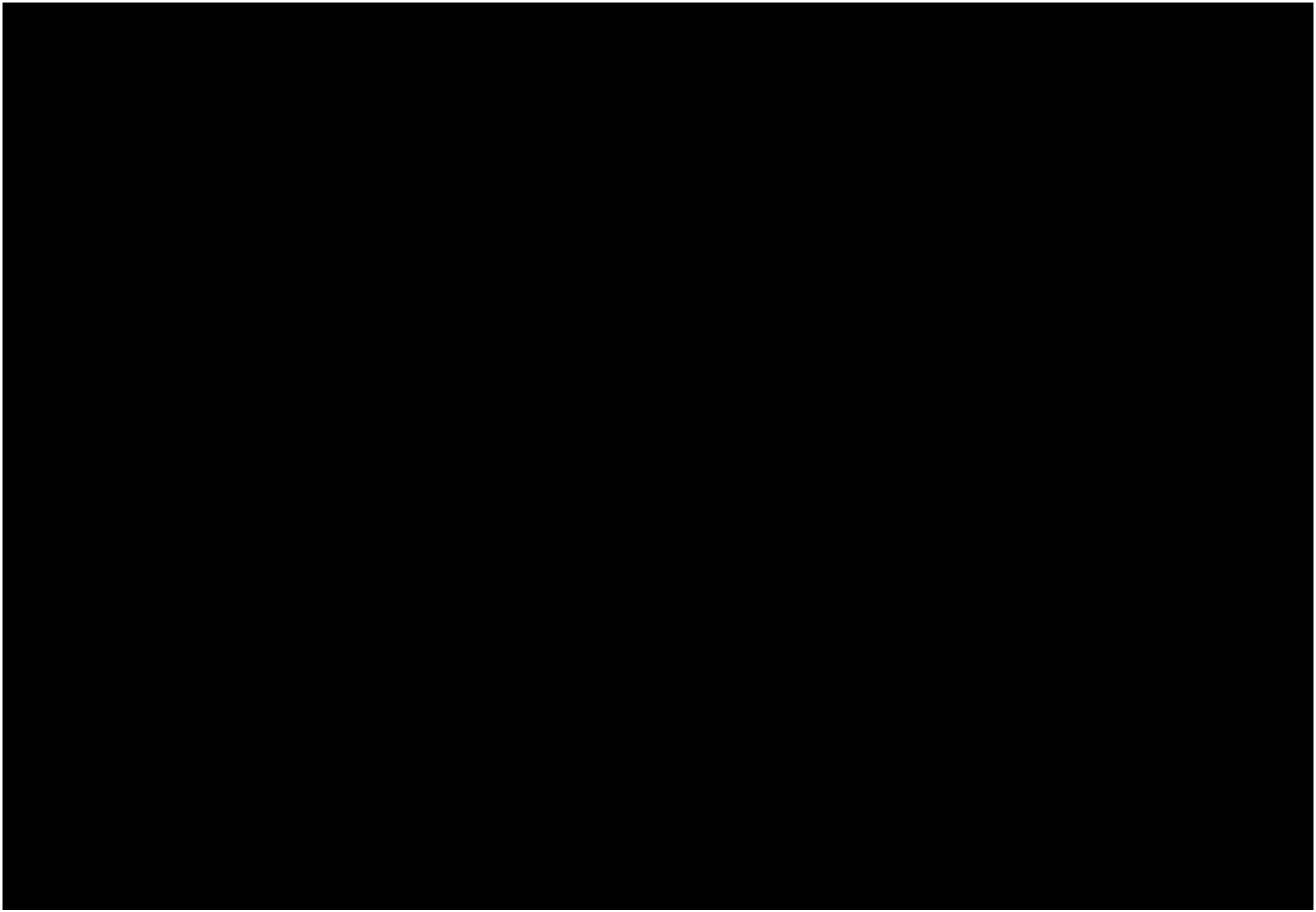
Space point resolution (drift direction) as function of drift length

TPC chamber exchange

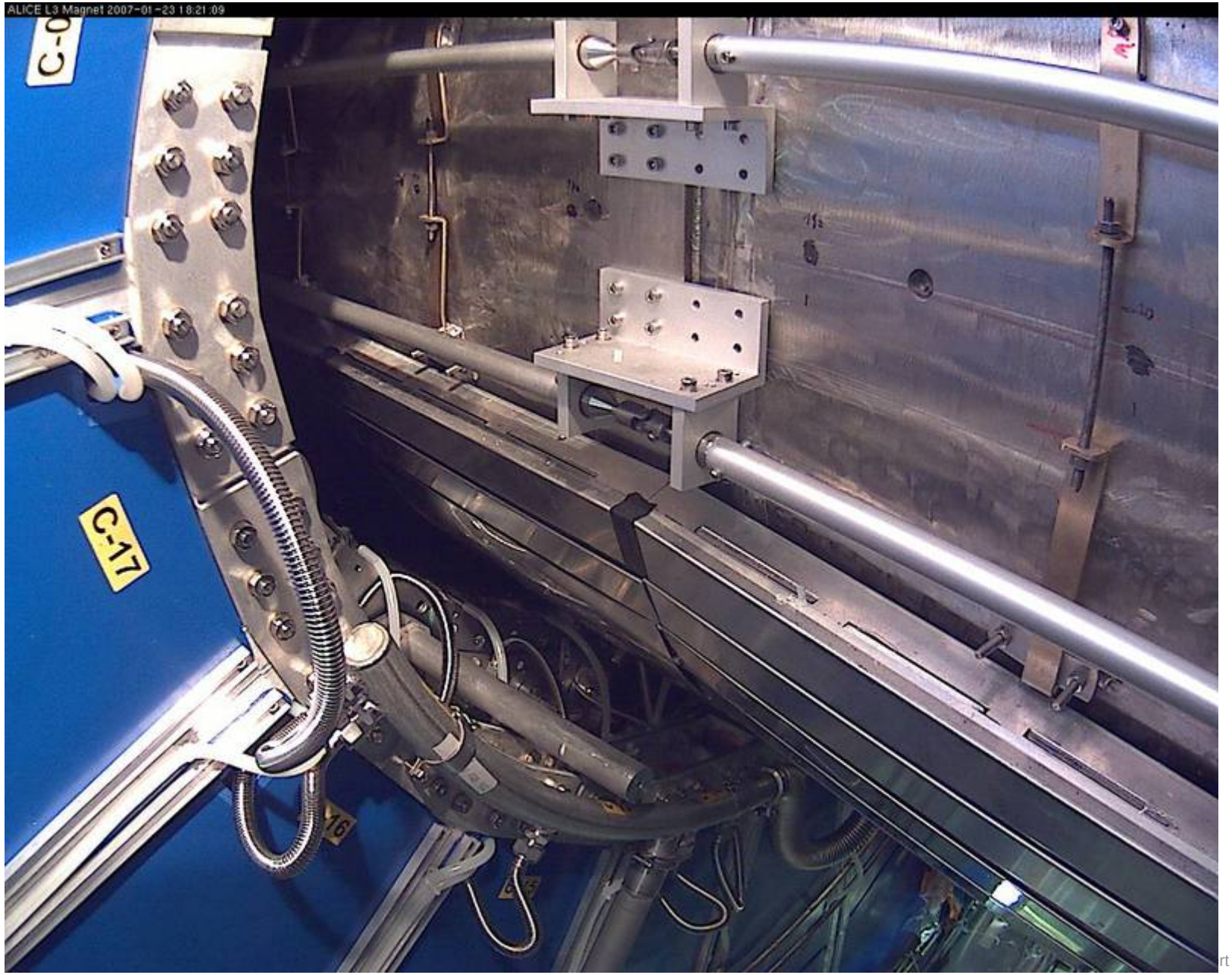
- One wire broke during TPC commissioning (October)
  - ⇨ chamber was operated in ‘non-standard’ configuration (FEE not connected)
  - ⇨ chamber was successfully exchanged







TPC inside Magnet



TRD

- **Chambers**: 270 chambers done (100 % of originally funded part)

  GSI, U. Hd, U. Frankfurt, JINR, Bucharest

  ⇨ **mass production for full TRD** : ongoing (5/week) , completion end 2007

- **Electronics**:

  ⇨ **Digital chip, R/O board & MCM:** in **production** (now in industry)

  ⇨ **TRD pre-trigger**: design & prototype completed and tested, **production** ongoing

- **Assembly**

  ⇨ 1st Supermodule completed Sept 2006,

  ✪ fully tested at CERN prior to installation in October

  ✪ noise performance identical to lab tests

  ⇨ 2 more SM's for installation in 2007

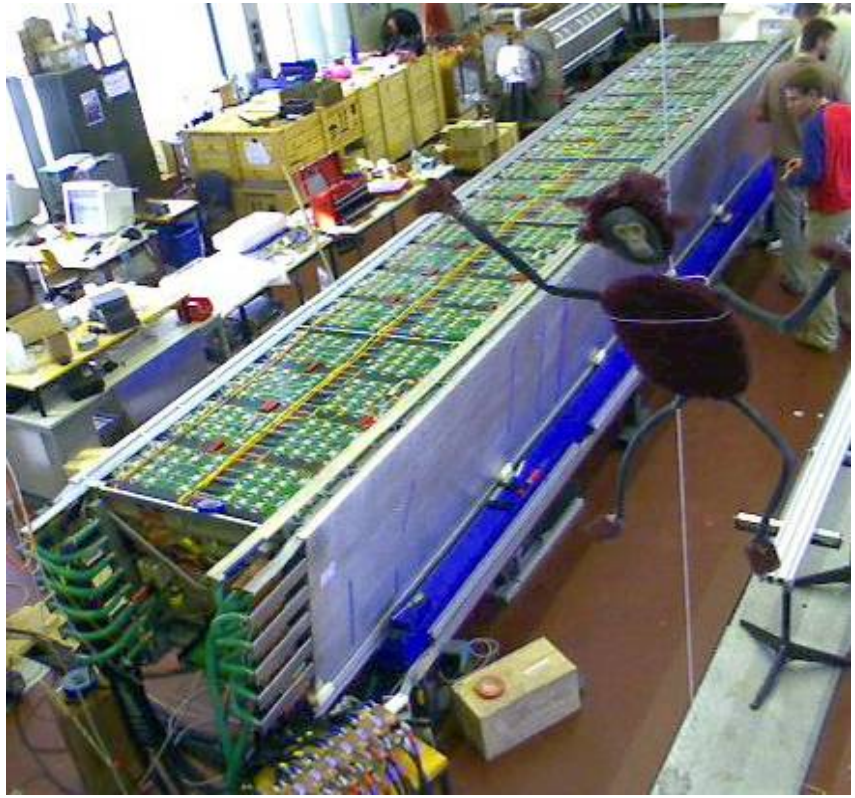
  ⇨ aim to have all 18 SM ready for installation end 2008

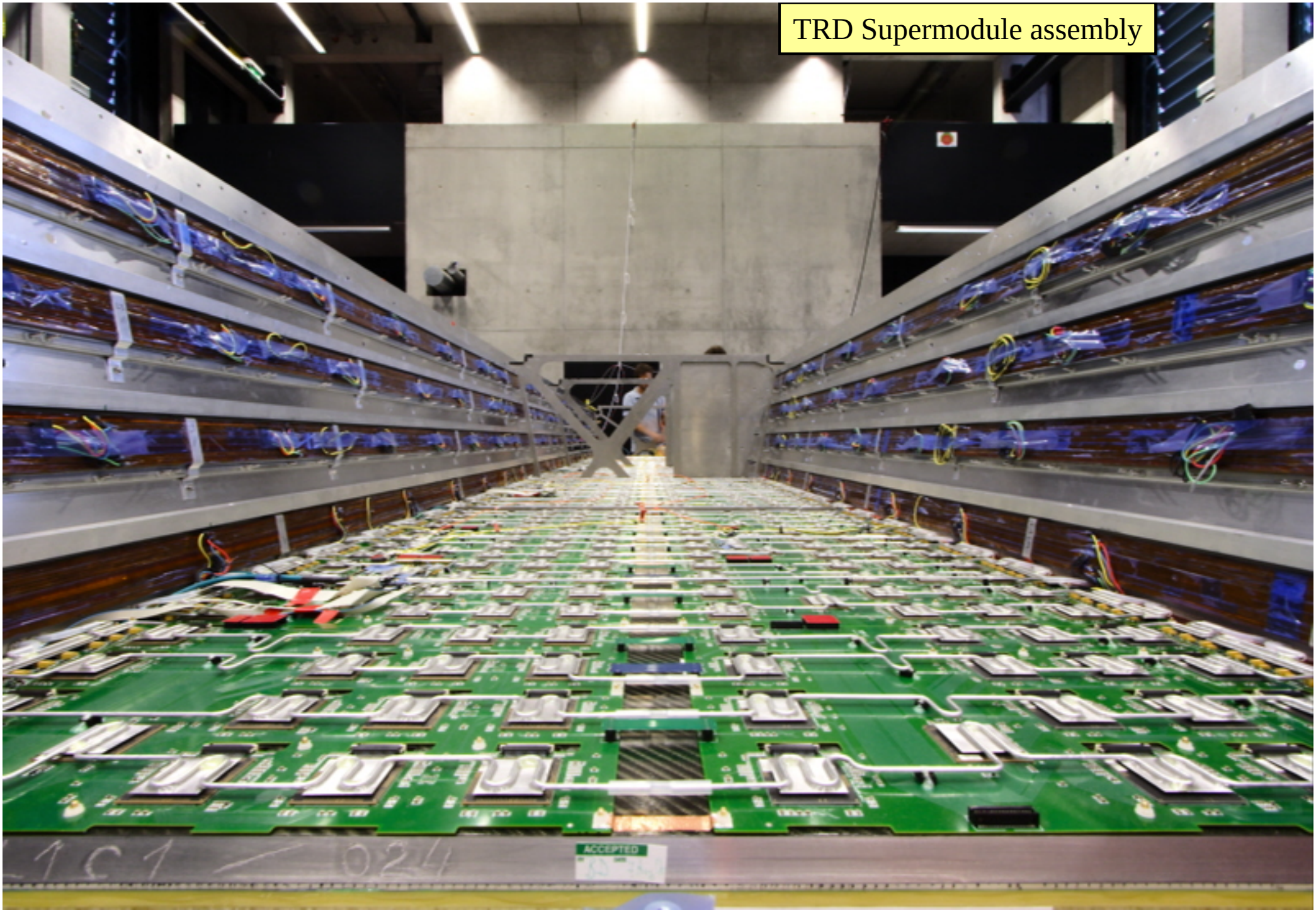
  ✪ equipping of chambers transferred to U. Frankfurt (in production now)

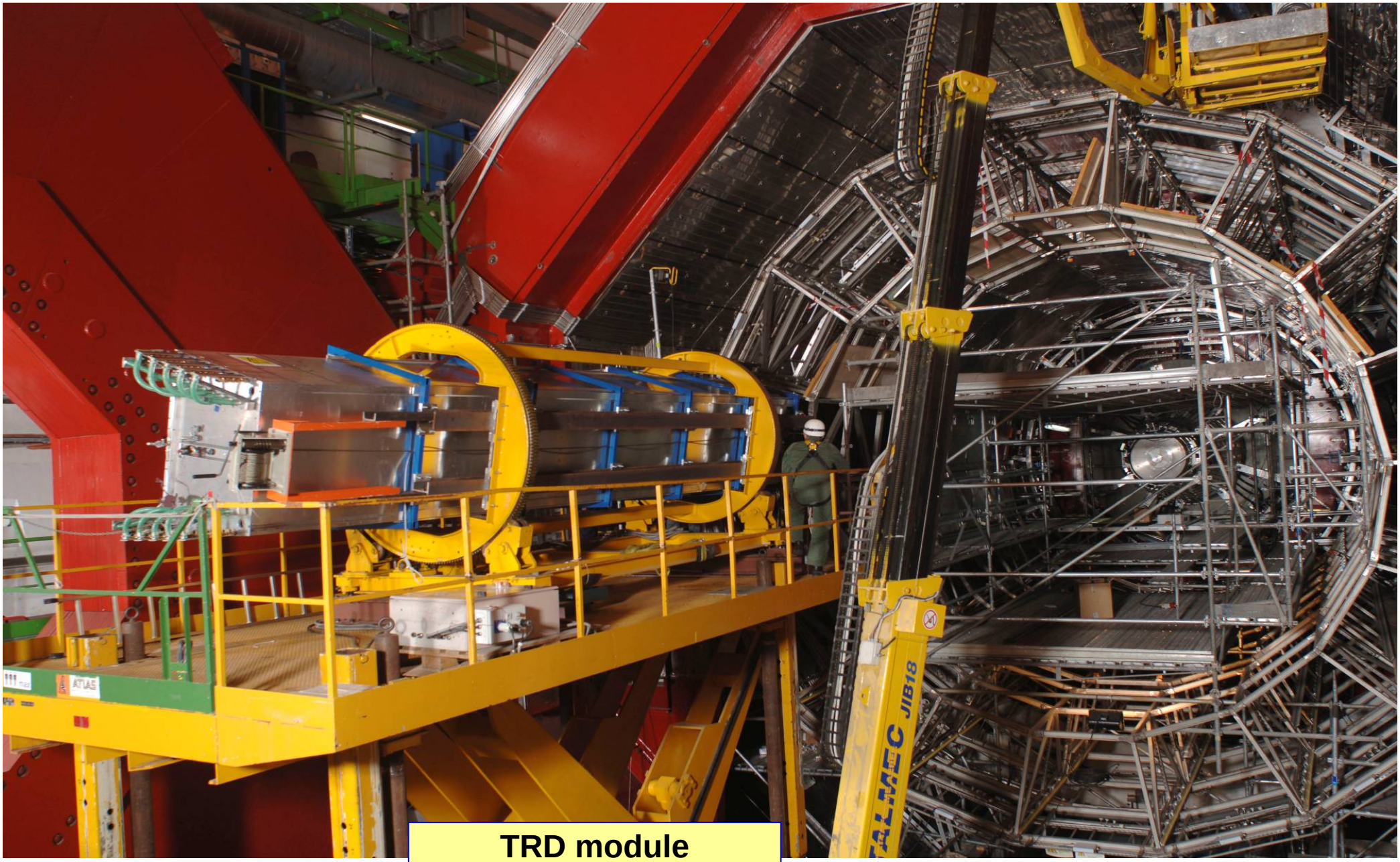
  ✪ building of SMs transferred to U. Muenster (starting up)

- **Concerns**

  ⇨ **tight schedule production of SMs for 2nd installation period**




TRD Supermodule assembly
ACCEPTED



TRD module during installation

Time of Flight (TOF)

Progress 2006

Mechanics :

- MRPC strips mass production **completed**
- Module's mechanics production done at **80%**
- Module's assembly with MRPC strips done at **40%**

- **SuperModules #1 & #2 installation done**

(small modifications needed to improve clearance)

Electronics : parallel to SM assembly

- HV system production **completed**
- CPDM cards production done at **93%**
- FEA+FEAC cards production done at **86%**
- TRM cards production done at **64%**
- LTM cards production done at **45%**
- Crates+ LV DC-DC production done at **31%**
- Final (Actel) DRM card qualified, production started

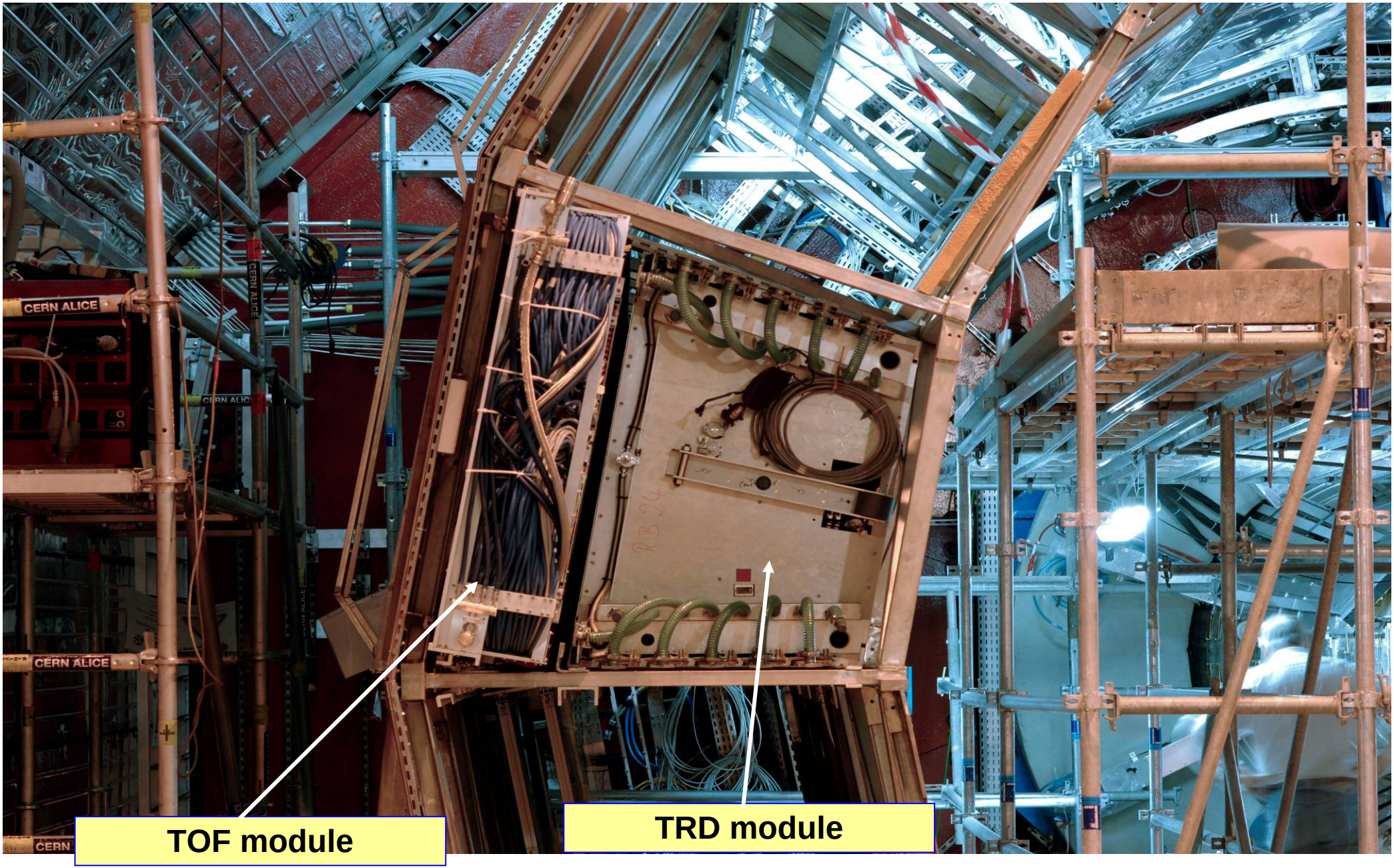
Plans 2007

- Complete FEA+FEAC+CPDM cards production **2/07**
- Complete modules assembly, TRM, LTM, DRM **7/07**
- Complete production of crates and LV DC-DC **11/07**
- **Complete production all SM's: end 2007**

TOF SuperModule

- **SuperModules** second installation window **June (5-7 additional SM's)**

In the pit: installing first TOF SuperModule


CERN ALICE
CERN ALICE
CERN ALICE
TOF module
TRD module

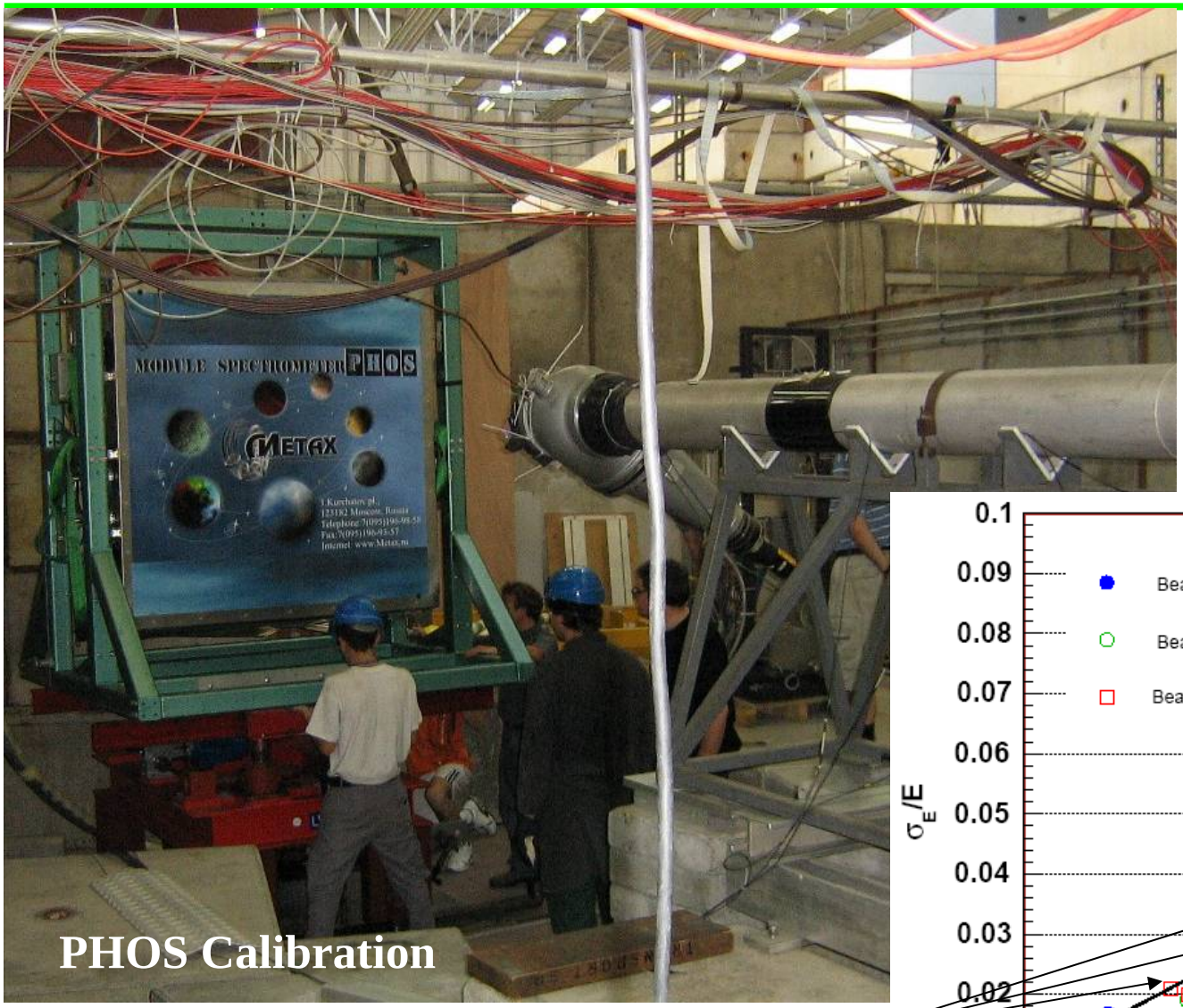
Photon Spectrometer (PHOS)

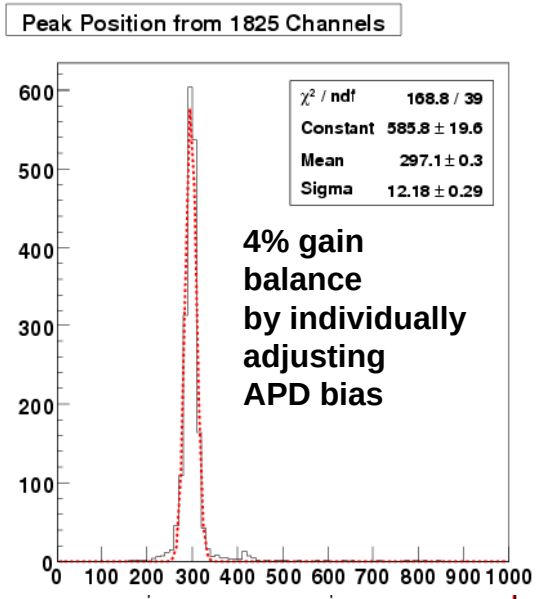
- Status:
  - ⇨ Crystals: **> 11000 (3 modules)** accepted
    - ✪ production **stopped**, additional funding requested in Russia (’07-’10)
  - ⇨ Mechanics: cradle installed
  - ⇨ 1st Module: completed, tested, calibrated in beam
  - ⇨ design & test of prototype trigger card (TRU)
  - ⇨ design of final TRU card

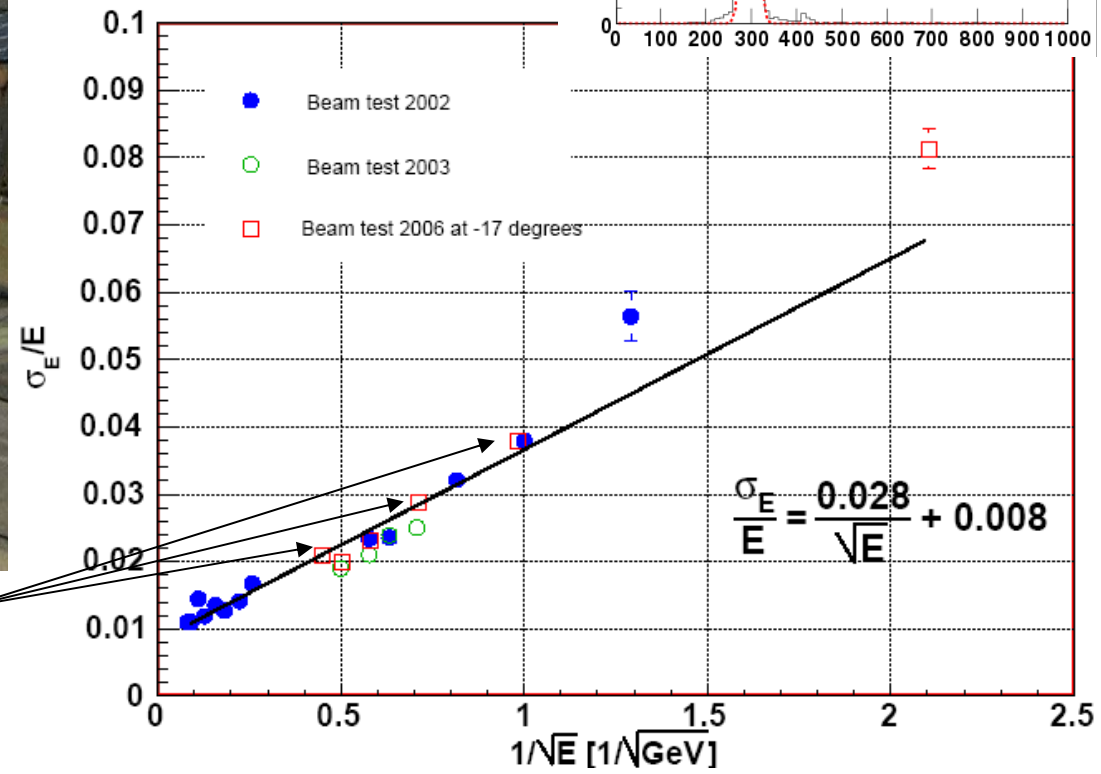
- Plans 2007
  - ⇨ 1st module installation **June 2007**
    - ✪ shifted to include trigger cards
  - ⇨ 2nd and 3rd modules ready end 2007

PHOS Cradle installation
July 2006

PHOS Calibration





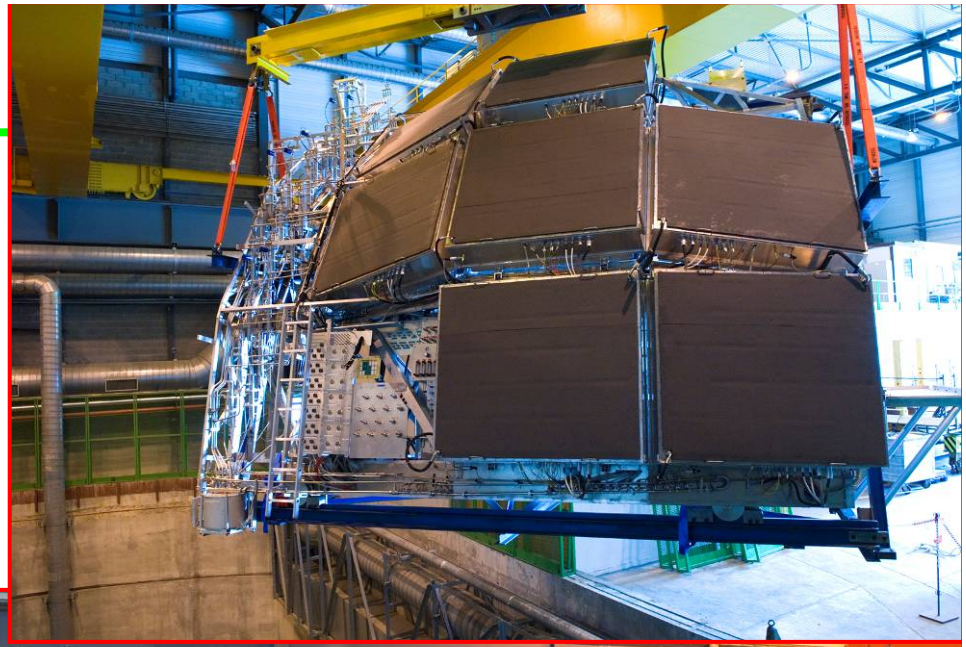


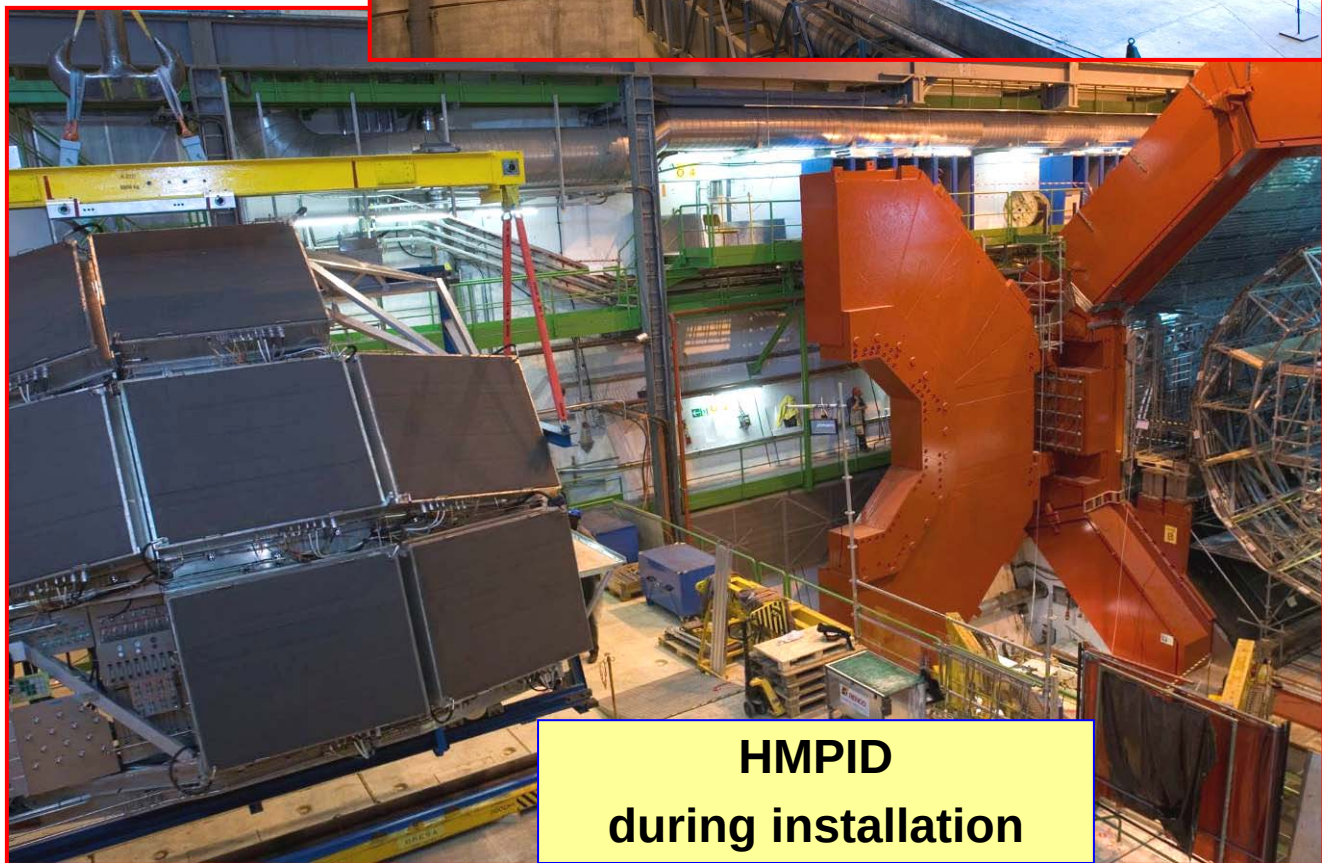
Calibration results 2006
(at T = -17^0 !)

HMPID Status

- 2006 Milestones
  - ⇨ completion of Photocathodes
  - ⇨ testing of final 2 modules with comics
    - ✪ 5 tested with beam 2003/4
  - ⇨ Installation inside the L3 magnet (September)
  - ⇨ Cabling & piping inside the magnet

- 2007 plans
  - ⇨ Complete cabling & DCS, start commissioning (Feb/March)
  - ⇨ Complete C_6F_{14} system (July)





HMPID during installation

Muon Tracking

- Stations 1&2:
  - ⇨ production completed (16 quadrants)
  - ⇨ Station 1: tests in progress; 4 quadrants at CERN early February for installation.
  - ⇨ Station 2: arrived at CERN in November and under test
    - ✪ some modifications planned to increase HV stability (additional wire supports)
- Station 3/4/5:
  - ⇨ production completed (140 slats + 20 spares)
  - ⇨ Assembly with FEE and Installation:
    - ✪ **6 half-chambers (4 of station 4 + 2 of station 5) are assembled & installed**
  - ⇨ service support columns & cabling in progress
- Electronics: rate limiting step in assembly/installation
  - ⇨ FEE electronics: - **Manas** production complete
    - **Manu:** 60% produced**;** stable delivery 500/week
  - ⇨ CROCUS (20): production & testing ongoing
- Installation planning
  - ⇨ chamber installation ends in May, services finishes in June
  - ⇨ commissioning in parallel, starting in March with Station 1

Muon Trigger Detectors

- **Mechanical support installed**
- **All 72 RPCs installed:**
  - **After validation with cosmic rays in Torino**
- **Front End Electronics completely installed:**
  - **Functional test after installation completed**
- **Cabling campaign started:**
  - **FEE to Local Electronics**
  - **~1500 cables to install**

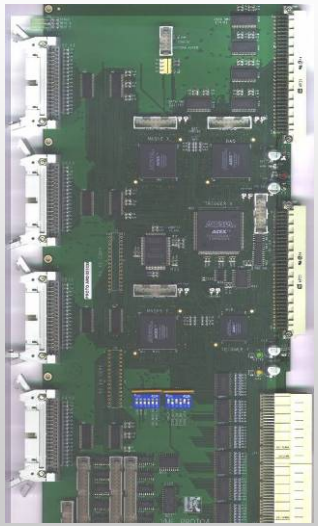
Muon Trigger Electronics

Local - Regional - Global Electronics produced and tested:

- **16 crates, 242 Local boards, 16 Regional boards, 1 Global board (+ spares)**

- **Readout card prototype, DARC, validated**
  - **final DARC in production, expected in March**

- **Electronics installation ongoing:**
  - **Test bench of the full system (from FEE to Global) installed and operated with the first completely cabled RPC**
  - **First results are fully satisfactory**
  - **The test bench will be used to test the complete electronics chain & cables at regular intervals during cabling**

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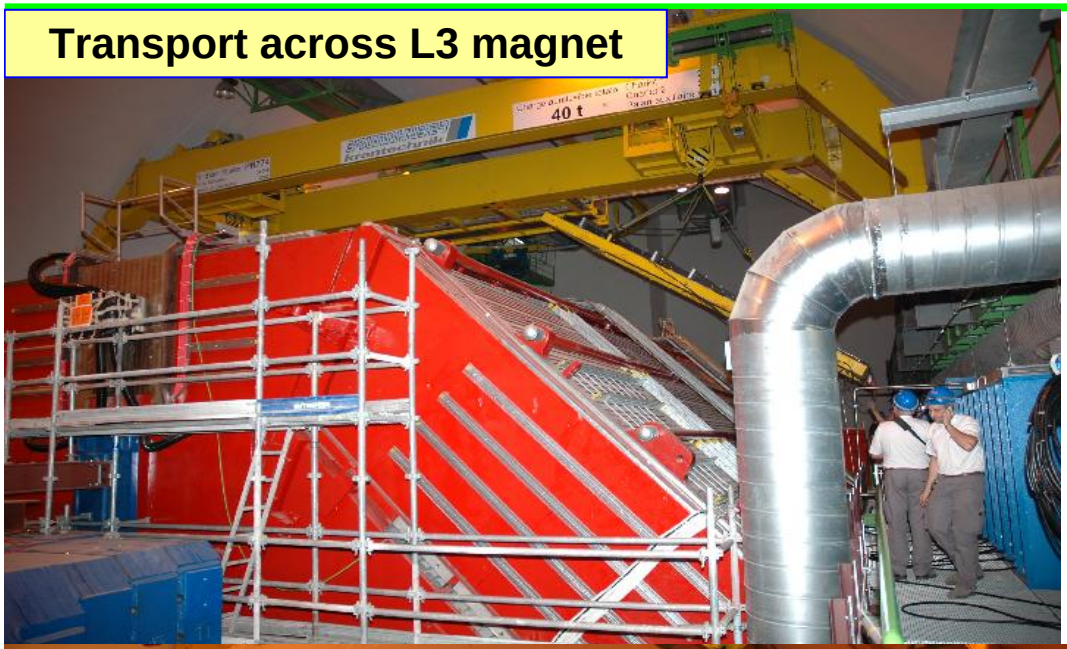
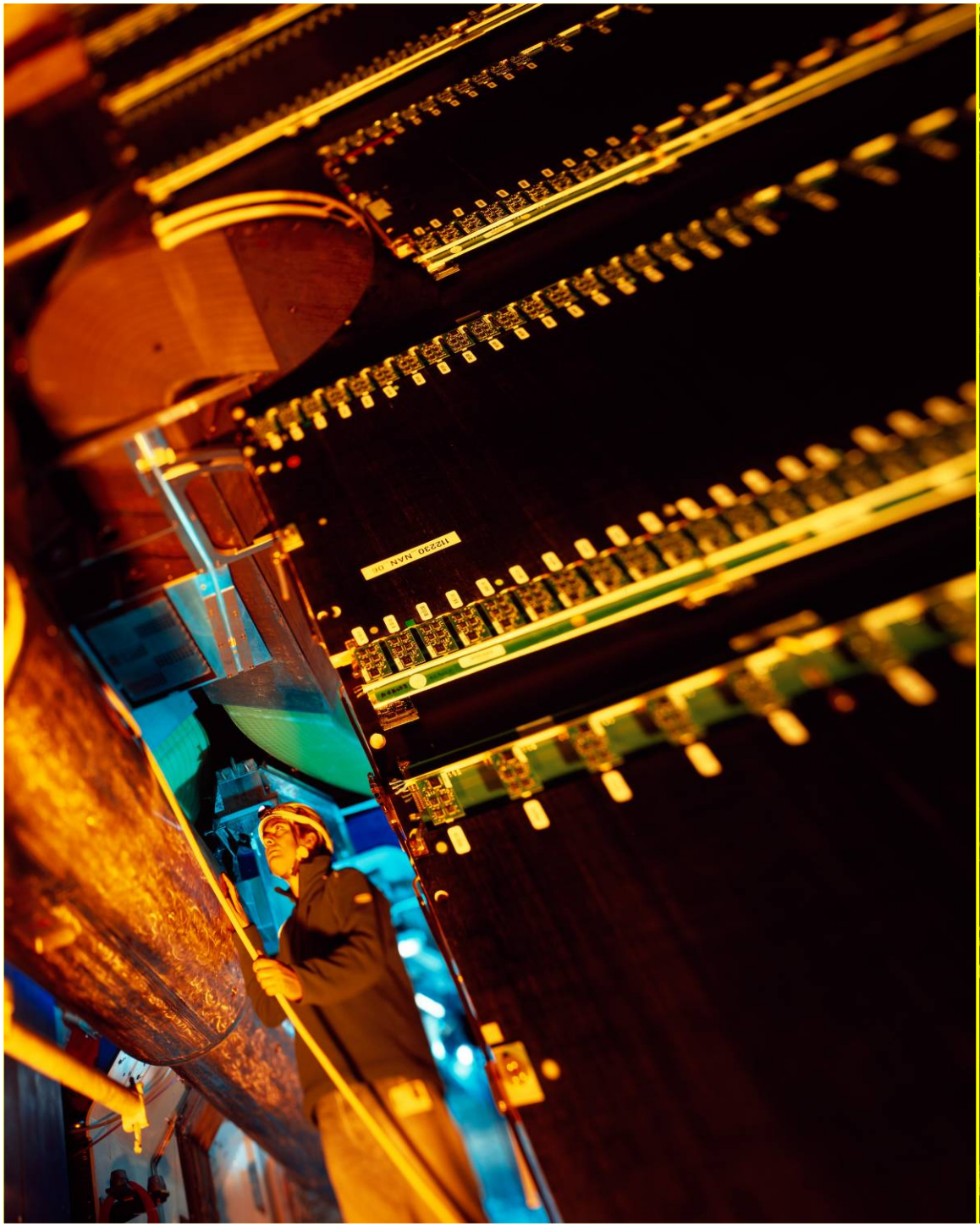
Muon Chamber Assembly
Area at Point 2

Muon Tracking Chambers (July 06)

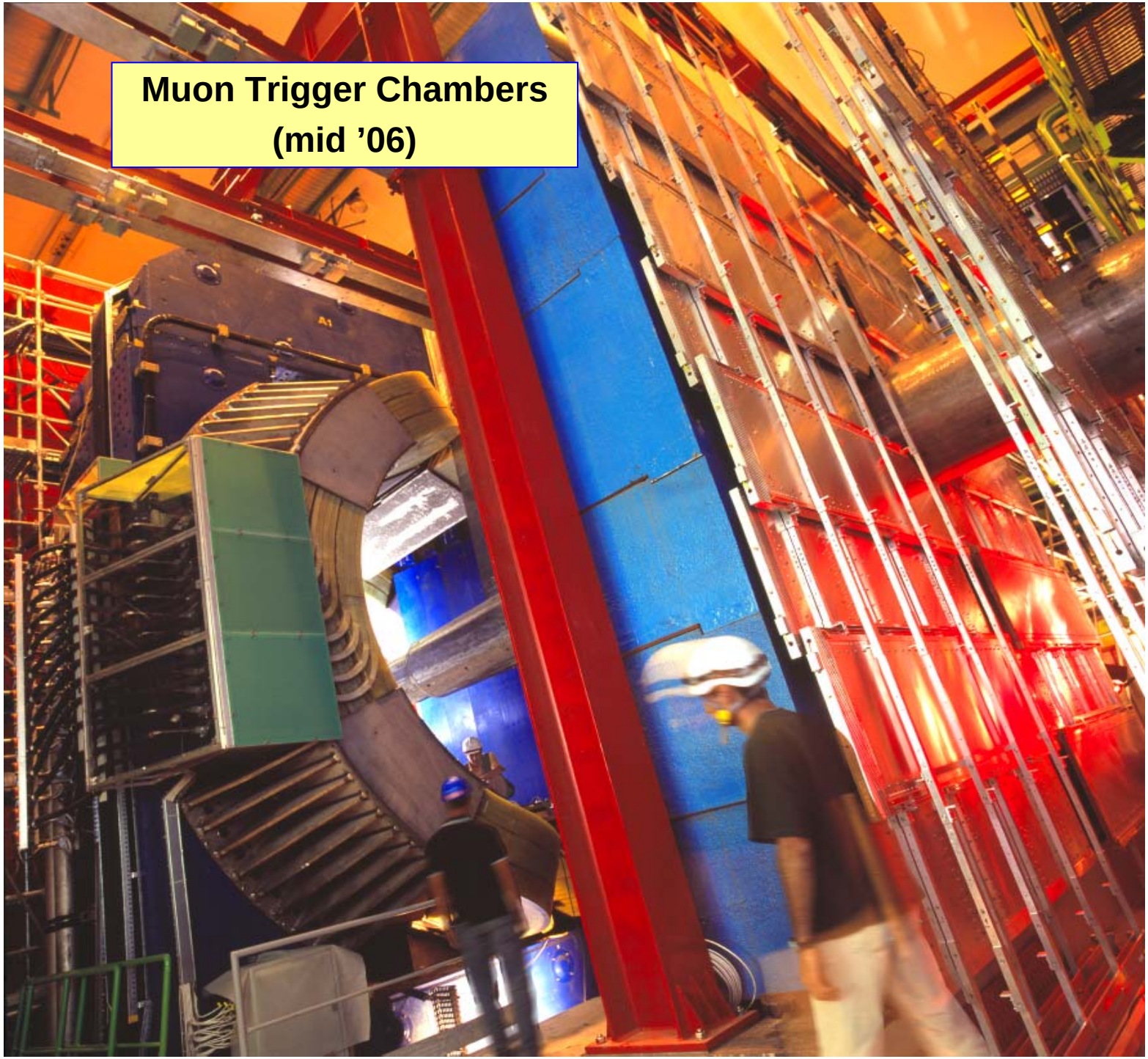
Transport across L3 magnet



Turning & Lowering




CERN ALICE

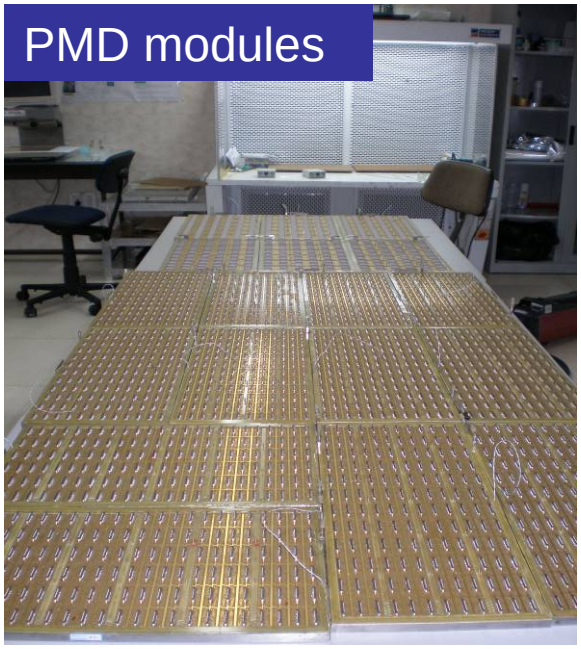

Muon Trigger Chambers
(mid ’06)

PMD status: Jan 2007

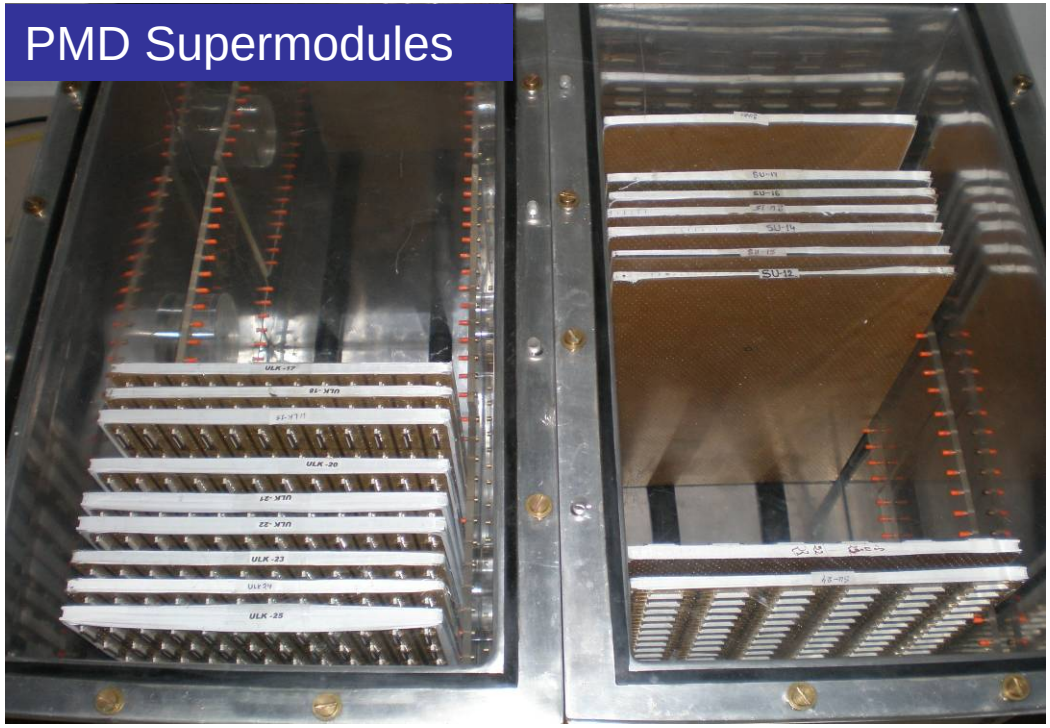
- Unit-module fabrication: completed
- Super-module fabrication: on schedule
  - **50%** of super-modules ready,
  - finished end March
- Support structure: delivery by mid-April
- Services: procurement in progress, installation in June-July

- Electronics:
  - Delivery of MANAS chips completed
  - All other components in hand
  - Order for Assembly for FEE boards to be released in one week

PMD modules



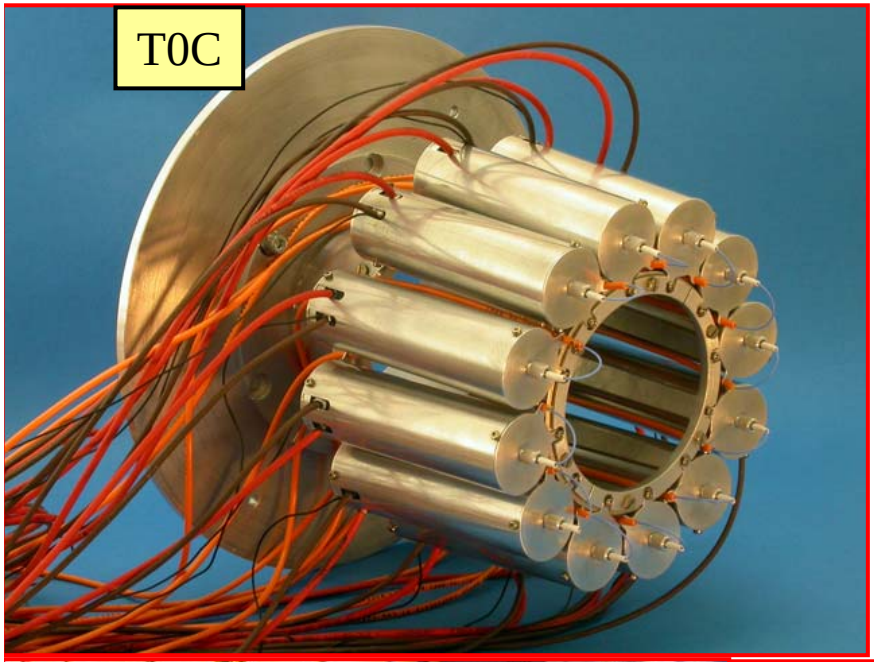
PMD Supermodules

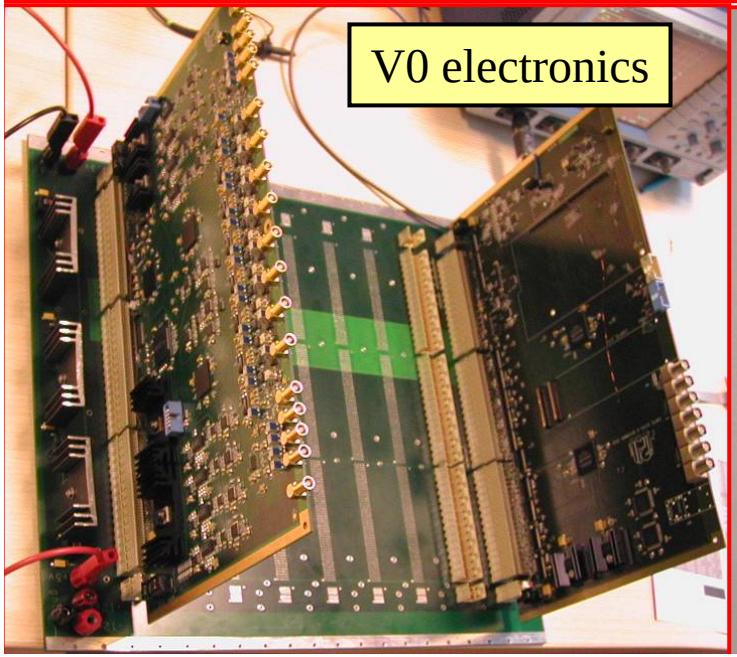


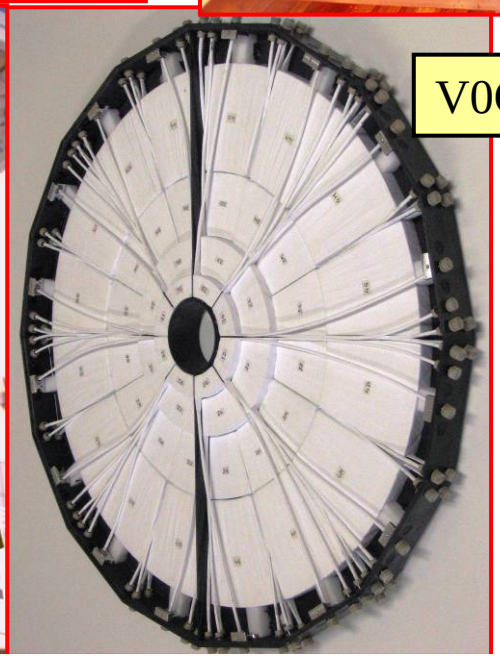
Forward & Trigger Detectors

- Interaction & timing: V0/T0
  - ⇨ T0A, T0C, V0C completed, V0A **being assembled**
- ZDC
  - ⇨ support structure & all calorimeters (4 **proton/neutron** + 2 **em)** **constructed**
- FMD
  - ⇨ several beam tests in 2006, performance at or better than specs (S/N >30)
  - ⇨ all components (detectors+FEE) produced & tested,
  - ⇨ assembly ongoing, transport to CERN mid Febr.
- Cosmic Trigger ACORDE
  - ⇨ used in TPC test (cosmic trigger), installation in the pit ongoing (top is finished)

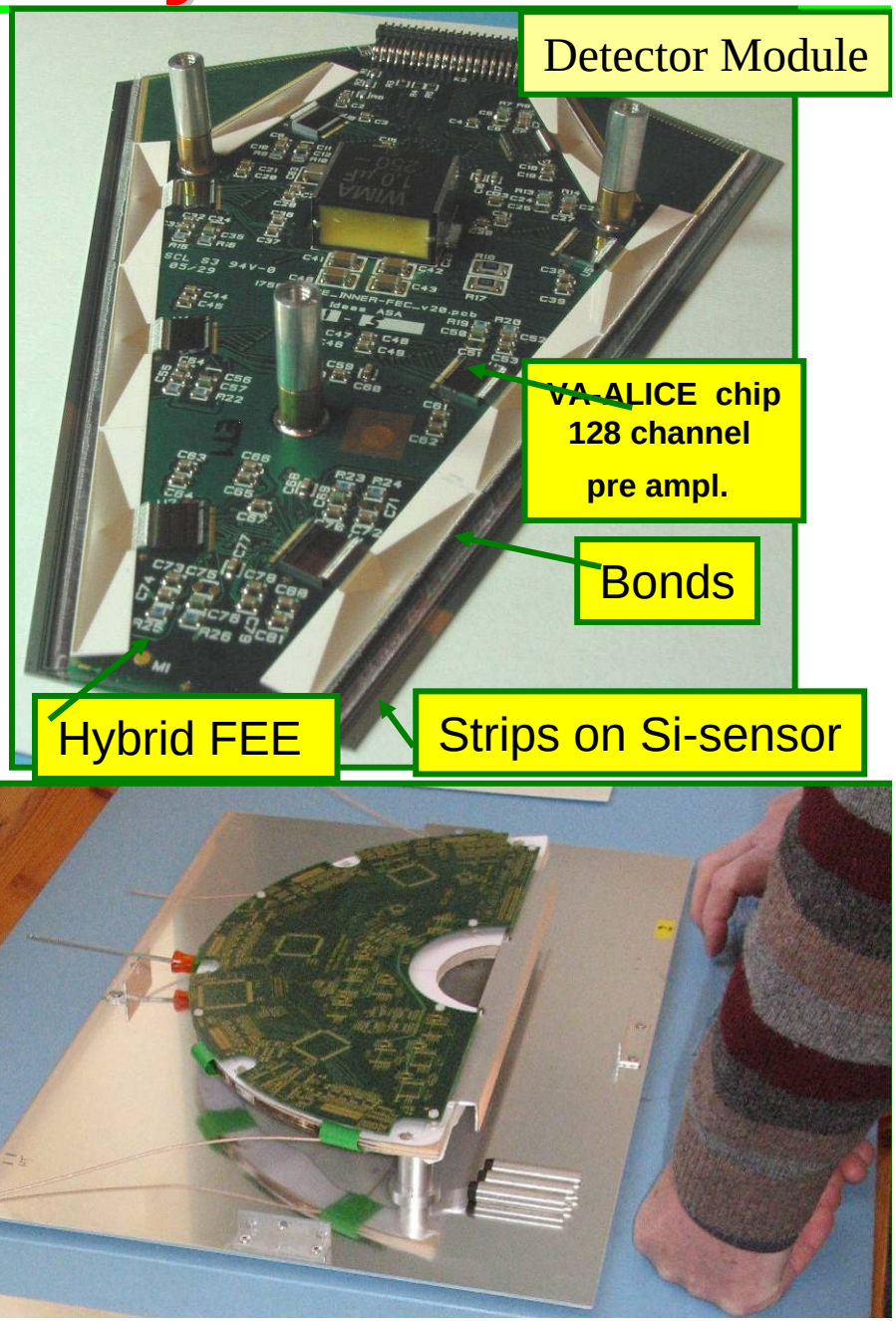
Forward Detectors







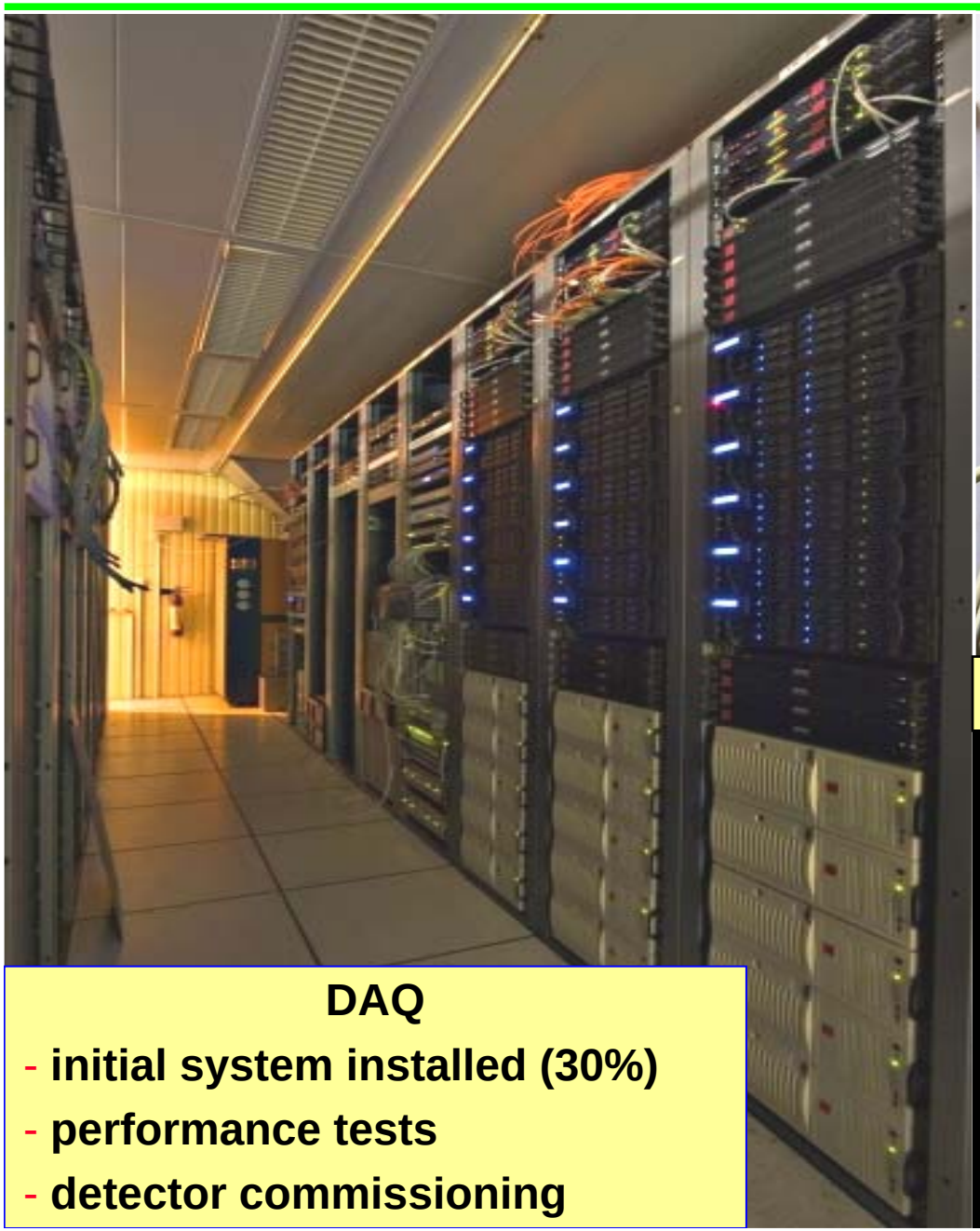
FMD Assembly

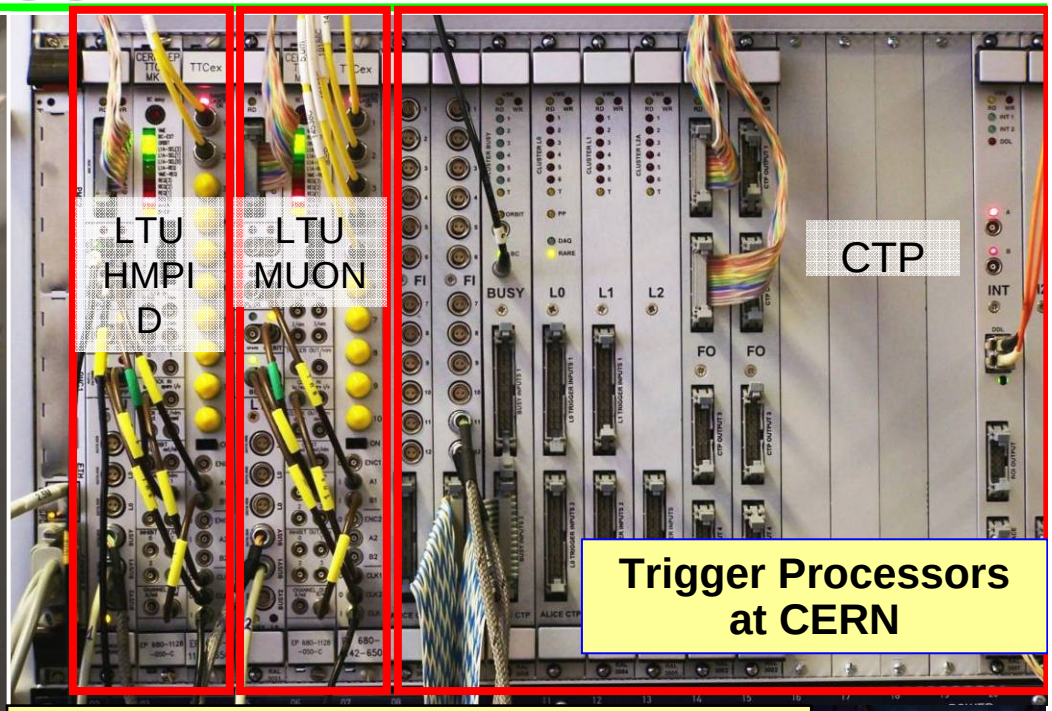


Trigger/DAQ/HLT/DCS

- Trigger
  - ⇨ all boards produced & tested, at CERN. Software development/User interface ongoing
- DAQ
  - ⇨ DDL SIU (rad hard) and D-RORC produced
  - ⇨ Selection, purchase, installation of Transient Data Storage and Cluster File System done
  - ⇨ ALICE Data Challenge VII (end 2006): reached 1020 MB/s to T0 storage
  - ⇨ initial configuration (30%) installed & commissioned during TPC tests
- HLT
  - ⇨ 14 PC (~56 CPU) fully equipped and installed in CR2, 80 more PC's installed in March
    - ✪ testing and commissioning of HLT during TPC commissioning
  - ⇨ New H-RORC produced and commissioned (TPC)
  - ⇨ Automated Cluster Management (CHARM) tested (TPC), now in production
  - ⇨ software, online-displays ongoing
- DCS
  - ⇨ back-end system & control PC's installed
  - ⇨ rack control, gas systems installed & being commissioned
- Integration **Trigger/DAQ/ECS/DCS/HLT/Detectors** is ongoing

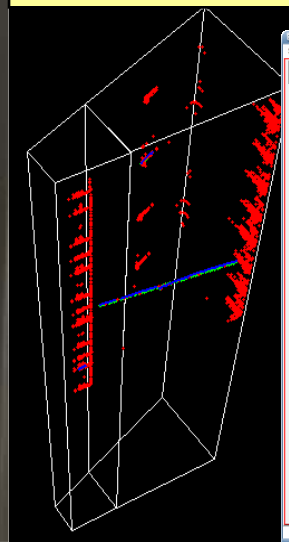
DAQ/Trigger/HLT

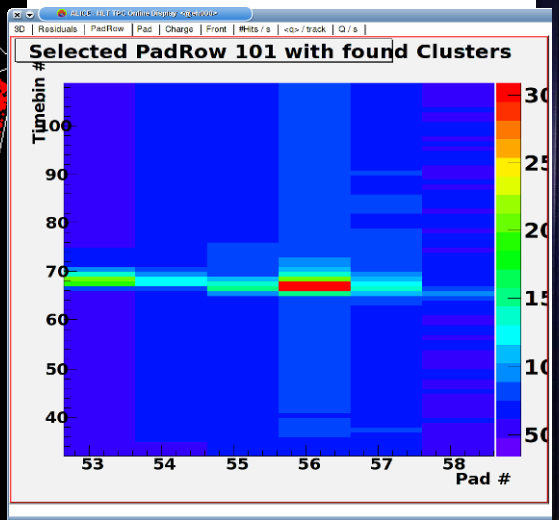




Trigger Processors at CERN

HLT, used in TPC commissioning





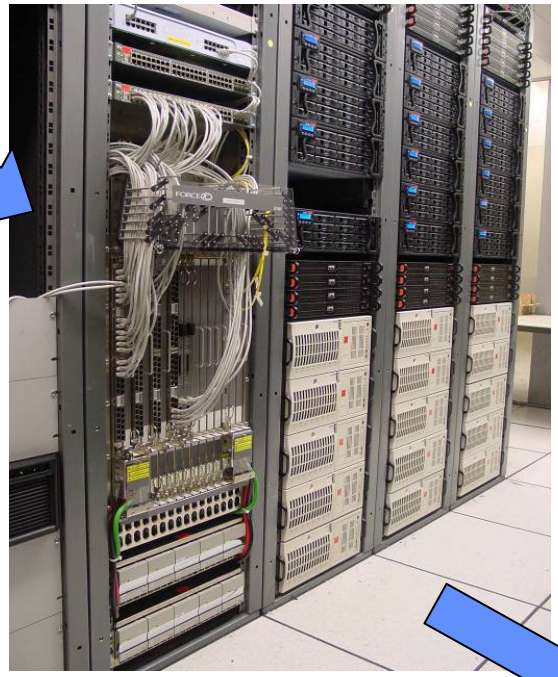
DAQ

- **initial system installed (30%)**
- **performance tests**
- **detector commissioning**

ALICE Computing Data Challenge 06

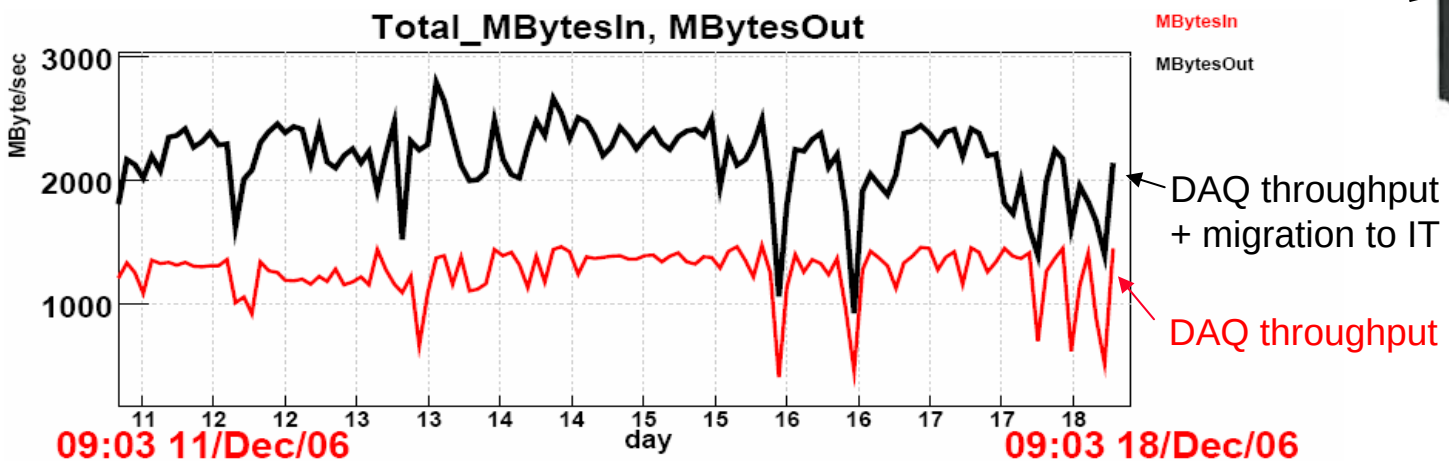
Realistic test of data flow from ALICE to IT Computing Centre

Data Generation:
45 optical link interfaces



Data Storage in the GRID Tier0
in CERN Computing Centre
on the Meyrin site

Global Performance Sept – Dec 2006
- 4 days at 1020 Mbytes/s : 336 TB
- 18 days at 700 MBytes/s : 1 PB



DAQ throughput
+ migration to IT

DAQ throughput

Computing

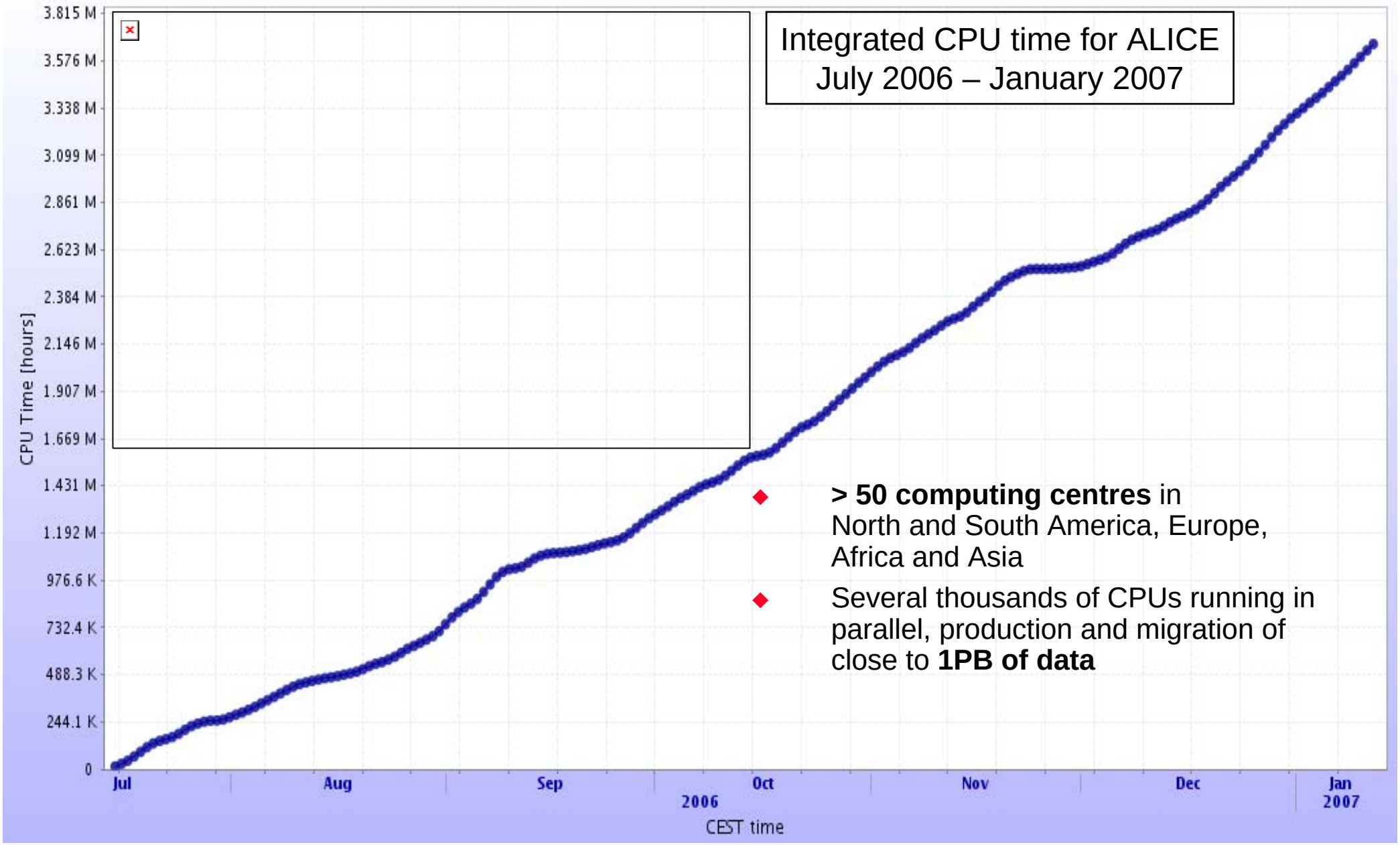
- Physics Data Challenge PDC06
  - ⇨ **Distributed generation and reconstruction:** **started April 06**
    - ✪ All T1s (except NDGF) and 30 T2s contribute, but only ~50% of pledged resources
  - ⇨ **Data movement challenge (LCG SC4)** **T1s <-> T0**
    - ✪ Achieved 50% of goal (300MB/s transfer rate) because of missing resources in T1s
  - ⇨ **Distributed analysis** (centrally organized and user driven): started
- Computing Resources
  - ⇨ ALICE **deficit reduced** from > 50% to ~ 30% (T2 situation better than T1)
    - ✪ **new resources** in US, Japan, Korea, Spain
    - ✪ **reduced requirements** in 2007/8 (new LHC start-up scenario)
  - ⇨ **integral LCG resource balance** significantly better than ALICE specific balance
    - ✪ hopefully some room for better distribution of pledged resources within WLCG…

Pledged by external sites versus required (new LHC schedule) all

		2007		2008		2009		2010	
		T1	T2	T1	T2	T1	T2	T1	T2
CPU	Requirement (MSI2K)	3.0	4.2	10.2	10.2	18.4	16.0	22.9	19.0
	Missing %	-7%	29%	-32%	-13%	-42%	-20%	-34%	-30%
Disk	Requirement (PB)	1.0	0.8	4.2	1.6	7.9	4.0	9.8	5.3
	Missing %	24%	48%	-32%	43%	-42%	2%	-31%	-5%
MS	Requirement (PB)	2.0	-	7.0	-	14.0	-	20.9	-
	Missing %	-26%	-	-42%	-	-53%	-	-53%	-

ALICE Physics Data Challenge 06

Distributed production of Monte-Carlo data for detector and software studies



Alice Installation Schedule

PHASE	Detector	Start	Finish
	Muon detectors	Apr 2006	May 2007
PHASE 3	Initial TPC installation + ITS rails	11.01.2007	02.02.2007
	TPC commissioning / ITS surface tests	05.02.2007	25.02.2007
	ITS Barrel (SDD,SSD) + Vacuum (central Be chamber) + Bake-Out	26.02.2007	26.03.2007
	FMD/V0/T0 (C side)	27.03.2007	12.04.2007
	Pixel + ITS barrel + services	13.04.2007	24.05.2007
	TPC + ITS in final position	25.05.2007	11.06.2007
	EMCal support frame / PHOS	12.06.2007	18.06.2007
	TOF/TRD 2nd installation window	19.06.2007	16.07.2007
PHASE 4	Compensator platform / Mini Frame (services)	17.07.2007	08.08.2007
	Final Vacuum Commissioning / Beam Line Closed	09.08.2007	22.08.2007
	FMD/V0/T0/PMD and Services (A side)	23.08.2007	11.09.2007
	Commissioning and Mobile Shielding	12.09.2007	start of beam

Summary

- Major Milestones
  - ⇨ TPC pre-commissioning
  - ⇨ ITS assembly almost completed
  - ⇨ Muon FEE production problems solved (MANAS, MANU)
  - ⇨ Detector installation well under way
  - ⇨ Reduced computing deficit
  - ⇨ Significant strengthening of Collaboration (US, Japan, …)

- Biggest Concerns
  - ⇨ **ITS/TPC installation** is very delicate & complex
  - ⇨ **Services and cabling:** enormous amount of work & logistics challenge
  - ⇨ **Computing resources:** still some way to go

Busy months ahead,
but working detector well on track
for collisions end 2007