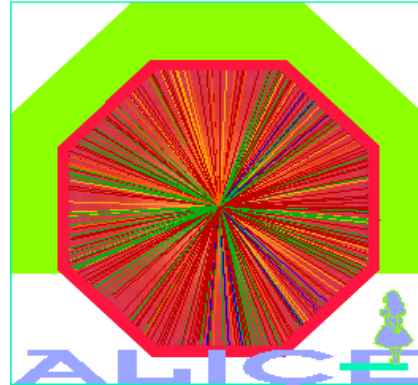


12th ALICE RRB

- Collaboration Status

- ⇒ Greek participation

- Project Status



24 April 2002

12th ALICE RRB J. Schukraft

ALICE CERN-RRB-2002-065

Collaboration Status

- Institutes

- ⇒ **joined**: Cape Town (SA), Ohio SC (USA)
 - ✚ participate in muon arm (SA), offline GRID computing (OSC)
- ⇒ **applying**: 3 groups from Mexico (Puebla Univ, Michoacana Univ., Cinvestav)
 - ✚ take responsibility of cosmic trigger (calibration & tests)
 - ✚ increased CORE contribution of Mexico under discussion
- ⇒ **under discussion**: ISS (Romania), Kaiserslautern (D), Jagellonian Univ. (PL)
- ⇒ **left**: all Greek Institutes (Athens, Demokritos, Ioannina)

- US participation in ALICE

- ⇒ **> 60FTE (staff+students) , ca 5.5 M\$** CORE contribution
 - ✚ participation in PHOS, new e.m. calorimeter, computing
- ⇒ **proposal submitted to DOE March 15**, first discussion in April

- Japanese participation in ALICE

- ⇒ first 'grant-in-aid' and R&D for TRD approved, full proposal towards end 2002

- Organization

- ⇒ Y. Schutz (Nantes) elected as new Deputy Spokesperson from 1.9.2002 for 1 year
- ⇒ new ALICE constitution approved (part of M&O MoU)

24/4/2002 12th RRB J. Schukraft

Greek Participation in ALICE

- all 3 Greek Institutes left ALICE in March (for CMS)
 - ⇒ surprise decision (MoU signed in January 2002 !)
 - ✚ concentrate Greek resources in fewer LHC experiments ?
 - ✚ possibly less obstructive environment for CASTOR calorimeter ?
 - ⇒ one subgroup actually wants to remain in ALICE, to be clarified...
- formal reaction required by CERN, RRB

Article 3.3 of the ALICE MoU:

3.3 Any Funding Agency may withdraw its support from the Collaboration by giving not less than eighteen months notice in writing to the Collaboration and the Director General of CERN. In such an event, reasonable compensation to the Collaboration will be *negotiated through CERN and confirmed by the RRB*.

3

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Outstanding Invoices for Greece

- Outstanding debt (1998 - 2002): 65,620 SF

Summary of Outstanding Invoices

1 - Common Fund

Inst.	Year	Amount (CHF)	Invoice
Ioannina	1998	5,000	invoice ref. 1998/189
Ioannina	1999	5,000	invoice ref. 1999/68
Ioannina	2000	5,000	invoice ref. 2000/225
Ioannina	2001	5,000	invoice ref. 2001/955
Ioannina	2002	5,000	invoice ref. 2002/2302
Athens University	1999	5,000	invoice ref. 1999/49
Athens University	2001	5,000	invoice ref. 2001/953
Athens University	2002	5,000	invoice ref. 2002/2300
Demokritos	2001	5,000	invoice ref. 2001/954
Demokritos	2002	5,000	invoice ref. 2002/2301

2 - Common Expenses

Athens, Dem. & Ioan.	1998	6,000	invoice ref. 1998/190
Athens	1999	2,000	invoice ref. 1999/267
Athens	2000	2,000	invoice ref. 2000/268
Athens	2001	2,000	invoice ref. 2001/953
Demokritos & Ioannina	2001	2,000	invoice ref. 2001/954

3 - M&O Expenses

Greece	2002	1,620	invoice ref. 2002/2211
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4

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Consequences

- MoU commitments: 1.5 MSF

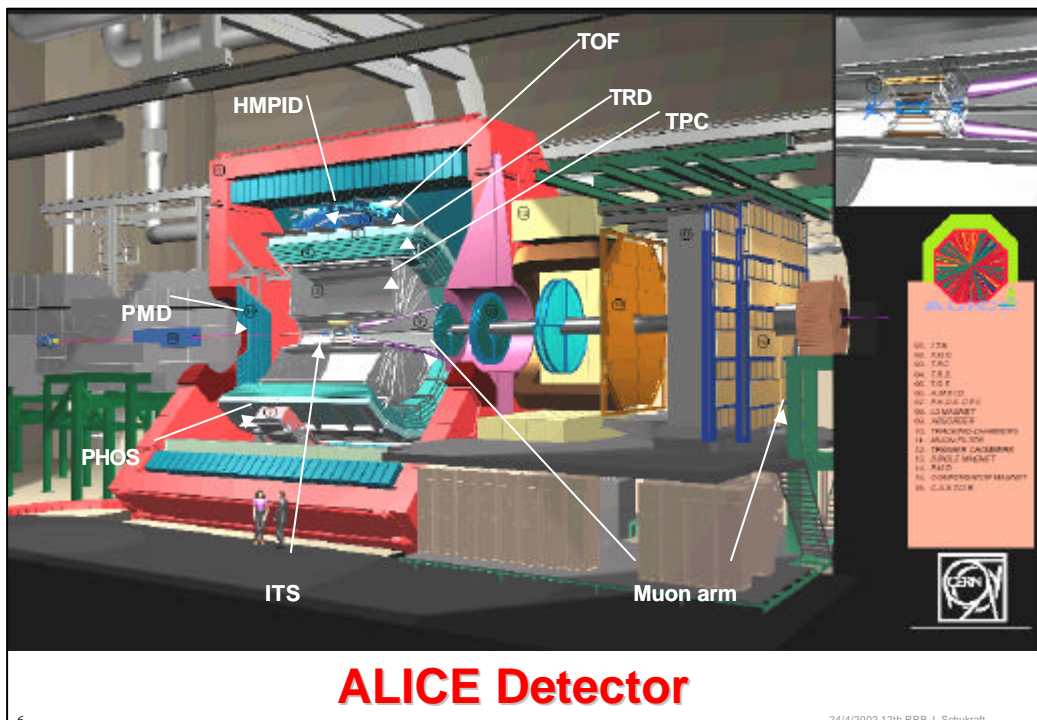
1) Castor (item 3.2)	Greece: 600.2 kSF
2) FMD (item 3.4)	Greece: 499.7 kSF , Denmark: 580.5 kSF, Russia 40.3 kSF
3) T0 (item 3.5)	Greece: 248.8 kSF , Russia: 62.2 kSF
4) Common Fund	Greece: 150 kSF

- practical measures taken by ALICE

- ⇒ **Castor:** **no longer** part of ALICE program
 - ✦ Castor was dedicated to 'exotica' searches
- ⇒ **T0:** **Finland** will shift 200 kSF from ITS to T0
 - ✦ made possible by savings due to in-house assembly of SSD's in Helsinki
- ⇒ **FMD:** **overfunding** in MoU (300 kSF), look for simplifications
- ⇒ **Common Fund:** **find savings** of around 100 kSF ? (**assuming debt will be paid**)
- ⇒ reduce **shortfall** to about **200 kSF** (30 kSF T0, 170 kSF FMD)

5

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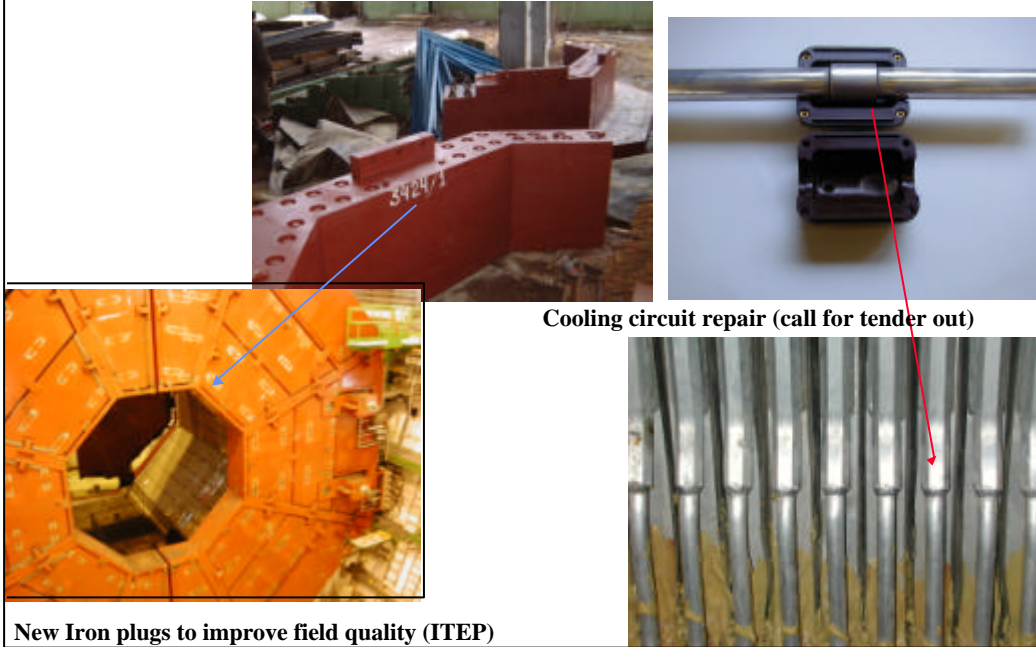


ALICE Detector

6

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L3 Magnet



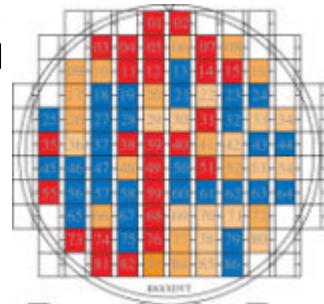
Cooling circuit repair (call for tender out)

New Iron plugs to improve field quality (ITEP)

SPD - FE Electronics & Bump-Bonding

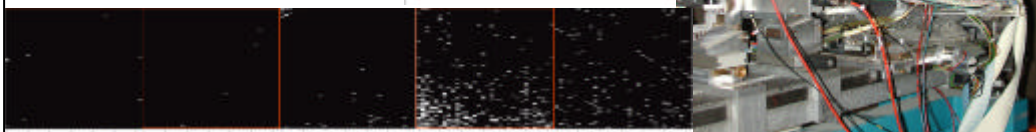
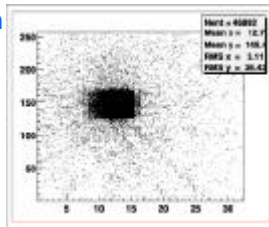
- pixel wafer production lot procured (48) for ALICE (~ 30% of total need), LHCb and NA60
- bump-bonding successful ! Two suppliers:
 - ⇒ AMS/Italy (Indium) ~ 10 singles, 2 ladders
 - ⇒ VTT/Finland (solder) ~ 20 singles, 2 ladders
- pixel wafer thinning after bump deposition
 - ⇒ <150mm thickness achieved in trials (sensors 200mm)
- PILOT control ASIC prototype working
- fast & efficient DAQ system
- **Pixel project well on track**
some delay to be recovered in production

wafer map
class 1
chips



beam test
summer 01

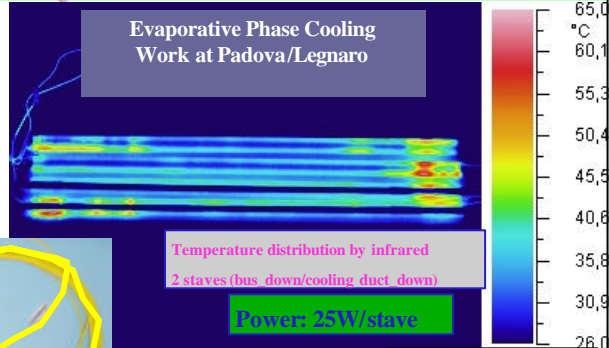
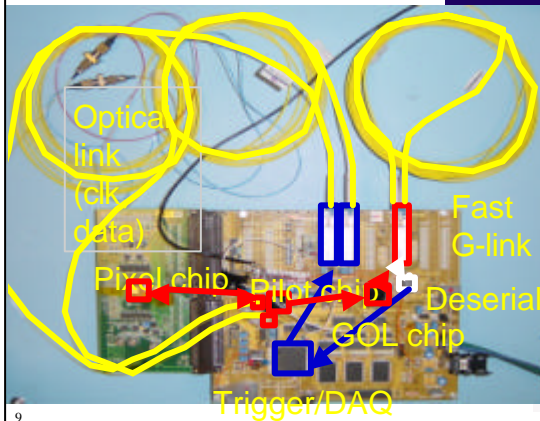
efficiency
94%- 99.5%



SPD - System tests

- **Next steps:**

- ⇒ system aspects (R/O bus, cooling, ..)
- ⇒ preparation of assembly facilities



A
50 mm kapton
25 mm copper
60 mm epoxy resin
125 mm kapton
50 mm cond. grease
40 mm SS cooling

9

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Silicon Strip Detector (SSD)

- **Detector tender completed**

- ⇒ three companies share the 1800 detector production, pre-serie

- **New, radtol FEE chip (HAL25) prototype working**

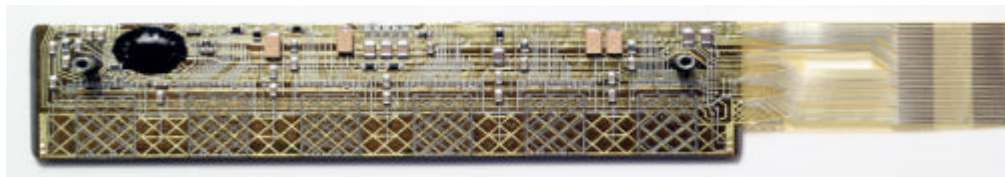
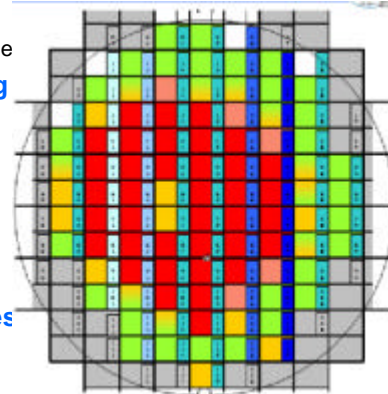
- ⇒ **very fast development** (~ 1 year) by Strasbourg, only minor adjustments needed (power consumption)
- ⇒ **systematic yield problems**, under investigation !
- ⇒ if solved, engineering run first half of 2002

- **Hybrid design defined**

- **R/O electronics and controls being finalized**

- **NOW: tune production/test/assembly procedures**

- ⇒ in house assembly (France, Italy, NIKHEF, Finland)
- + part in Industry

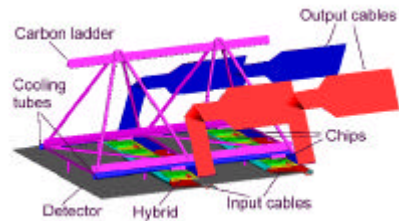
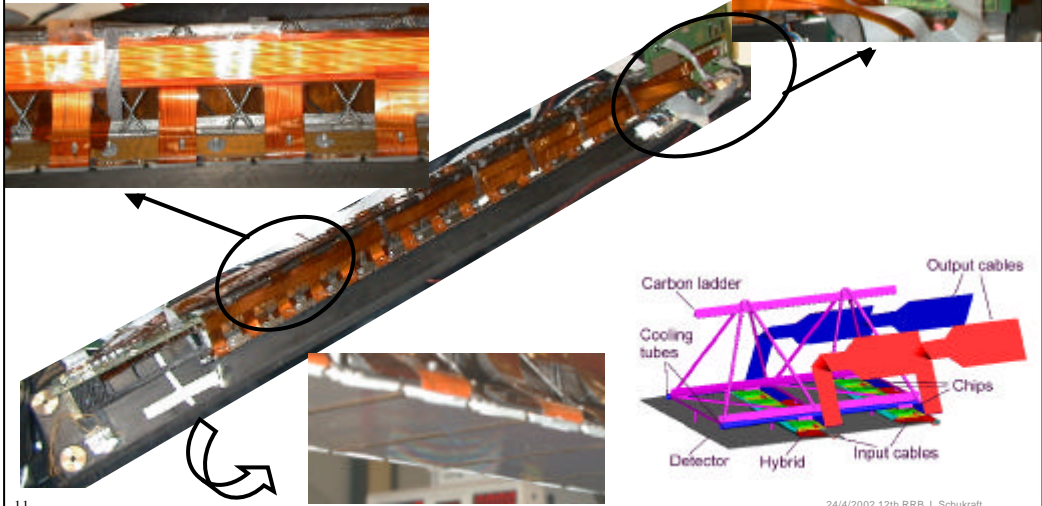


10

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First STAR Ladder

- 16 modules, similar assembly technology



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Forward detectors

PMD pre-shower det.
redesign for new position
(increased granularity) almost
complete, two beam tests in
2001 with new design

V0 $1.6 < |\eta| < 3.9$ Interaction
trigger, centrality trigger and beam-gas
rejection. Two arrays of 72 scintillator
tiles readout via fibers

T0_L

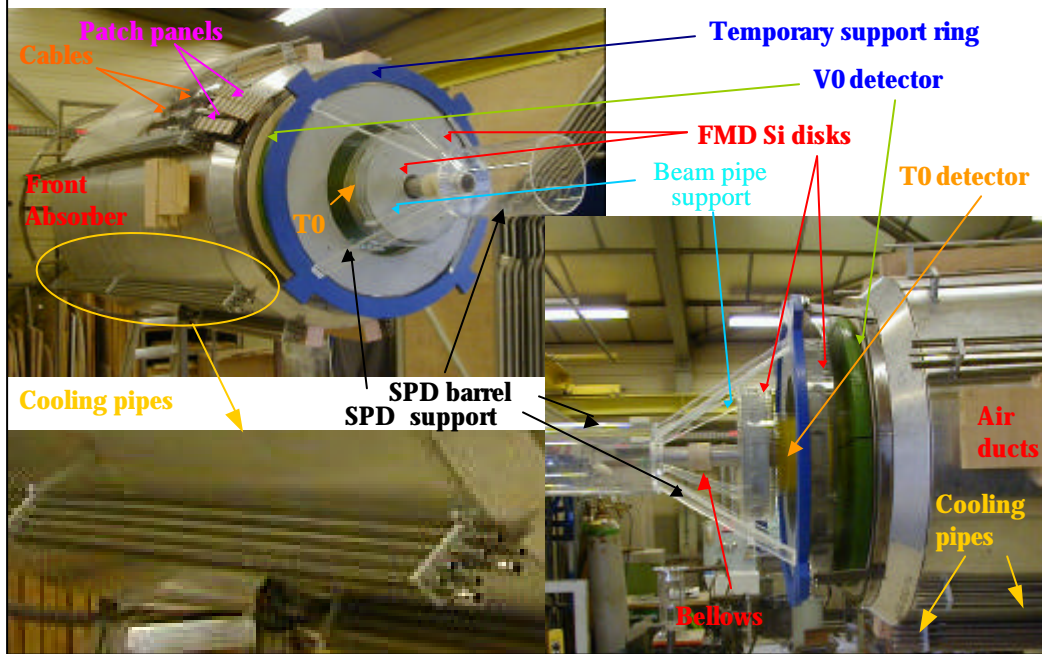
FMD Measure Multiplicity and $dn/d\eta$
 $1.6 < \eta < 3$ and $-5.4 < \eta < -1.6$
Silicon pad detector disks (slow readout) with
12k analog channels

T0_R $2.6 < |\eta| < 3.3$ T₀
for the TOF (< 50 ps time res.) Two
arrays of 12 quartz counters.
Also backup to V0

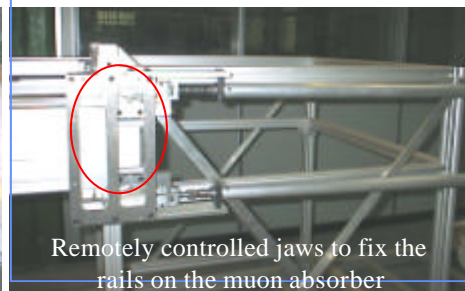
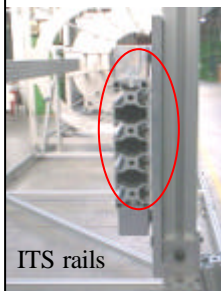
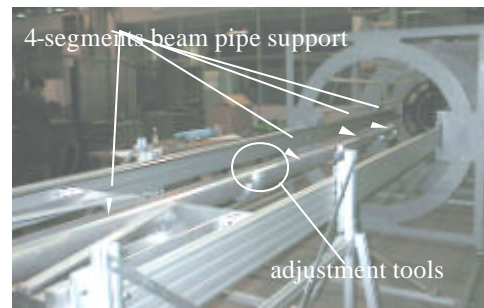
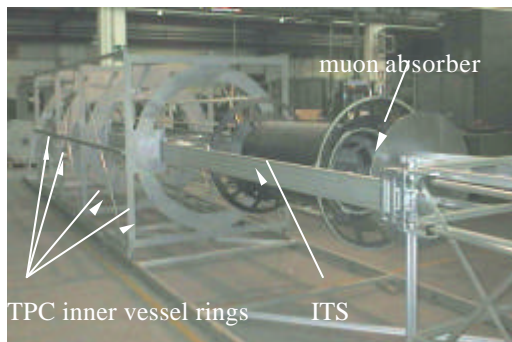
12

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ITS/FWD Cabling Maquette



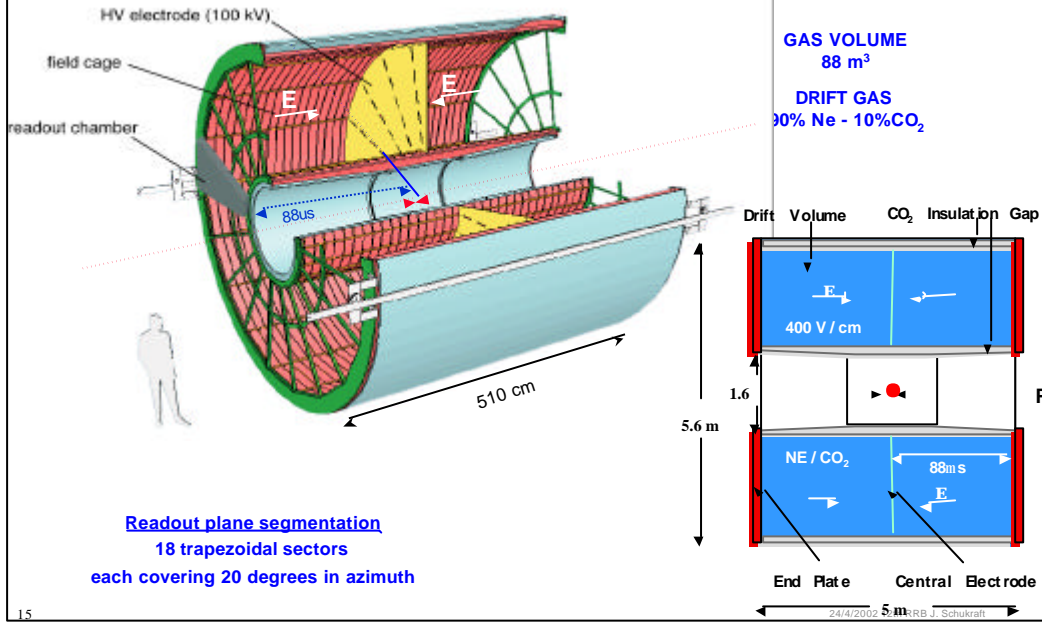
ITS Installation: testing



Full scale model to test installation rails, insertion, removal & integration of ITS with FMD, TPC and beampipe

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TPC layout



15

TPC status: Field Cage

BEING MANUFACTURED! (after re-tendering to reduce cost)

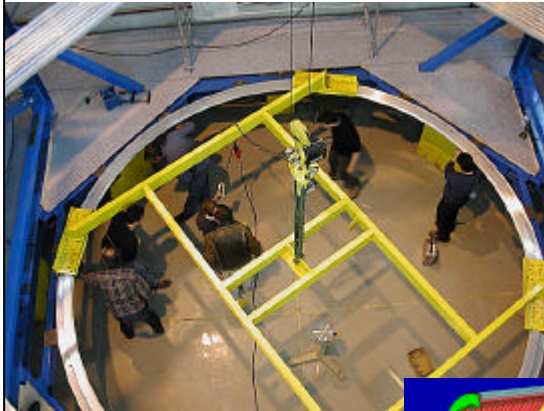
Hand lay-up of composite structure

Cylinders are fabricated from three 120-degree-panels' glued together (lashing).
Production has started in September 2001
Inner FC arrived at CERN end March

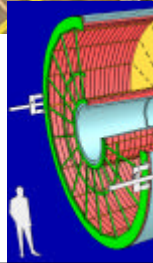
- Aluminum
- Tedlar®
- Fiber Pre-Pregs
- Nomex®
- Honeycomb Core

16

TPC: Flanges and Endplates



Forged and machined rings
for OFV & OCV
*André Constructions Mécaniques -
Grenoble - France*



10 m Ø vacuum tank for electron
beam welding Endplates
DCN Nantes - France

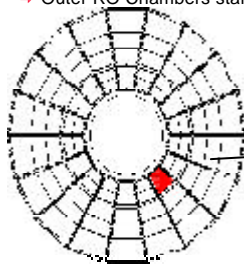
17

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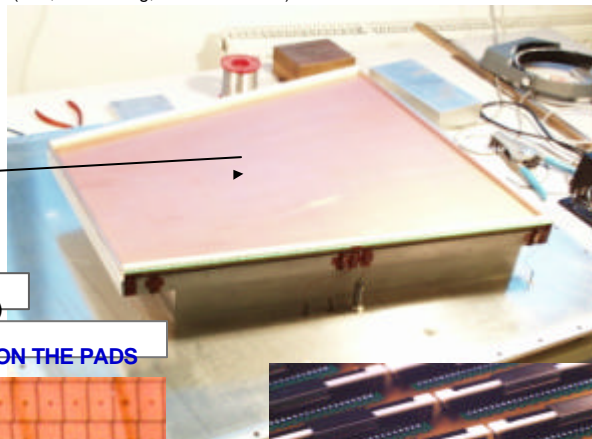
TPC: RO Chambers

● **R&D completed, in production**

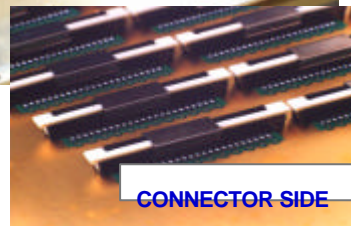
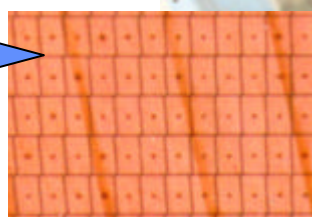
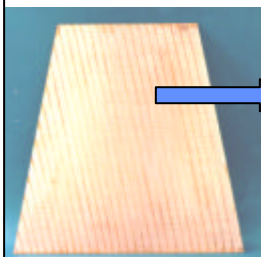
- ⇒ Inner RO Chambers >50% production done (GSI, Heidelberg, later Bratislava)
- ⇒ Outer RO Chambers start prod. 1st Q02



Pad Plane: 5504 pads (4x7.5 mm²)

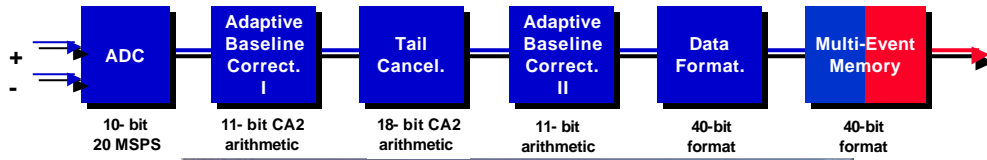


CLOSE-UP ON THE PADS



CONNECTOR SIDE

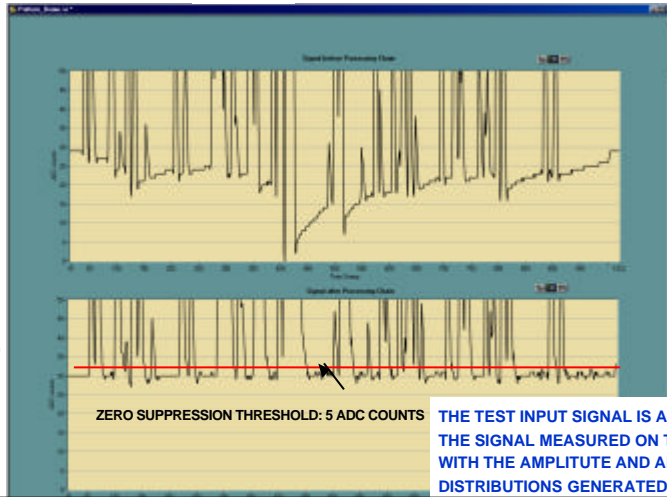
TPC Electronics: ALICE TPCE READOUT CHIP (ALTRO)



ALTRO OUTPUT
FILTER DISABLED

ALTRO
test result

ALTRO OUTPUT
FILTER ENABLED



Taken up in TT
Database,
lively customer
interest!
(both Industry
and research
labs)

21

HMPID Module #1

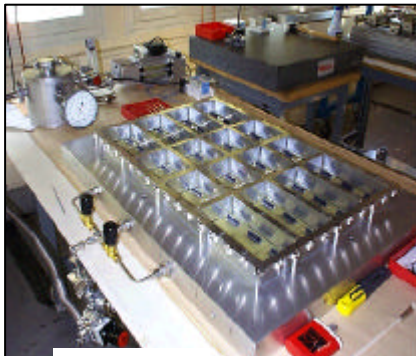
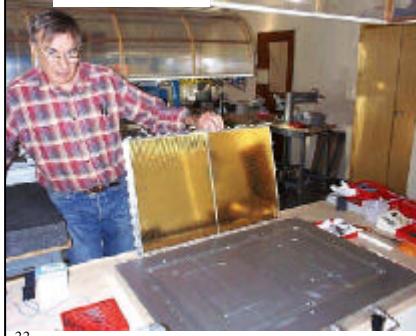
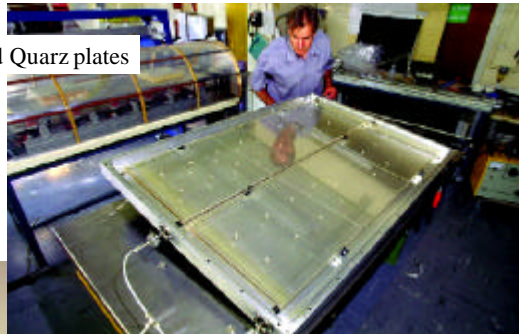


Photo cathode

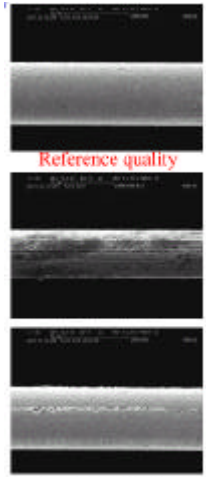
Fused Quartz plates



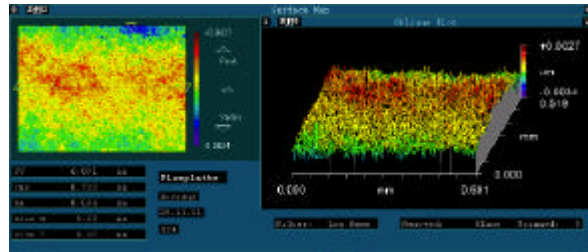
22

HMPID Quality Control

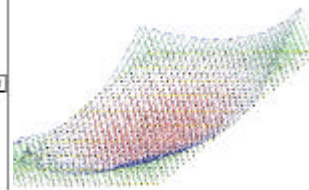
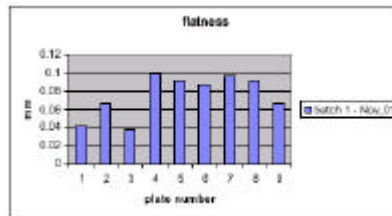
Anode wires: 20 μm gold plated tungsten-rhenium



Quartz roughness < 1 nm rms



Quartz flatness and parallelism < 0.1 mm



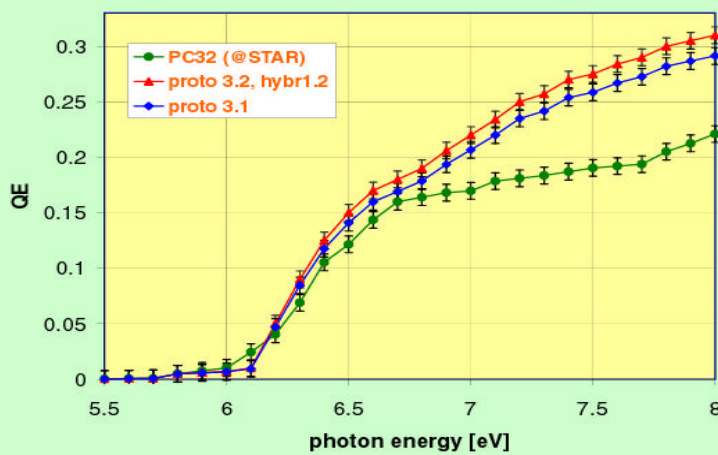
Quartz quality control at Berlin Glass KG

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23

CsI Quantum Efficiency

CsI quantum efficiency measured in HMPID prototypes test-beam



Improved photo-cathode QE by optimizing CsI evaporation parameters

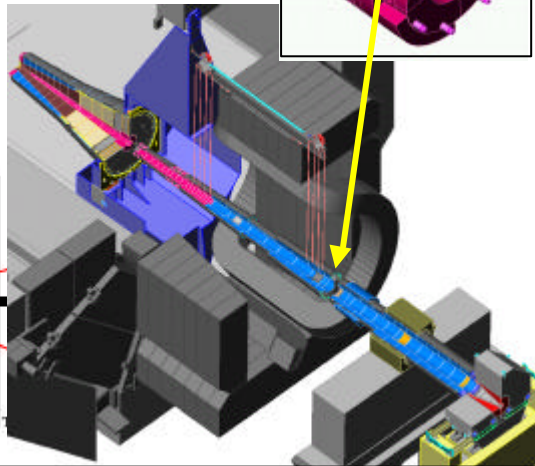
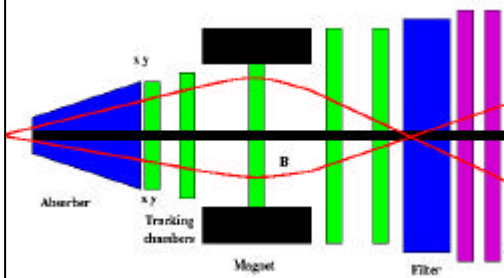
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24

Dimuon Spectrometer

- **Progress:**

- ⇒ production of **magnet** started (yoke and coil)
- ⇒ **trigger** chambers final prototype tested
- ⇒ PRR of **tracking** chambers end 2001
- ⇒ begin of detector production in 2002
- ⇒ **absorber** design being revised to reduce cost (100 tons)



25

Muon Magnet

- **Dipole Magnet**

- ⇒ 0.7 T and 3 Tm
- ⇒ World's largest warm dipole

- **Progress:**

- ⇒ **Coil** production in progress in **France**
- ⇒ **Yoke** production in progress in **Russia**



Test coil winding



Iron yoke

26

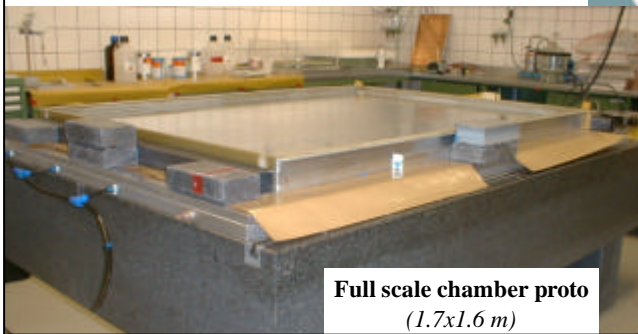
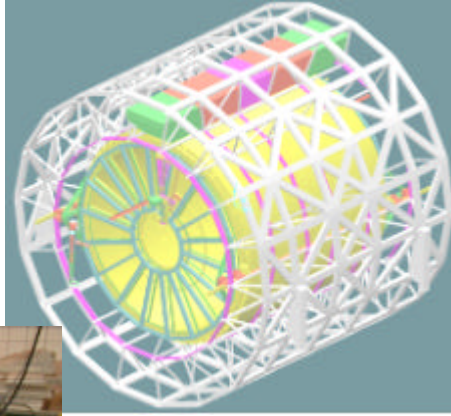
Transition Radiation Detector (TRD)

- **TRD TDR**

- ⇒ submitted Oct. 2001
- ⇒ approved Febr. 2002

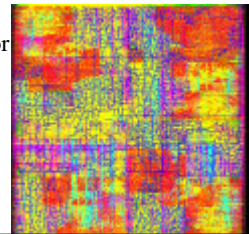
- **reduced acceptance proposed to LHCC**

- ⇒ **3 out of 5 azimuthal rings**
 - ⊕ ~ 60% acceptance for single leptons
 - ⊕ ~ 45% acceptance for lepton pairs



Full scale chamber proto
(1.7x1.6 m)

track processor
Layout
(MIMD)



Trigger

- **important design changes prompted by LHCC CR (Jan 2001)**

- **increased functionality and performance**

- ⇒ increase number of **trigger inputs**
 - ⊕ L0 (1.5 μ s): 16 -> 24 (strobe fast dets)
 - ⊕ L1 (~6 μ s): 12 -> 20 (strobe slow dets)
 - ⊕ L2 (~ 100 μ s) 4 -> 6 (initiate R/O)
- ⇒ increase number of concurrent **trigger classes** ('physics triggers')
 - ⊕ from 12 to 50

- **simplified architecture**

- ⇒ introduce **trigger dead** time of < 2 μ s
 - ⊕ no effect on physics (pile-up protection > trigger dead time)
 - ⊕ max. interaction rates 10 kHz (Pb-Pb) - 200 kHz (pp)
- ⇒ reduce number of independent **detector clusters** for R/O from 12 to 6

- **status**

- ⇒ new URD accepted Jan. 2002
- ⇒ many smaller improvements (scalers, pile-up protection, ...)
- ⇒ **much improved ALICE trigger !**

ALICE Computing

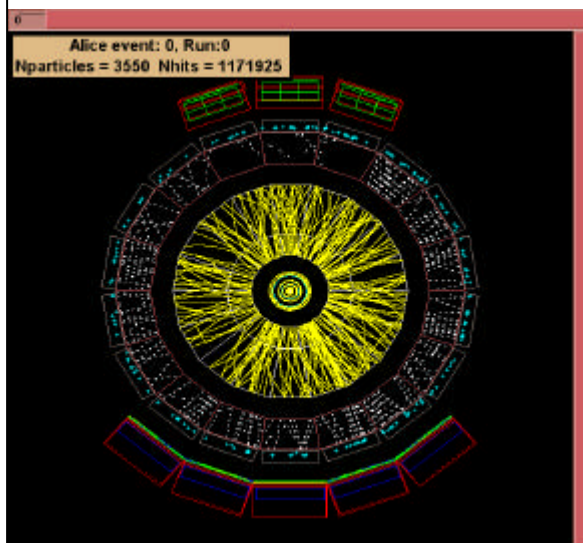
- ALICE computing ~ same order of magnitude as ATLAS or CMS
- offline status
 - ⇒ Major decisions already taken (DAQ, Off-line)
 - ✚ Move to C++ completed (TDR's produced with the new framework)
 - ✚ Adoption of the ROOT framework
 - ⇒ Participate in Data Challenge program
- Physics Performance Report (mid-end 2002, parallel to CERN TH WS)
 - ⇒ Evaluation of acceptance, efficiency, resolution for signals
 - ✚ Simulation of ~10,000 central Pb-Pb events
 - ✚ Signal Superposition + Reconstruction 100,000 events, ~ 200 TB total
 - ⇒ 1 event: 24 h simulation + 12 h digitization (800 MHz PIII)
 - ✚ ~ 1/2 year flat with 100 PC's
 - ⇒ Distributed production in several ALICE sites using GRID tools
 - ✚ Installation kit, Book keeping & Data Management, Farm Monitoring
 - ⇒ Started November 2001

29

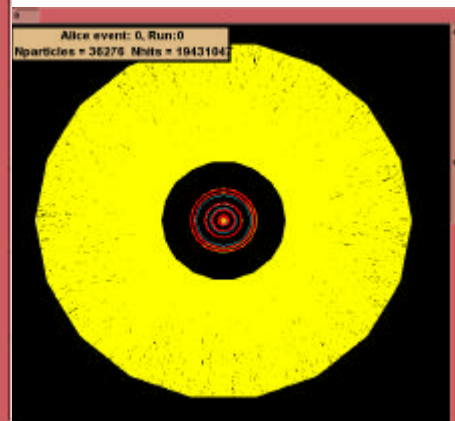
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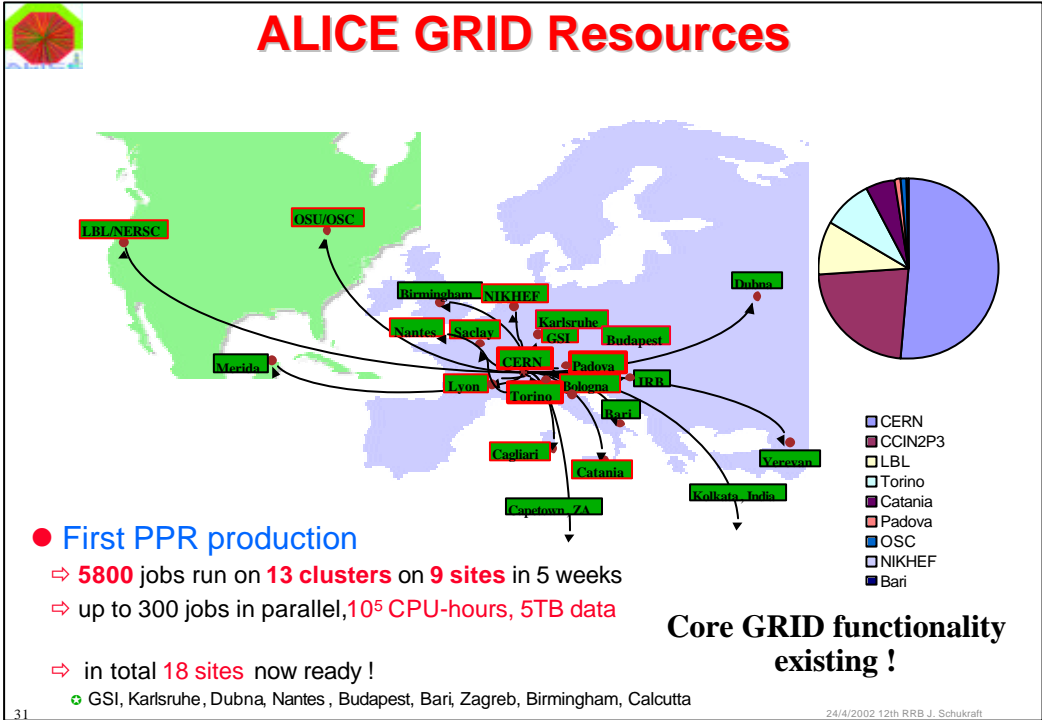
In Action...

- Full simulation of ALICE (shown is a 2^0 q slice) with Pb-Pb events at max multiplicity



For full event:





Summary

- Collaboration**
 - ⇒ still potential for significant growth
 - ⇒ financial problems (few % level)
 - ✦ manageable (unless severe fall-out from CERN crisis...)
- Detector**
 - ⇒ last baseline detector **TDR submitted** (TRD)
 - ✦ missing: TOF addendum, Computing/DAQ/Trigger/HLT, PPR
 - ⇒ **major progress & problems solved**
 - ✦ from pixels (bump bonding),, to computing (grid prototype)
 - ⇒ **Production started in 2001 on significant scale**
 - ✦ struggle to stay in time & budget

On track to have initial detector ready for physics @ LHC start-up

32 24/4/2002 12th RRB J. Schukraft