

# 21<sup>st</sup> ALICE RRB

- **Collaboration Status**

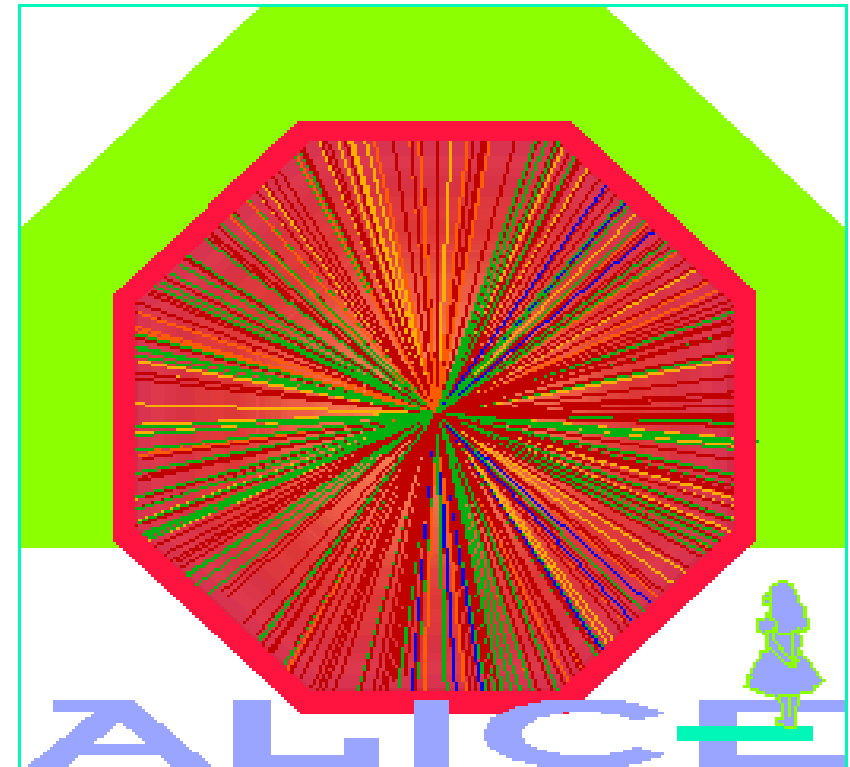
- ⇒ **Funding**

- ⇒ **New Institutes**

- **Project Status**

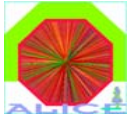
- ⇒ **Installation & Planning**

- ⇒ **Detector construction**





# 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** (3<sup>rd</sup> HI run) (cash flow may be problematic)
  - ⇒ **EMCAL support structure** in production, installation April 2007
  
- **Japanese participation: PHOS funding approved** (TRD funding not approved)
  - ⇒ ~ **1.1 MCHF** for APD's/preamps + **150 kCHF** Common Fund
  - ⇒ 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



# Funding 2007-2010



<b>TRD</b> 60%→100% coverage	<b>Germany</b>	agreed: <b>5 M €</b>
<b>EMCAL</b>	<b>US</b> <b>Italy</b> <b>France</b>	CD1 approved: <b>13-16 M \$</b> initial discussions : <b>~1 M €</b> initial discussions : <b>~1 M €</b>
<b>PHOS</b> crystals & mechanics modules 4/5	<b>Russia</b>	requested: <b>'deliverable'</b>

- **Common Fund**

- ⇒ currently estimated to be ~ **800 kCHF negative** at end of construction

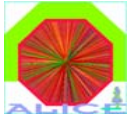
- ★ **mostly offset** by additional income expected from new institutes (500 - 700 kCHF)

- **other cost issues or funding requests:**

- ⇒ two issues related to CERN responsibilities under discussion with CERN (service installations, ZDC vacuum chambers)



# Collaboration News



## ● New Institutes:

⇒ **US:** 3 National Labs + 2 Universities

✦ **LBNL** (Berkeley), **LLNL** (Livermore), **ORNL** (Oak Ridge)

✦ **Yale** (New Haven), **Wayne State** (Detroit)

⇒ **Japan:** change from 'associate' to 'full' member

✦ **Hiroshima, Tokyo, Tsukuba**

⇒ **Brazil:** single team from 2 Institutes

✦ Univ. São Paulo (**USP**), Univ. Estadual de Campinas (**UNICAMP**)

⇒ **Spain:** single team from 2 Institutes

✦ **CIEMAT** Madrid, Univ. **Santiago de Compostela**

⇒ **Romania:** **ISS** Bucharest

**EMCAL, GRID**

**PHOS (+TRD), GRID**

**offline**

**Grid computing**  
**Grid computing**

## ● Institutes applying:

⇒ **6 US Universities,**

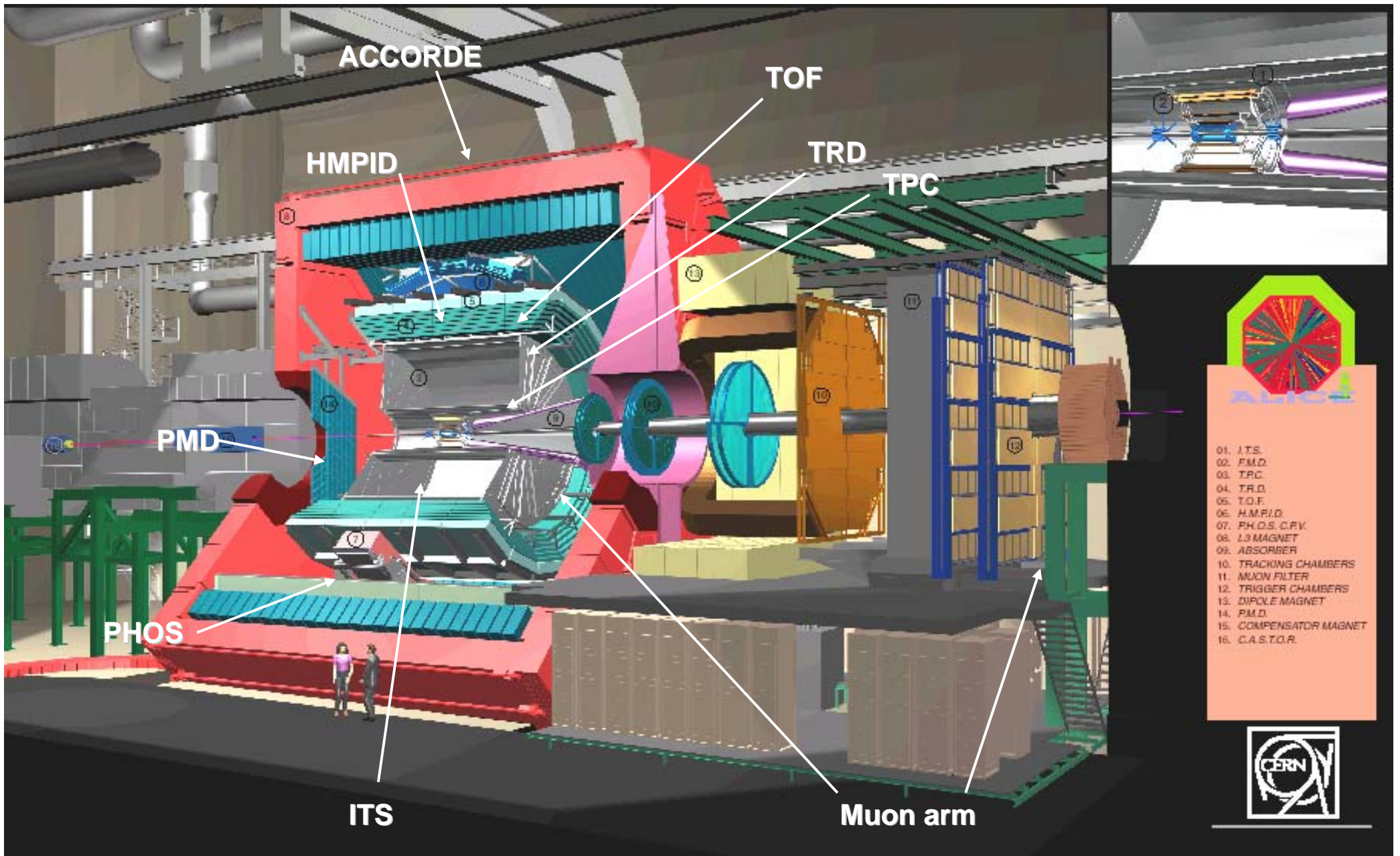
✦ currently under review by DOE

⇒ **PUCP (Peru), Yonsei (Korea)**

## ● ALICE Collaboration

⇒ ~ **1015** Members, **97** Institutes, **30** Countries



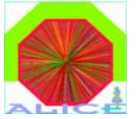


# ALICE Detector





# Planning Update



## ● Physics

- ⇒ 'day 1' physics in 2007 with pp:
- ⇒ 'early pp physics' 2007/2008:
- ⇒ first heavy ion run

**global event properties (at 900 GeV)**  
**detailed studies** of pp ('QCD at 14 TeV')  
**end 2008** ('after first long pp run')  
will certainly also depend on physics landscape end 2008

## ● work-plan in 2007, updated for LHC schedule released in June 2006

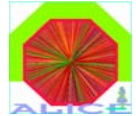
- ⇒ shifted **ITS installation** back to give maximum time for construction and pre-commissioning
  - ☆ experiment **closed by end July 2007** (3 month shift)
  - ☆ ~ 2-3 months for final commissioning w/o beam
- ⇒ expected start-up **configuration mid 2007**
  - ☆ **complete**: ITS, TPC, HMPID, muon arm, PMD, trigger dets (V0, T0, ZDC, Accorde),...
  - ☆ **partially complete**: PHOS(1/5), TOF(9/18), TRD (2-3/18), DAQ (20%)
  - ☆ **most time-critical**: ITS detectors with little or no contingency

## ● beyond mid 2007

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



# Installation Mile-stones



PHASE	Detector	Start	Finish
	Muon detectors	Apr 2006	May 2007
PHASE 2	HMPID/TOF/TRD mech. insertion tests	02.05.2006	06.06.2006
	Magnet Power test	07.06.2006	09.06.2006
	Services / Supports	10.06.2006	
	TOF/TRD/HMPID, Acorde,	18.09.2006	10.10.2006
PHASE 3	Initial TPC installation	20.11.2006	21.12.2006
⇒⇒⇒⇒⇒	<b>ITS Barrel (SDD,SSD) + Vacuum (central Be chamber) + Bake-Out</b>	<b>08.01.2007</b>	<b>05.02.2007</b>
	FMD/V0/T0 (C side)	06.02.2007	21.02.2007
⇒⇒⇒⇒⇒	<b>Pixel + ITS barrel + services</b>	22.02.2007	04.04.2007
	TPC + ITS in final position	05.04.2007	24.04.2007
	EMCal support frame / PHOS	25.04.2007	01.05.2007
	TOF/TRD 2nd installation window	02.05.2007	29.05.2007
PHASE 4	Compensator platform / Mini Frame (services)	30.05.2007	26.06.2007
	FMD/V0/T0/PMD and Vacuum (A side)	27.06.2007	16.07.2007
	Final Vacuum Commissioning / <b>Beam Line Closed</b>	17.07.2007	<b>23.07.2007</b>
	Commissioning and Mobile Shielding	24.07.2007	<u>31.08.2007</u>



# Installation & Services



- Large support structures

- ⇒ essentially completed & installed
- ⇒ EMCAL support structure in production
  - ✦ arrives at CERN end November



- Installation, services, infrastructure

- ⇒ installation of racks, cables, bus bars, gas/cooling pipes etc.. **ongoing**

- Overall Status

- ⇒ progress & performance **satisfactory**

- ⇒ **large effort ongoing for service installations !**

- ✦ significant amount of work: ~ 30 km pipes, 10 000 cables (500 km)
- ✦ coordination of large number of parallel activities



**Scaffolding for Service Installations**







...helmet without head

...person without head

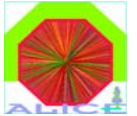
installing C-side SSD cables and  
patchpanels  
difficult  
environment...

...arms without person





# Silicon Pixels SPD



- **6 sectors (60%) under test in DSF**

- ⇒ integration (cooling, electronics, DAQ, DCS,..)
- ⇒ 7<sup>th</sup> sector assembly **completed**

- **Components production & test**

- ⇒ bump-bonded ladders ≈ 200 out of 240
- ⇒ Al/polyimide pixel bus ≈ 100 out of 120
- ⇒ all other components uncritical & in time

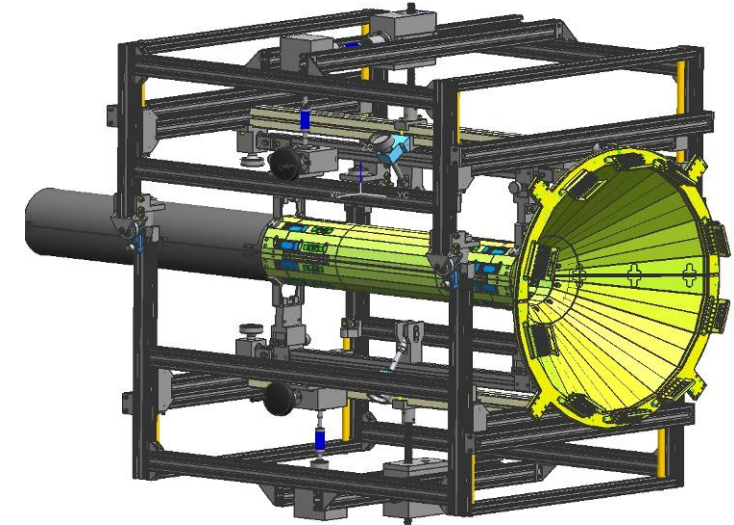
- **Schedule**

- ⇒ **assembly time reduced** ≈ 3 weeks/sector
  - ★ limited by ladder testing
  - ★ some sectors have to be re-worked
- ⇒ **assembly**: completed week 6/07 (early Feb)

- ⇒ **ready for installation date: 22.02.07**

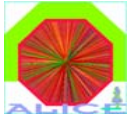
- **Concerns**

- ⇒ **very tight schedule**
  - ★ integration tooling delayed
- ⇒ manpower (testing, sector assembly, integration)





# Silicon Drift Detector SDD



## ● Status

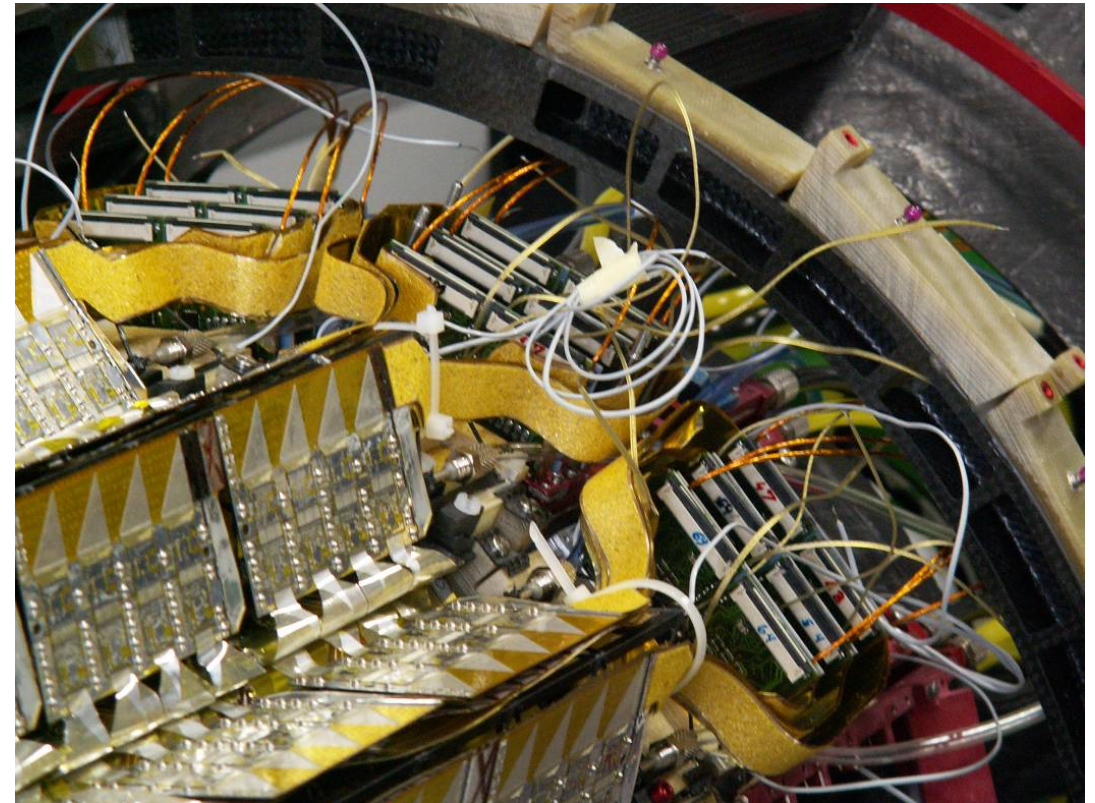
- ⇒ detector production **completed** (including spares)
- ⇒ modules **assembly: completed**
- ⇒ connection of modules to cables : **60%** completed
- ⇒ ladder **Assembly & test: completed** for layer 3, now **starting** on layer 4.

## ● Schedule

- ⇒ detector assembly completed end **November**
- ⇒ ladder assembly completed one week later
- ⇒ transport to CERN early **December 2006**
- ⇒ **INSTALL in Cavern early January 2007**

## ● Concerns

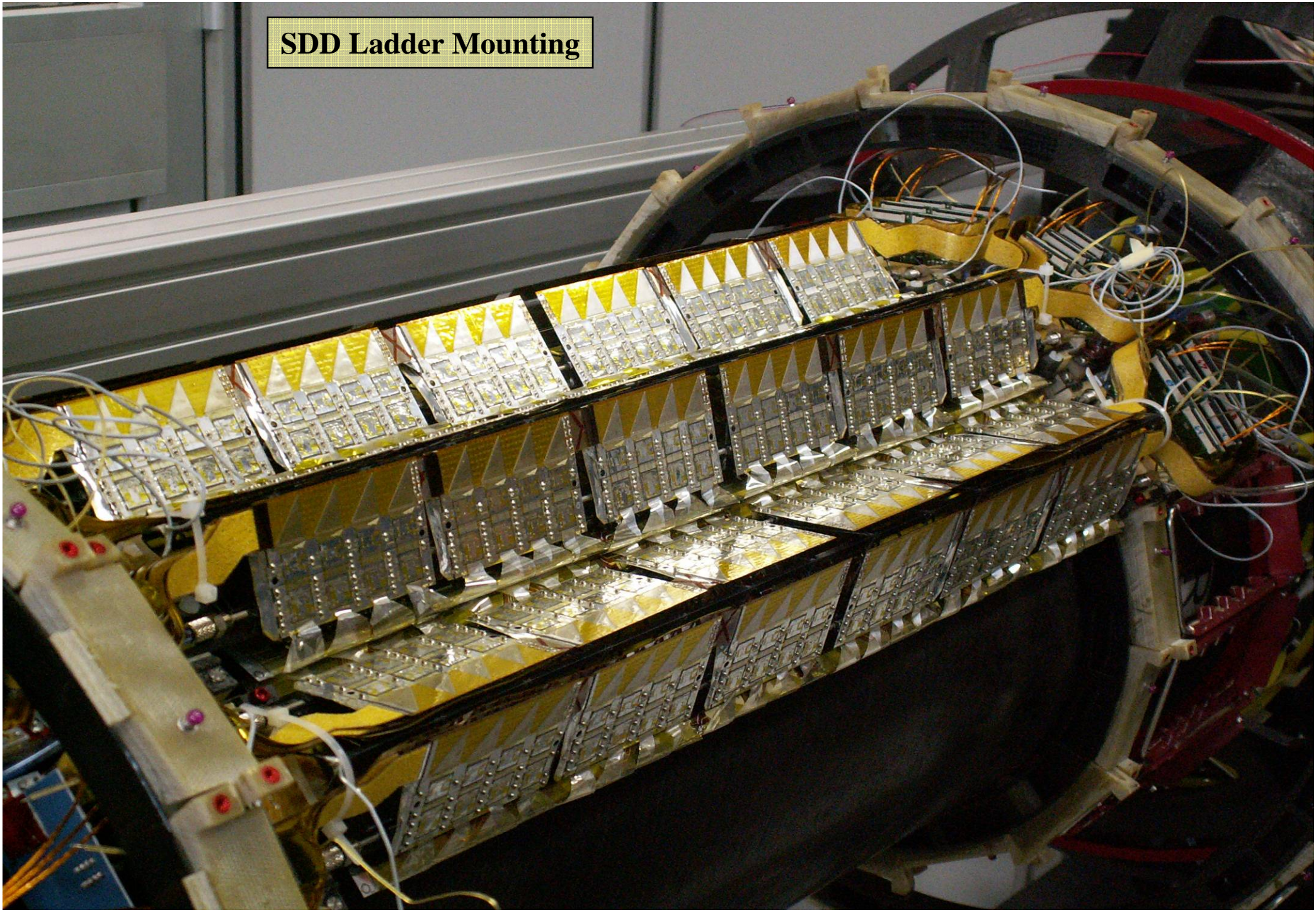
- ⇒ **extremely tight schedule**



**SDD Endcap Electronics**



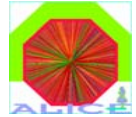
**SDD Ladder Mounting**







# Silicon Strip Detector SSD



## ● Status

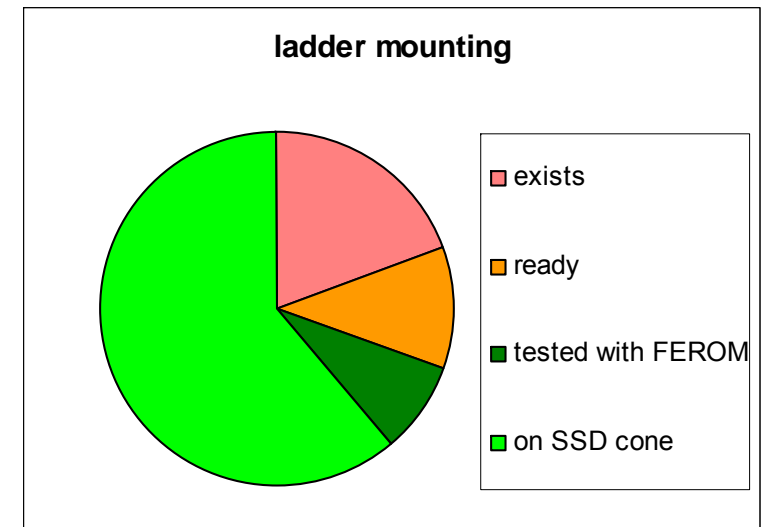
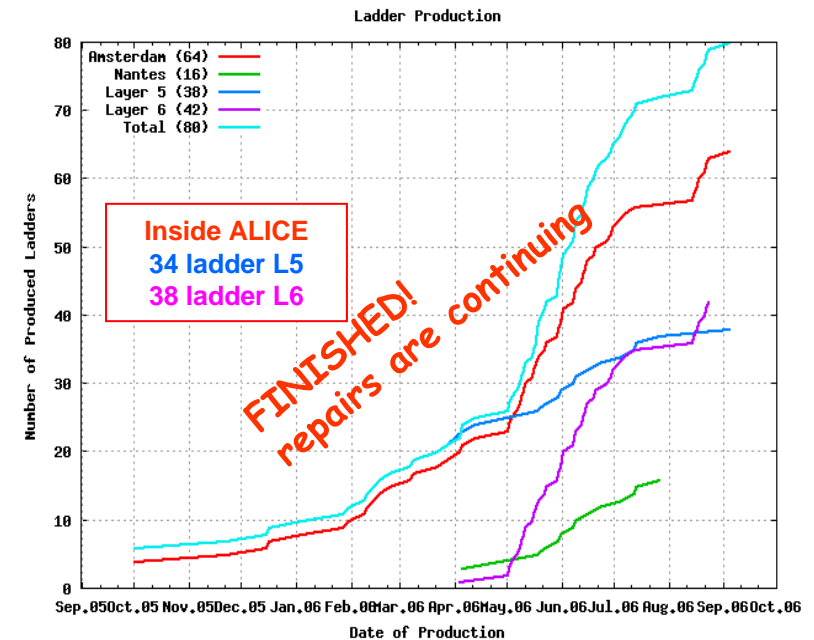
- ⇒ module assembly **completed**
- ⇒ ladder assembly (80 ladders in total) **completed**
  - ☆ finishing and repair continues through October
- ⇒ FEROM (read-out crates)
  - ☆ 4 (of 8) crates produced, in test phase
  - ☆ 2 units in routine use for testing SSD ladders
- ⇒ Ladder mounting on SSD cone
  - ☆ layer 5: **completed** and tested
  - ☆ layer 6: **50%** completed
- ⇒ cables and patchpanels on C-side in L3 magnet **installed**

## ● Schedule

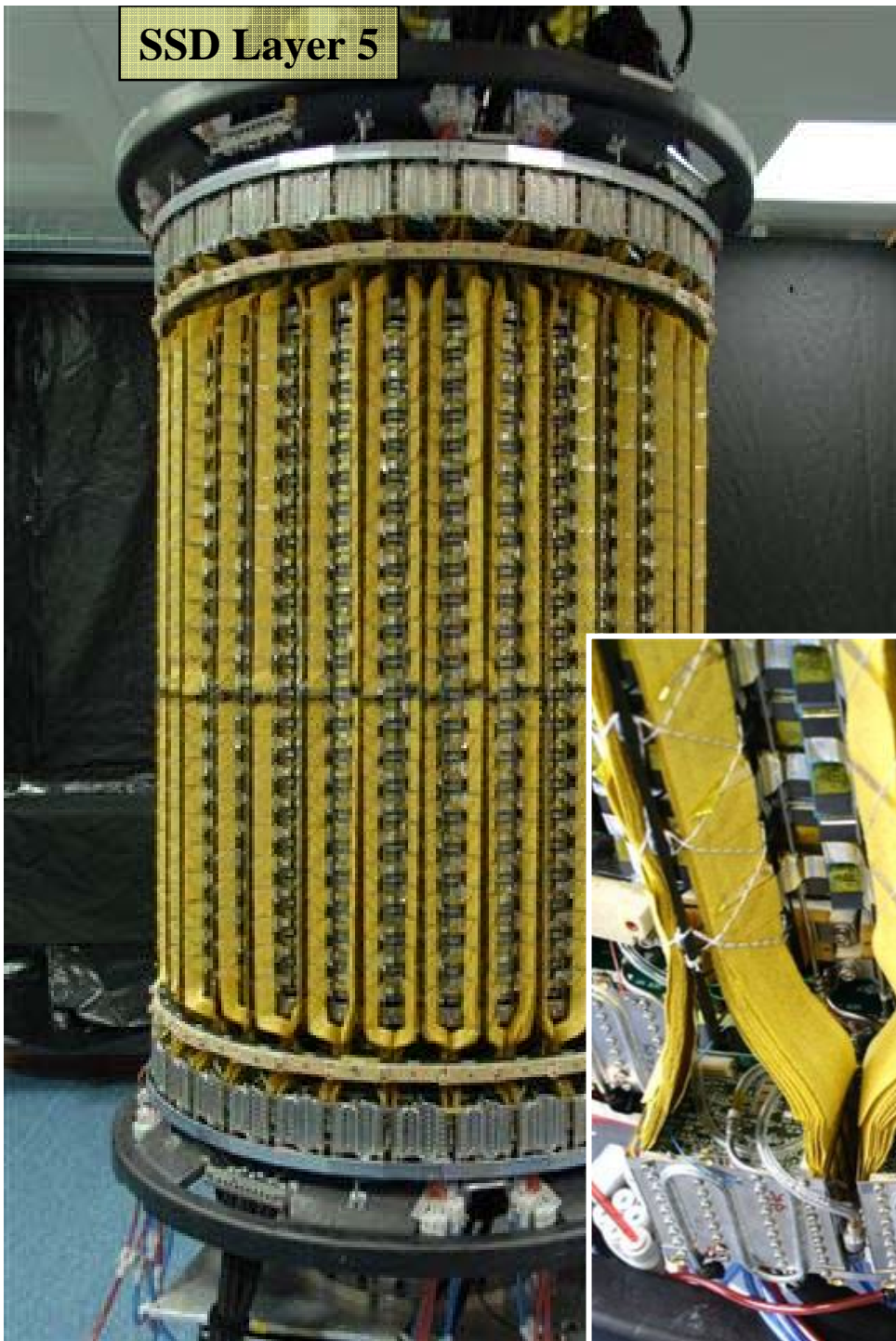
- ⇒ transport to CERN **end Nov 06**
- ⇒ ready for installation: **8 Jan 07**

## ● Concerns

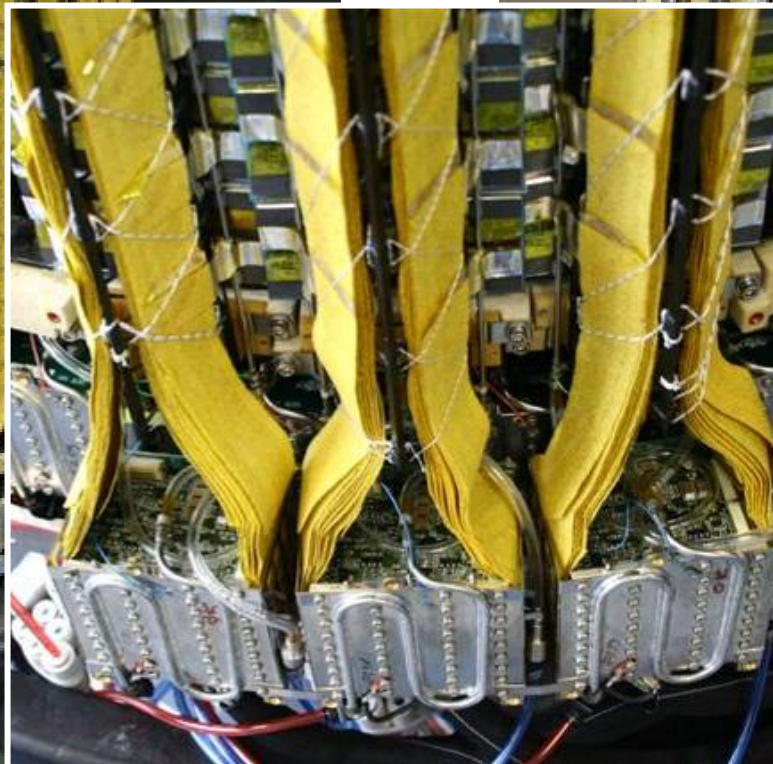
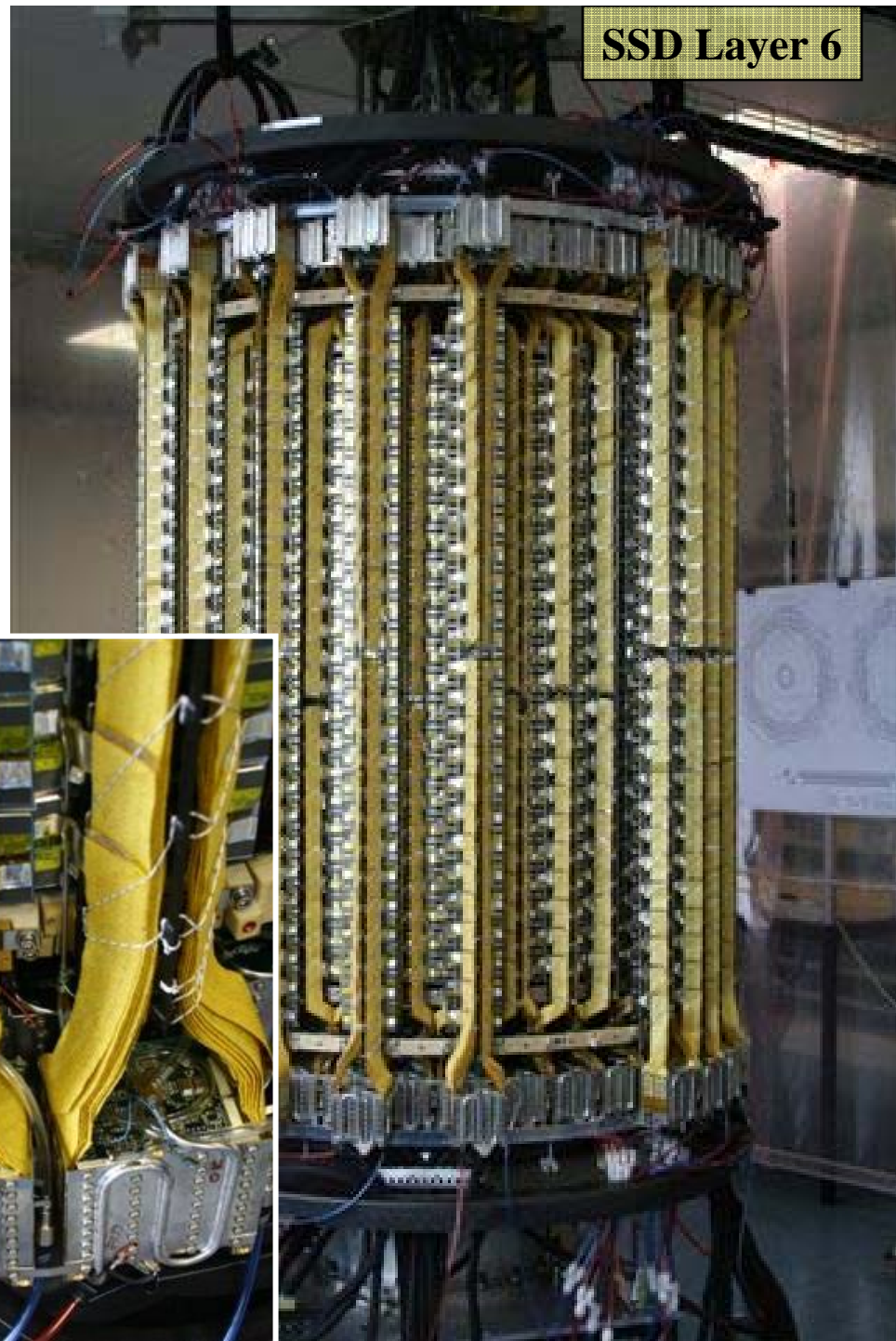
- ⇒ **little contingency**
- ⇒ **delivery of LV power supplies** (CAEN)
  - ☆ concerns also other detectors & LHC expts



SSD Layer 5



SSD Layer 6



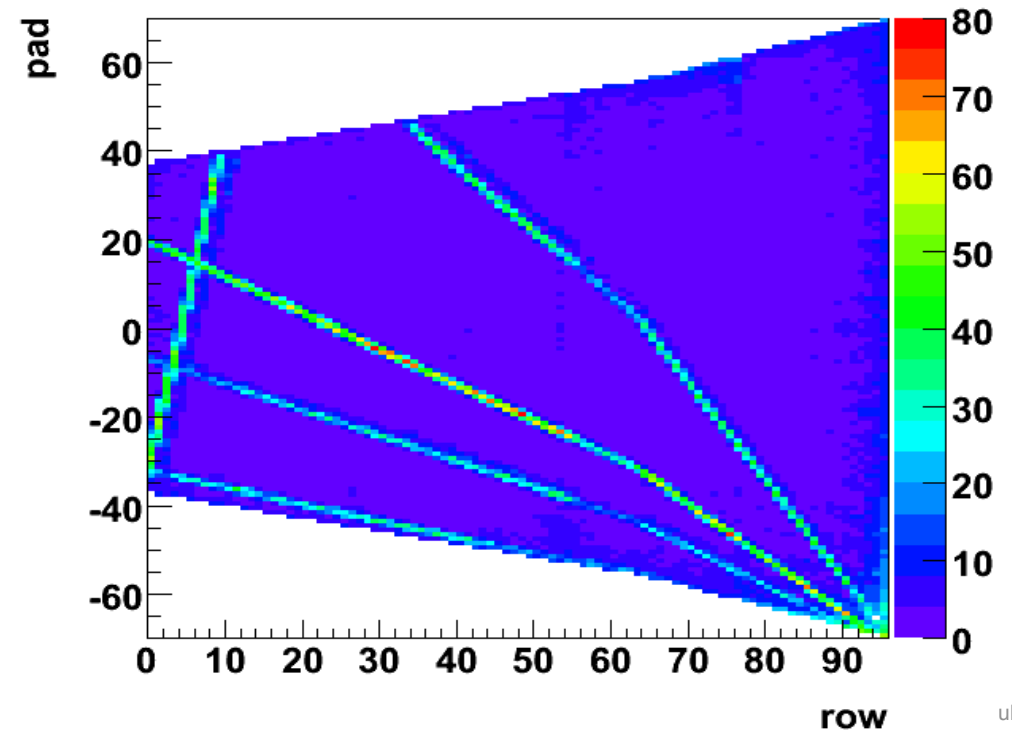
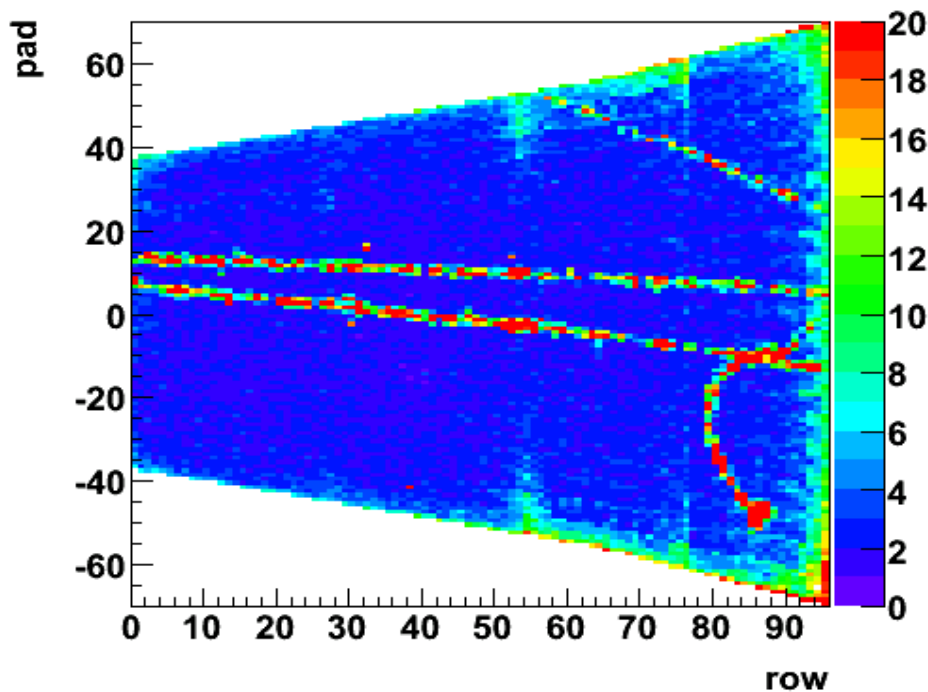
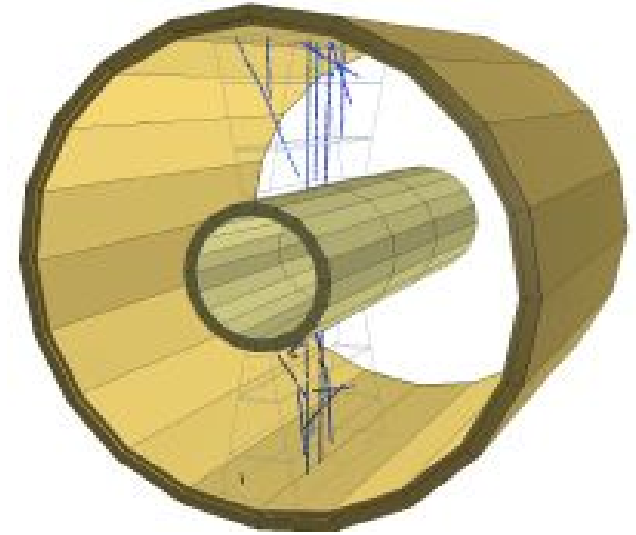


# First TPC tracks



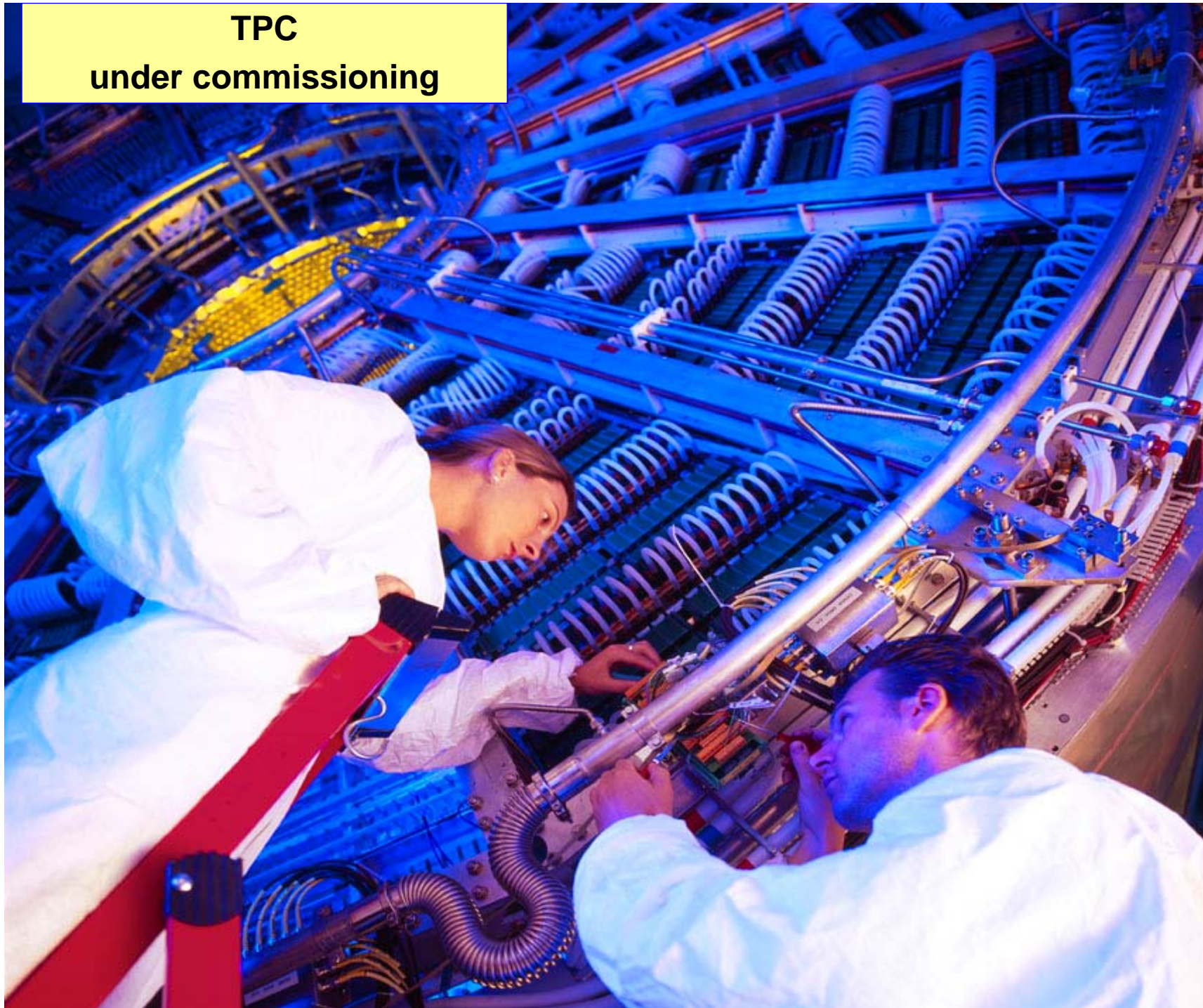
## ● first cosmic & laser tracks on 16 May 2006

- ⇒ first round of testing all chambers & FEE completed
  - ★ very time consuming (2 sectors at a time)
  - ★ resolution according to specifications
- ⇒ HLT connected and being commissioned
- ⇒ 2<sup>nd</sup> round ('endurance tests') ongoing
  - ★ end last week a wire broke in one OROC (to be replaced)
- ⇒ installation (foreseen in Dec 06) may shift by ~2 weeks





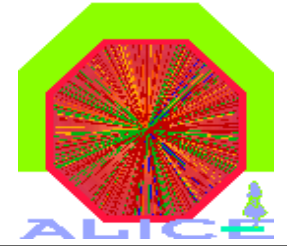
**TPC**  
**under commissioning**



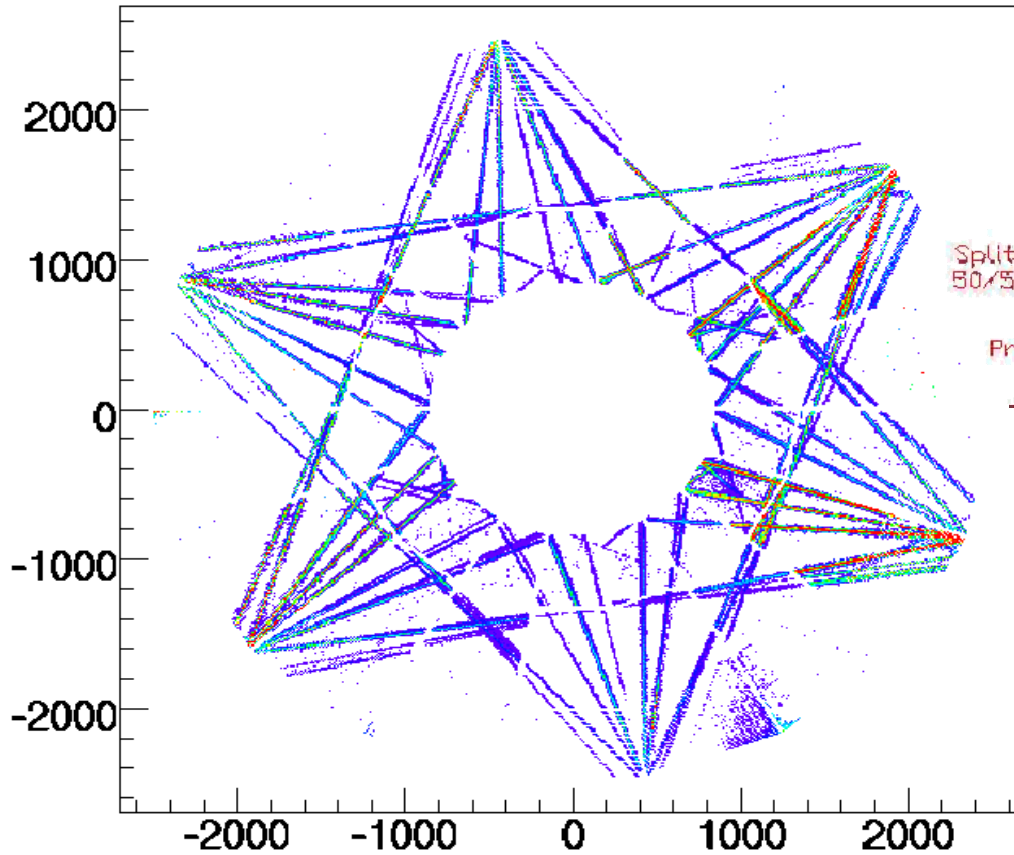




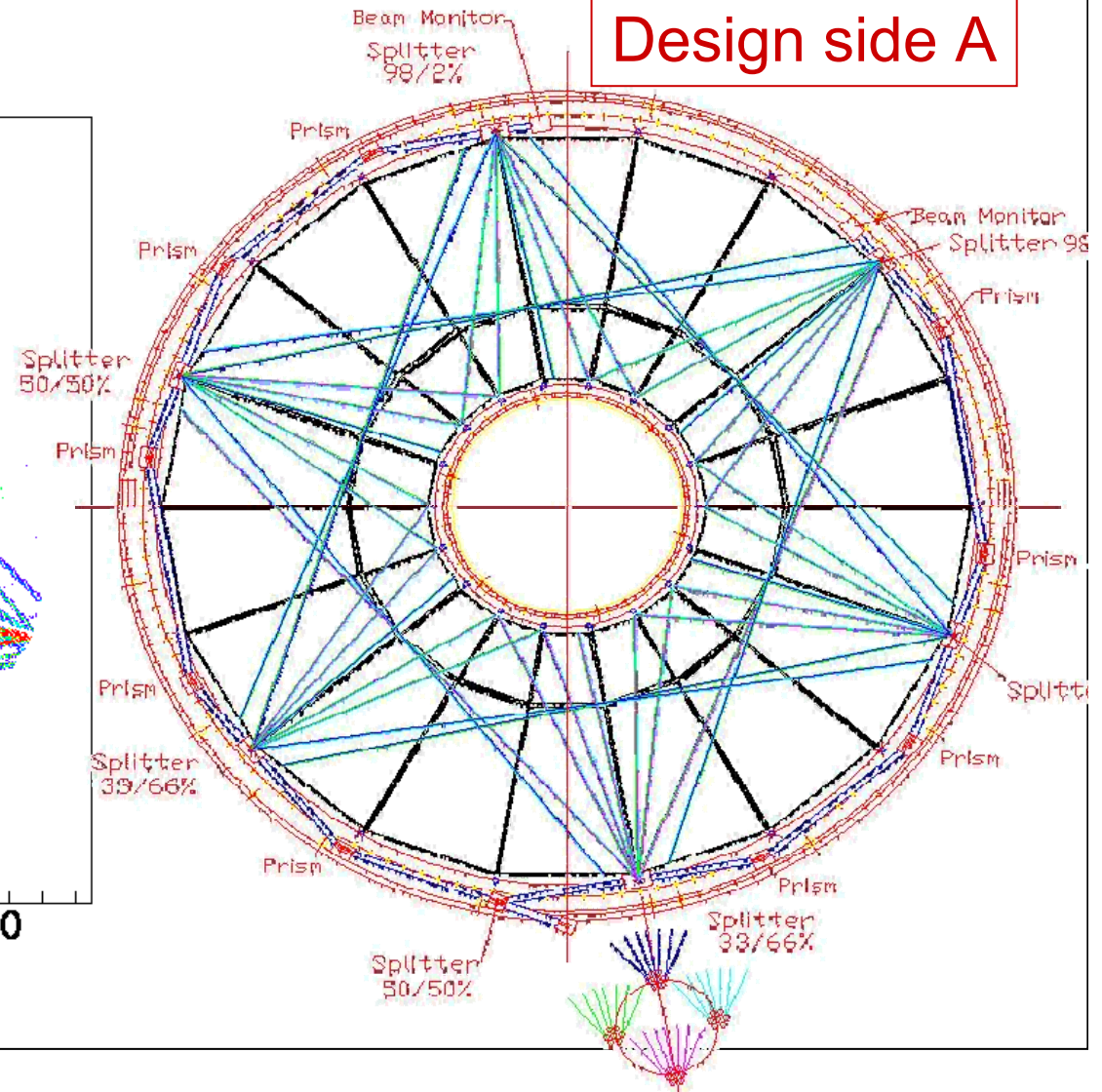
# TPC Laser system



Measured side A



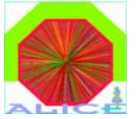
Design side A







# TOF



## ● Component Production

- ⇒ strip construction: 85% done
- ⇒ module production : 41 % done
- ⇒ FEE cards: 78 % done

## ● Assembly & Installation

- ⇒ Supermodule assembly : started in **May 06**
- ⇒ 2 SMs installed **Oct 06**

## ● Schedule

- ⇒ strip completed: **Nov 06**
- ⇒ modules completed: **May 07**
- ⇒ 7 more SMs ready for installation : **May 07**
- ⇒ TOF production complete: **end 2007**
  - ★ installation during winter shutdown 2007/8



TOF SuperModule



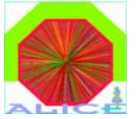
In the pit: installing first TOF SuperModule







# 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**

⇒ 1<sup>st</sup> Supermodule completed Sept 2006,

★ **installed October**

⇒ 2 more SM's for installation in May 2007

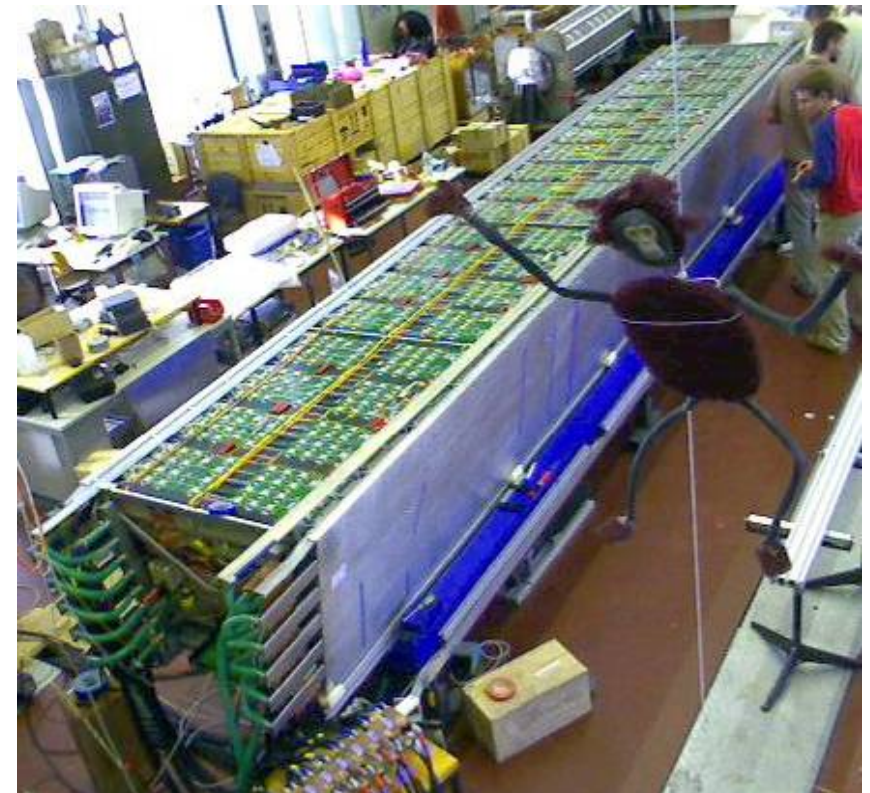
⇒ aim to have 18 SM ready for installation end 2008

- **Concerns**

⇒ **tight schedule production of SMs for 2<sup>nd</sup> installation period**

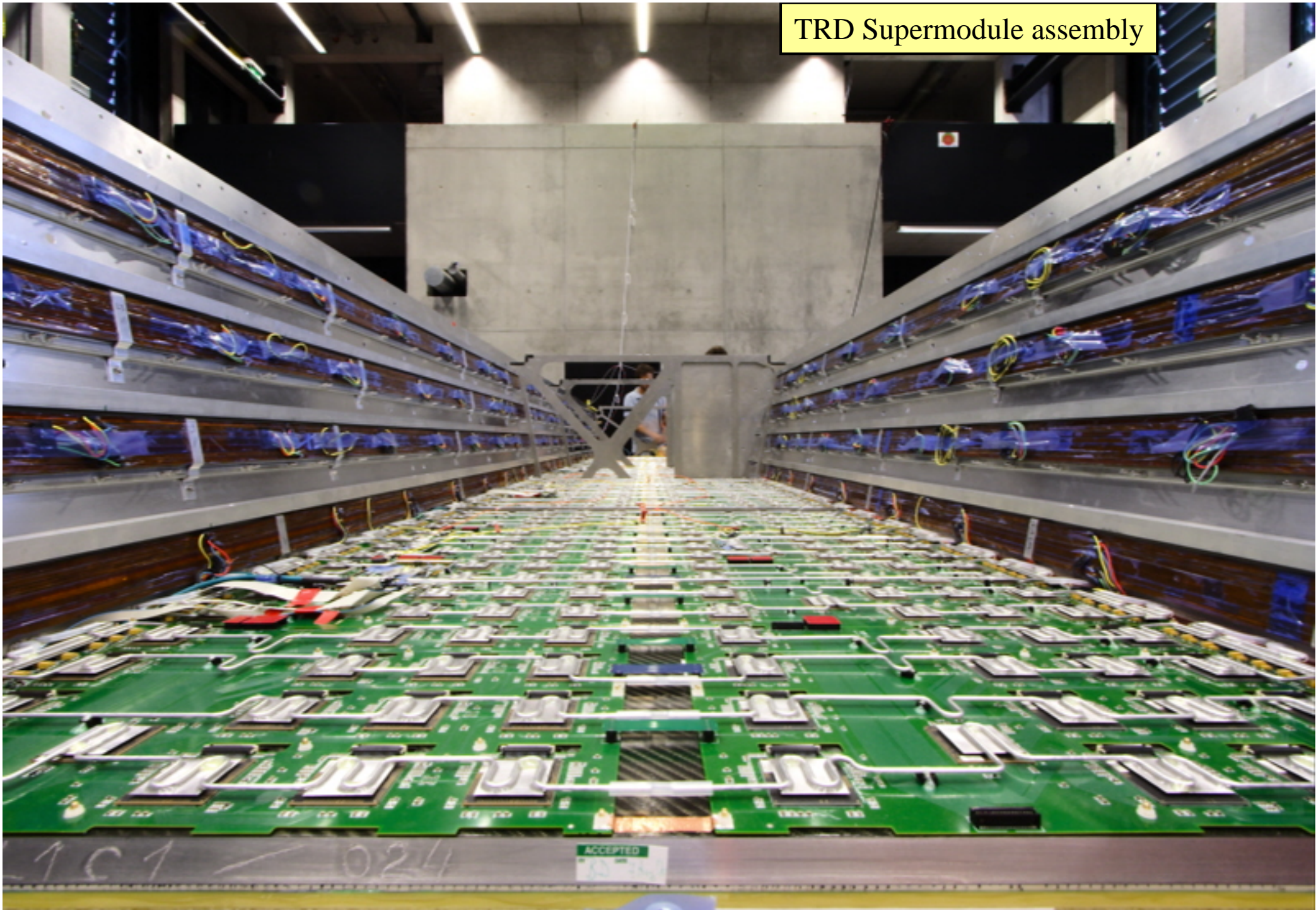
★ **equipping chambers transferred now to U. Frankfurt (started up)**

★ **building SMs being transferred to U. Muenster**

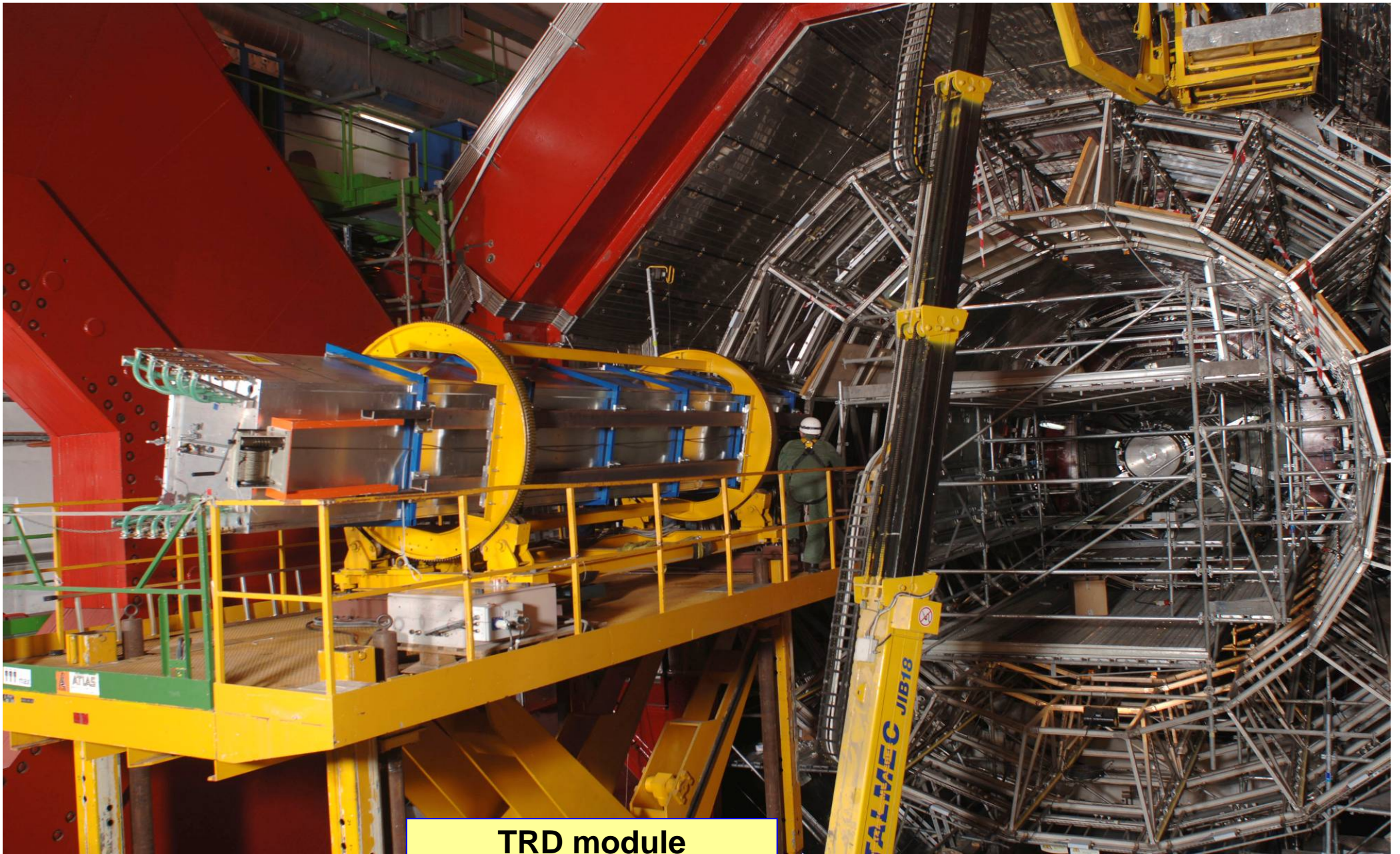




TRD Supermodule assembly

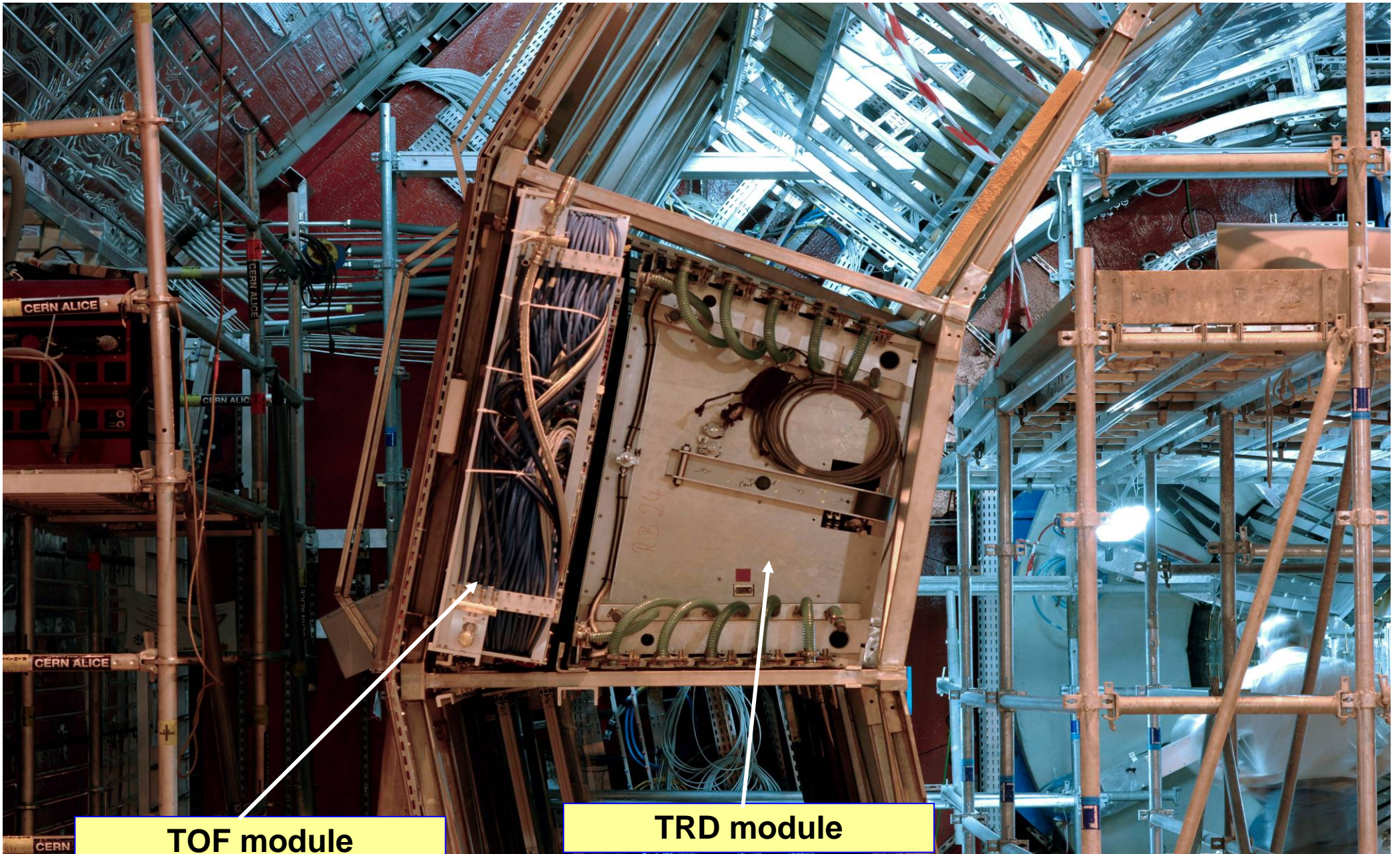






**TRD module  
during installation**





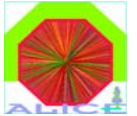
**TOF module**

**TRD module**





# Muon Arm



## ● Tracking

⇒ chamber production **complete**

☆ assembly & installation ongoing

⇒ FEE electronics:

☆ MANAS chips **complete** (last batch send 19.10)

☆ FEE board MANU ~**30%** delivered, rate 500 MANU/week

☆ FEE is rate-limiting => completion date shifted by 2 months

⇒ Rails, supports and cooling: installed by mid-November

⇒ Chamber installation: station 4: **2 half-chamber installed**;  
**3<sup>rd</sup> ready to install, 4<sup>th</sup> ready to install week 43**

## ● Trigger

⇒ **Installation complete !**

☆ now connecting services

⇒ Commissioning to start early 2007

### Assembly

-station 4: [**Apr 06** - Oct]

-station 5: [Oct - Jan 07]

-station 1: [ Apr - Dec]

-station 2: [Jul - Jan 07]

-station 3: [Feb - **Apr 07**]

### Installation

-station 4: [**May 06**- Oct]

-station 5: [Nov - Jan 07]

-station 1: [Dec - Jan 07]

-station 2: [Feb - Mar 07]

-station 3: [Apr - **May 07**]



Muon tracking chamber





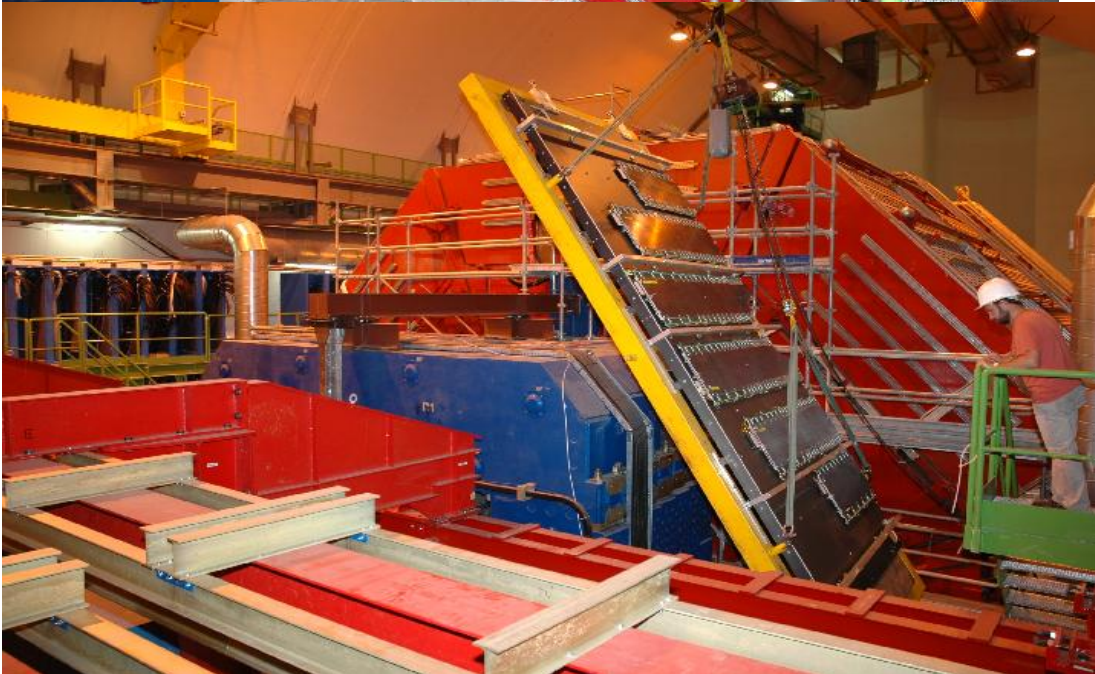
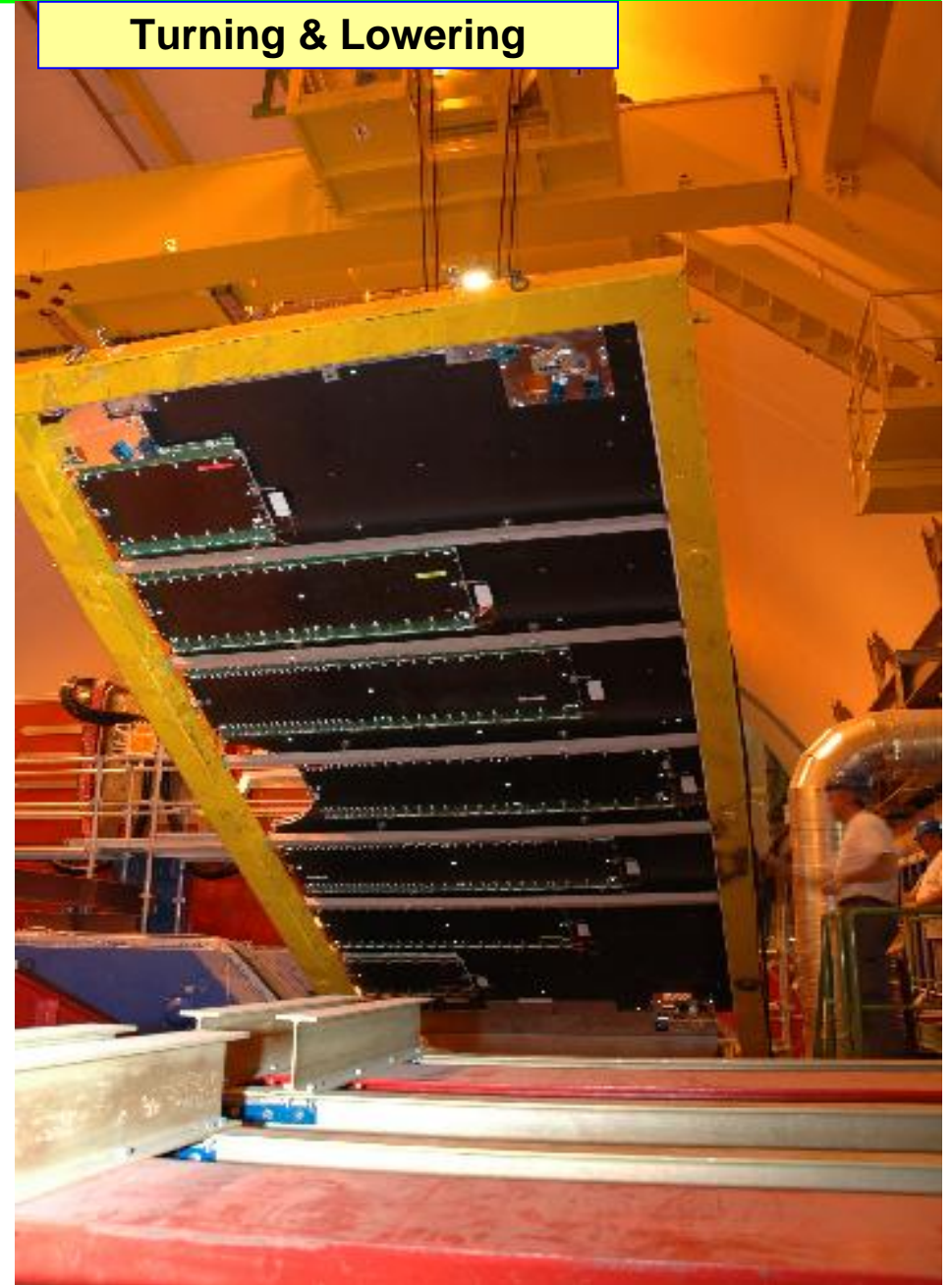
# Muon Tracking Chambers (July 06)



Transport across L3 magnet

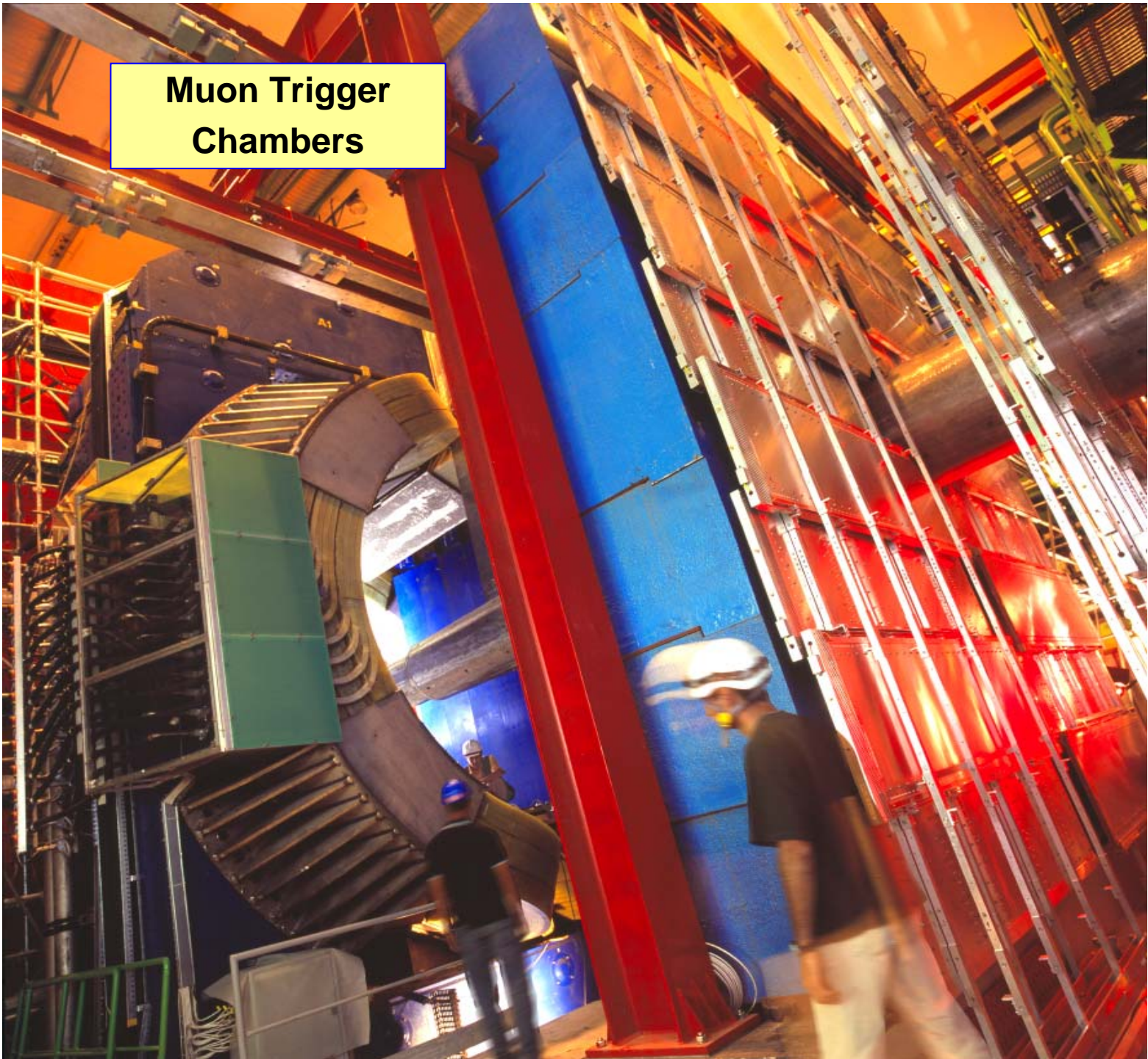


Turning & Lowering





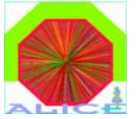
**Muon Trigger  
Chambers**







# Other Detector Systems



## ● PHOS:

- ⇒ **1<sup>st</sup> module** completed, tested & calibrated in beam
  - ★ some improvements to be implemented
  - ★ installation shifted into 2007 to include trigger cards
- ⇒ modules 2 & 3 to be produced and calibrated in 2007

## ● HMPID:

- ⇒ **Installation completed !**

## ● Forward Detectors (V0, T0, FMD, PMD, ZDC):

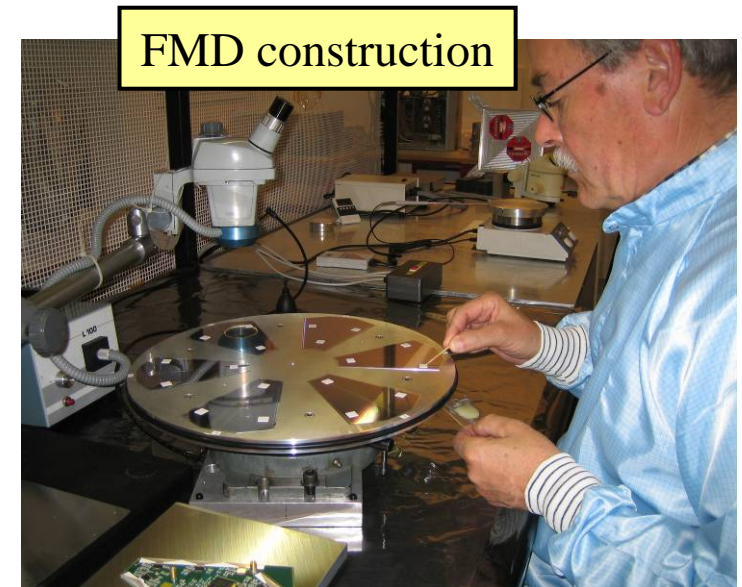
- ⇒ **all in production**, on track

## ● ACORDE cosmic trigger:

- ⇒ **1/3 installed** (others used in TPC test)

## ● Trigger, DAQ, HLT, Control (DCS, ECS):

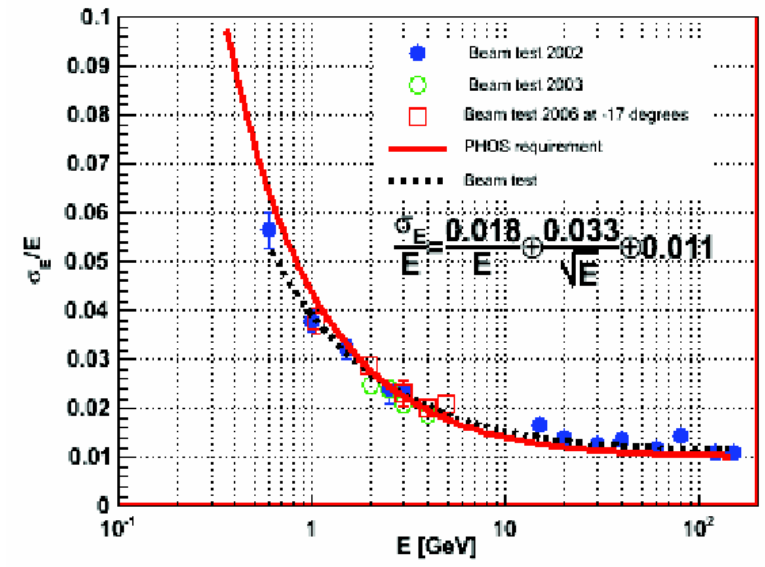
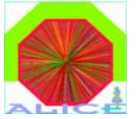
- ⇒ all systems progressing **well and on schedule**



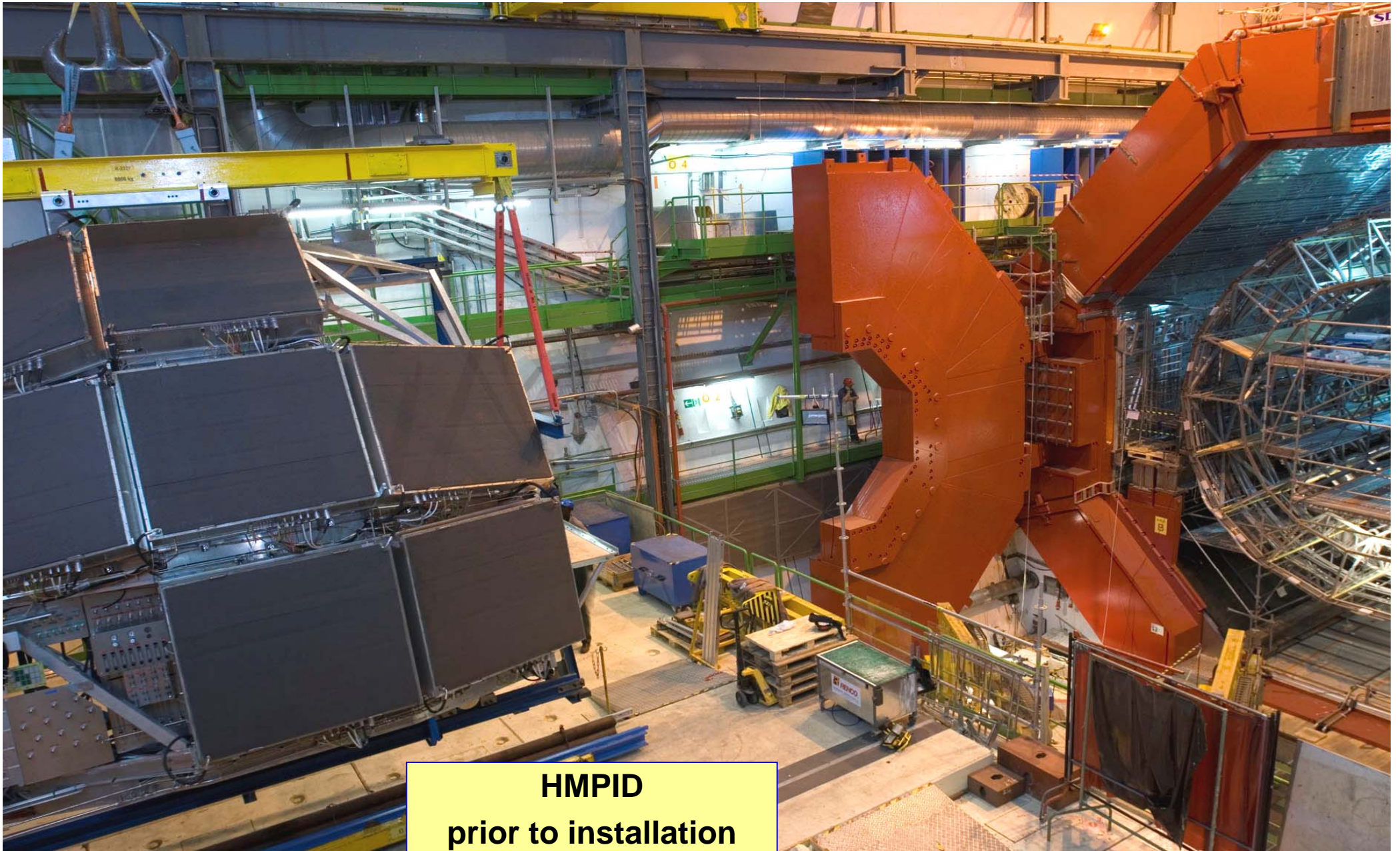




# PHOS Calibration







**HMPID  
prior to installation**









# 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): ready to **start end 2006**

## ● 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

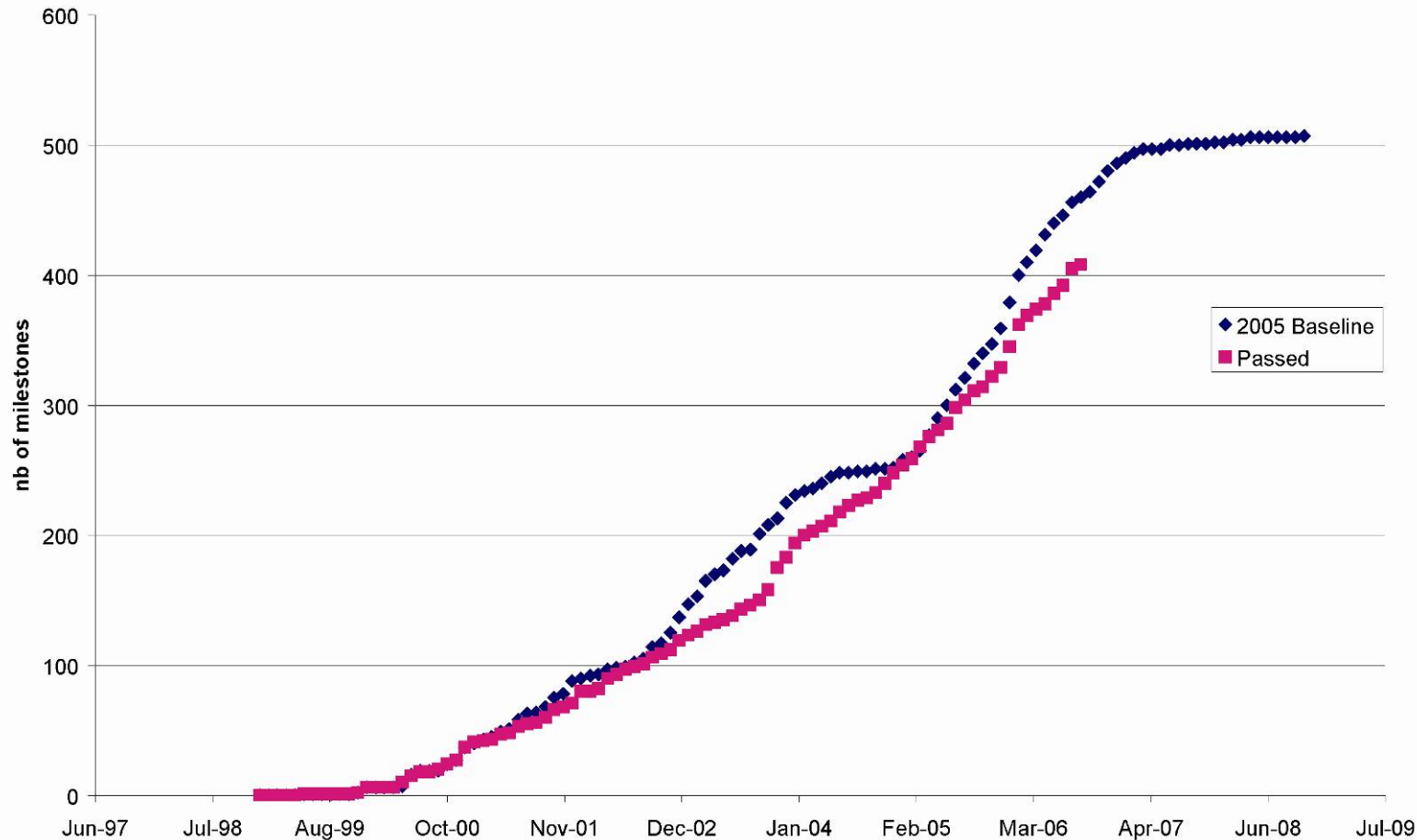
✦ hopefully some room for better distribution of pledged resources within WLCG...

		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%	-



# Milestones

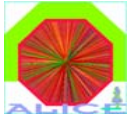
ALICE LHCC Milestones - September 2006



- Delay of ~3 months compared to 2005 Baseline (ALICE closed in April)
- Compatible with current schedule (ALICE closed end July)
- **Critical path: ITS detectors**



# Summary



## ● Major Milestones

- ⇒ **ITS assembly** significant progress for all 3 systems
- ⇒ **Detector installation** started (Muon chambers, HMPID, ACORDE, TOF, TRD)
- ⇒ **Reduced computing deficit**
- ⇒ **Significant strengthening of Collaboration** (US, Japan, ...)

## ● Biggest Concerns

- ⇒ very tight **schedule for ITS**
- ⇒ **Services and cabling:** enormous amount of work & logistics challenge
- ⇒ **Computing resources:** still some way to go