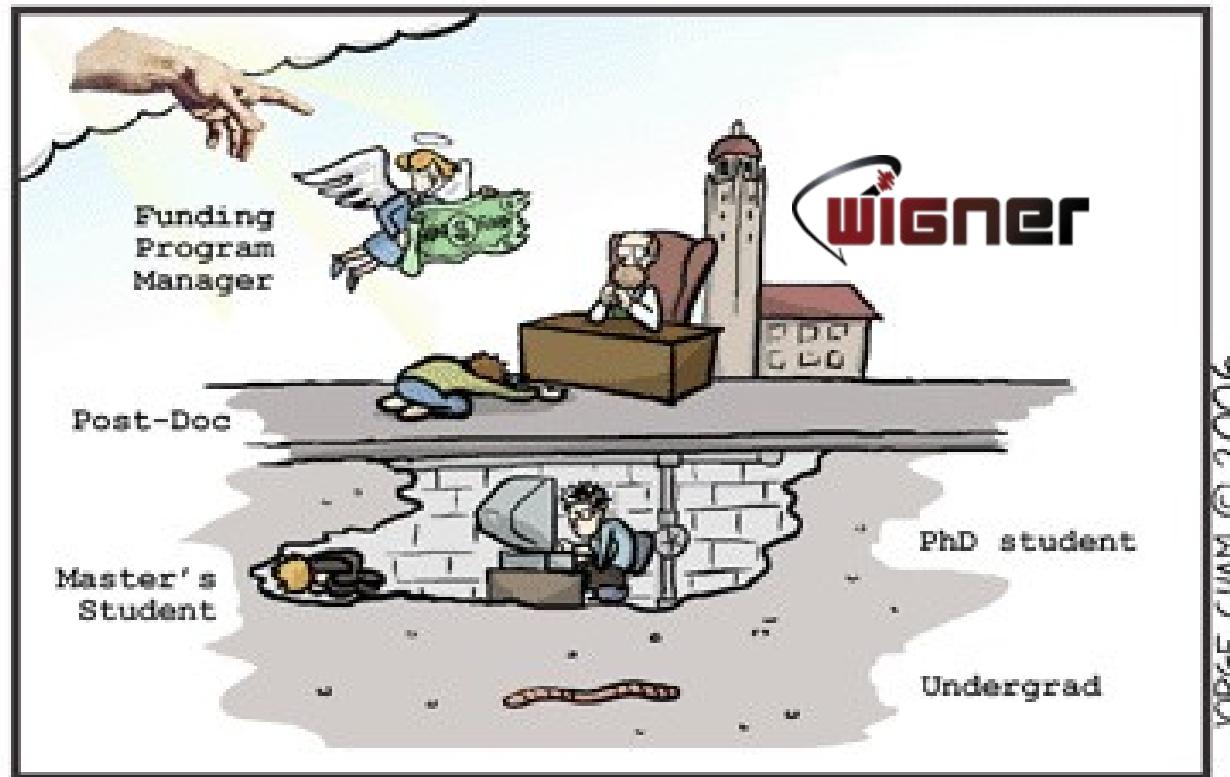




Hungarian ALICE Group @ Wigner RCP of the HAS



G.G. Barnaföldi,  
Zagreb-Budapest Meetup 2013, Wigner RCP, Budapest, 15<sup>th</sup> November 2013

# OUTLINE

- The Hungarian ALICE Group
  - Resources
  - Directions
- Contributions by the Hungarian ALICE Group
  - Hungarian Contribution at the early stage
  - Recent works for the ALICE Collaboration
- The Future of the Hungarian ALICE Group
  - Participation in UGs and recent developments,

# The Hungarian ALICE Group

## The most valuable: Human Resource Senior Staff

 <p><b>Barnaföldi Gergely Gábor</b> csoportvezető E-mail: barnafoldi.gergely (kukac) wigner.mta.hu</p> <p>Profil: fizikai hárter, szimulációk, GRID és információtechnológia</p>	 <p><b>Léai Péter</b> csoportvezető helyettes E-mail: leai.peter (kukac) wigner.mta.hu</p> <p>Profil: fizikai hárter, szimulációk, GRID és információtechnológia</p>	 <p><b>Bencze György</b> E-mail: gyorgy.bencze (kukac) cern.ch</p> <p>Profil: detektor fejlesztés, VHMPID technikai koordináció</p>
 <p><b>Boldizsár László</b> E-mail: boldizsarlaszlo (kukac) wigner.mta.hu</p> <p>Profil: adatfeldolgozás: HMPID, VHMPID</p>	 <p><b>Dénes Ervin</b> tudományos főmunkatárs E-mail: ervin.denes (kukac) cern.ch</p> <p>Profil: detektorépítő csoport vezető, ALICE Detector Data Link fejlesztése</p>	 <p><b>Fodor Zoltán</b> E-mail: fodor.zoltan (kukac) wigner.mta.hu</p> <p>Profil: -</p>
 <p><b>Futó Endre</b> E-mail: endre.futo (kukac) cern.ch</p> <p>Profil: -</p>	 <p><b>Kiss Tivadar</b> E-mail: kiss.tivadar (kukac) wigner.mta.hu</p> <p>Profil: -</p>	 <p><b>Molnár Levente</b> E-mail: molnar.levente (kukac) wigner.mta.hu</p> <p>Profil: adatfeldolgozás: HMPID, VHMPID, jet-fizika</p>
 <p><b>Pál Gabriella</b> E-mail: palla.gabriella (kukac) wigner.mta.hu</p>	 <p><b>Varga Dezső</b> E-mail: dezsso.varga (kukac) cern.ch</p>	

5 permanent + engineers

11 students MSc, PhD

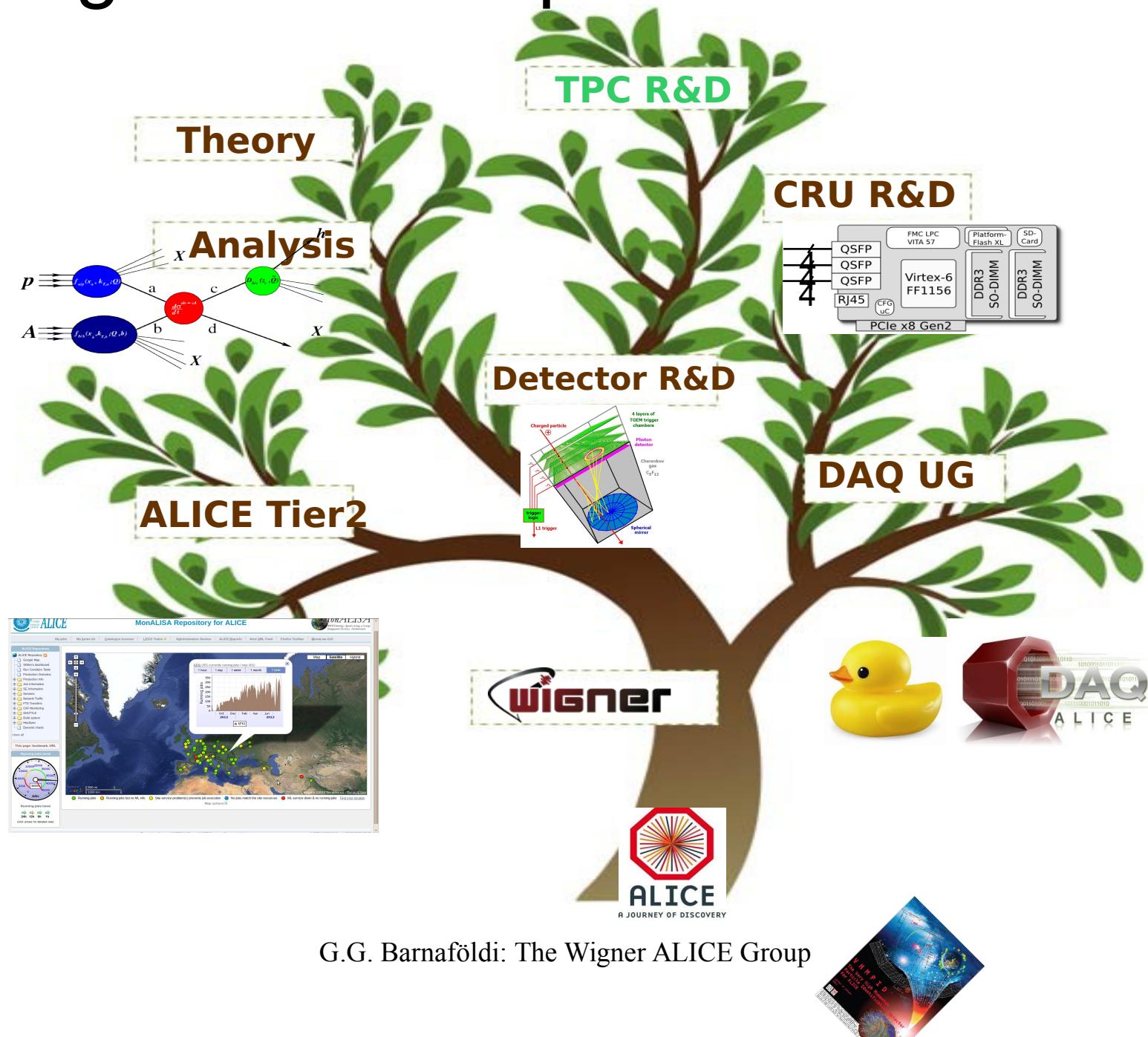
## Students

 <p><b>Bencédi Gyula</b> E-mail: bencedi.gyula (kukac) wigner.mta.hu</p> <p>Profil: detektor fejlesztés, HPTD</p>	 <p><b>Berényi Dániel</b> E-mail: berenyi.daniel (kukac) wigner.mta.hu</p> <p>Profil: detektor szimulációk</p>	 <p><b>Hamar Gergő</b> tudományos segédmunkatárs E-mail: hamar.gergo (kukac) wigner.mta.hu</p> <p>Profil: detektor fejlesztés, HPTD</p>
 <p><b>Kiss Gábor</b> E-mail: kiss.gabor (kukac) wigner.mta.hu</p> <p>Profil: DAQ fejlesztés és szimuláció</p>	 <p><b>Kovács Levente</b> E-mail: gercsobt (kukac) freemail.hu</p> <p>Profil: elektronika és detektorfejlesztés, HPTD</p>	 <p><b>Oláh László</b> E-mail: olah.laszlo (kukac) wigner.mta.hu</p> <p>Profil: detektor fejlesztés, szimuláció</p>
 <p><b>Pochybova Sona</b> E-mail: sona.pochybova (kukac) cern.ch</p> <p>Profil: 2 jet - 3 jet folyamatok vizsgálata, HMPID és VHMPID szimulációk</p>		
 <p><b>Blutman Kristóf</b> E-mail: kristof.laszlo.blutman (kukac) cern.ch</p> <p>Profil: elektronika, ALICE DAQ</p>	 <p><b>Harangozo Szilveszter</b> E-mail: harangozo.szilveszter (kukac) wigner.mta.hu</p> <p>Profil: ALICE GRID, nukleáris effektusok</p>	 <p><b>Horváth Péter</b> E-mail: b3horpet (kukac) freemail.hu</p> <p>Profil: detektor fejlesztés, szimuláció</p>
 <p><b>Kalmár Gergely</b> E-mail: kalmar.gergely (kukac) wigner.mta.hu</p> <p>Profil: ALICE GRID, hadronizációs folyamatok, web-design</p>	 <p><b>Melegi Hunor Gergely</b> E-mail: melegi.hunor (kukac) wigner.mta.hu</p> <p>Profil: adatgyűjtő rendszerek, elektronikai fejlesztések</p>	

## Resources: Wigner ALICE group in numbers

- cc. 10 FTE
  - 5 staff in addition technicians + engineers
  - 11 students (Eötvös University, Technical University)
- Supports:
  - VHMPID: OTKA NK77816 (2009-13),
  - DAQ R&D: OTKA NK106119 (2012-16)
- Fully equipped Wigner mechanical workshop (5 eng.+techn.)
- DAQ & Gaseous Detector R&D labs,
- Access to clean rooms at Wigner RCP

# Hungarian Participation in the ALICE

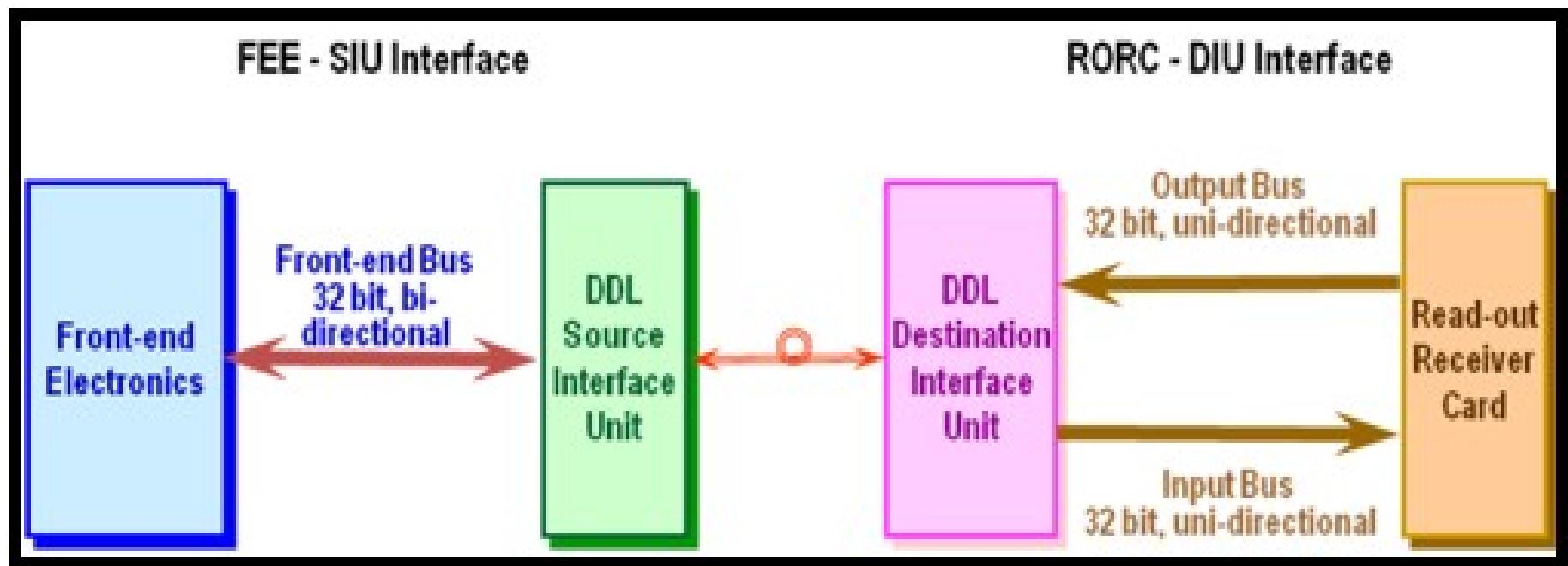


# Contributions by the Hungarian ALICE Group

- DAQ – DAQ UG/service group
  - Strongly involved in the ALICE DAQ UG, CRU
  - Ervin D, Kiss T, Rubin Gy, [Melegh HG](#), [Monostori B](#), [Blutman K](#)
- P/A – Physics/Analysis group
  - High  $p_T$ , jets, PID, Correlation
  - BGG, Lévai P, Lowe A, [Oláh L](#), [Pochybová S](#), [Bencédi Gy](#), [Boldizsár L](#)
- DDG – Detector Development group
  - Gaseous detector R&D, VHMPID (HPTD, pressurized vessel),
  - Varga D, Bencze Gy, Hamar G, Endrőczi G, [Kovács L](#), [Kiss G](#)
- GRID – ALICE Tier-2 Site
  - T2 Budapest: 200 cores, 73 TB HDD
  - BGG, Kalmár G, [Harangozo Sz](#)

# ALICE DAQ: Highway for Information

ALICE DAQ/DDL (Data Acquisition & Link Connection between FEE nad Data Collector Computers: Detector Data Link (DDL) & Roead-Out Receiver Carc (RORC)



# ALICE DAQ: Highway for Information

ALICE DAQ/DDL

500 DDLs

450 D-RORCs

2 PB/yr

High radiation background (kRad)

Mainly in the TPC

Used by other CERN experiments

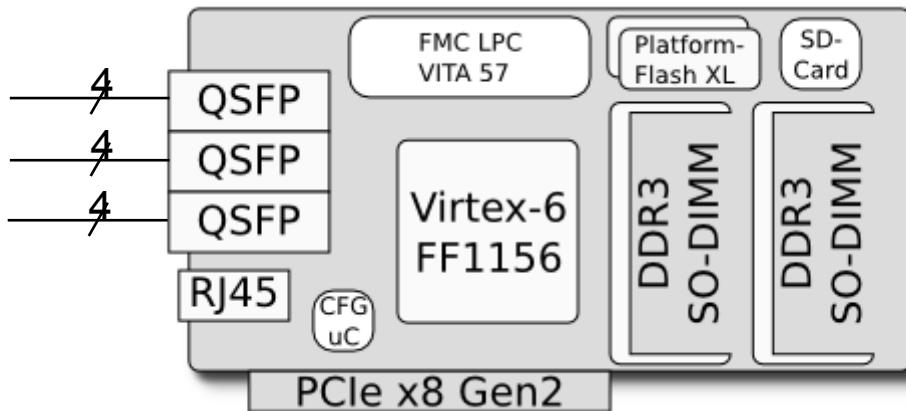
Success reloaded.. ALICE DAQ UG



# ALICE DDL/DAQ: data on the Highway

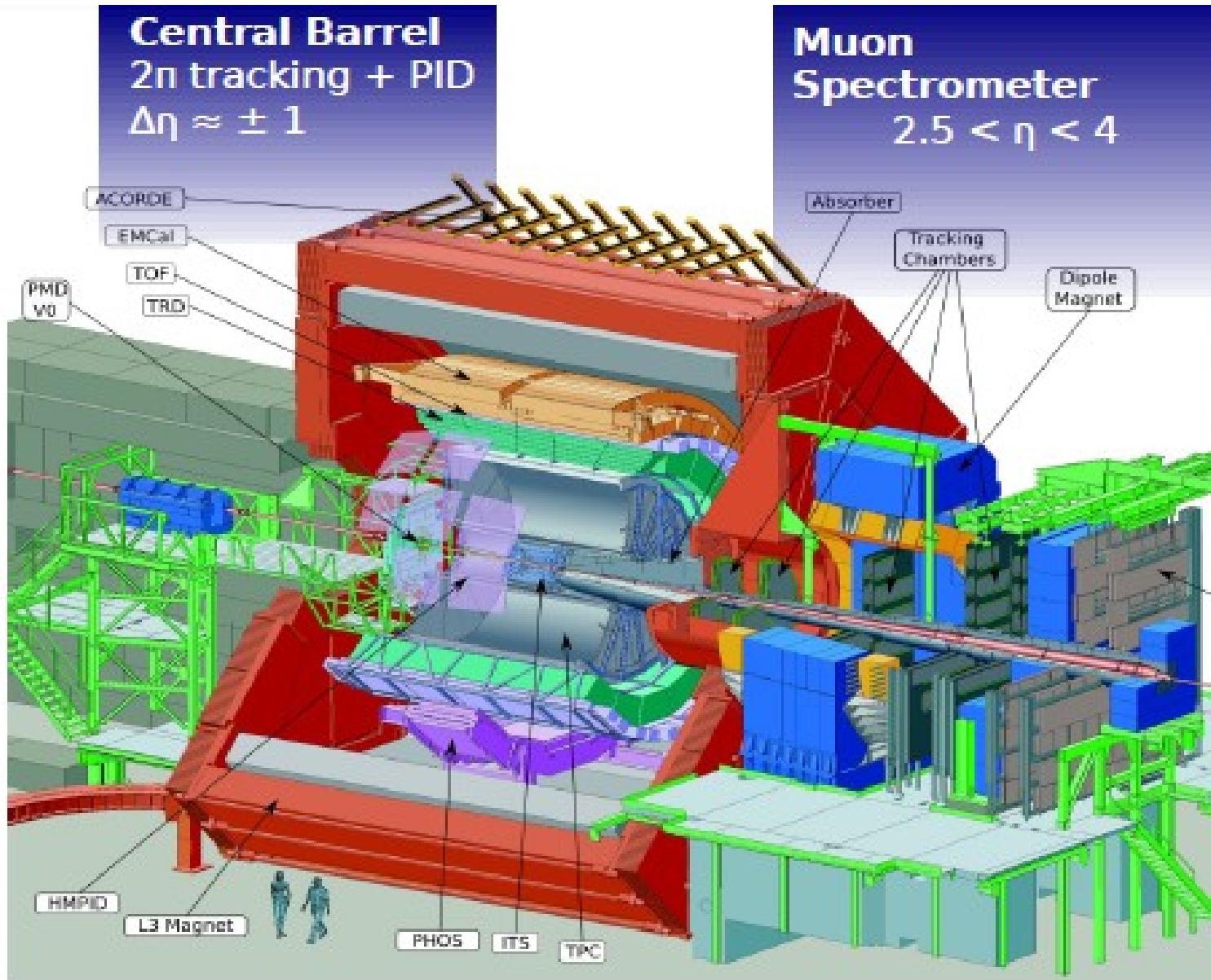
## CommonDAQ & trigger DAQ/HLT DDL2, RORC2

- Prototype READY
- Built in during LS1 (2014-16) (LS1) and LS2
- 12 pcs. DDL2 (6 Gb/s) link including DAQ LDC (36 Gb/s) data flow
- PCIe V2 8 bus (500 MB/s/lane) → I/O 32 Gb/s
- FPGA based data acquisition at trigger/DAQ level (e.g cluster finding)



- Now: In 1 PC 5 links (2Gb/s) I/O (10 Gb/s)
- Prototype Parameters (under devel.)
  - 12 link (6 Gb/s)
  - 6 link DAQ LDC commom (36 Gb/s).
  - PCIe2x8 (500 MB/s/lines) I/O (32 Gb/s)
- At the building in time
  - 12 links (10 Gb/s/PC)
  - PCIe3 16 lines I/O (128 Gb/s)

# Participation in CERN ALICE collaboration: HMPID + VHMPID



Detectors in the Central Barrel

**ITS:**  
PID:  $dE/dx$   
low pt tracking

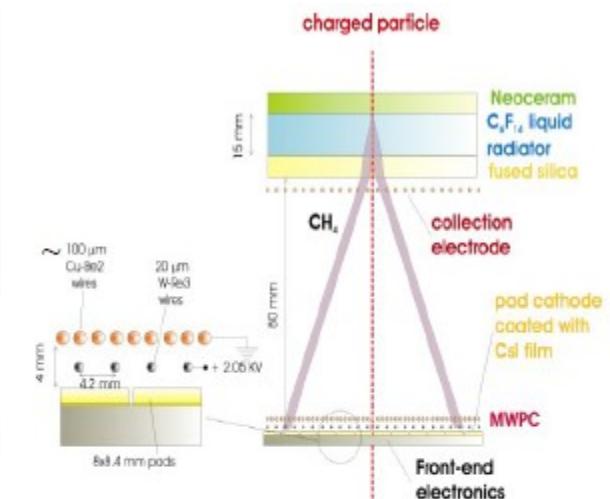
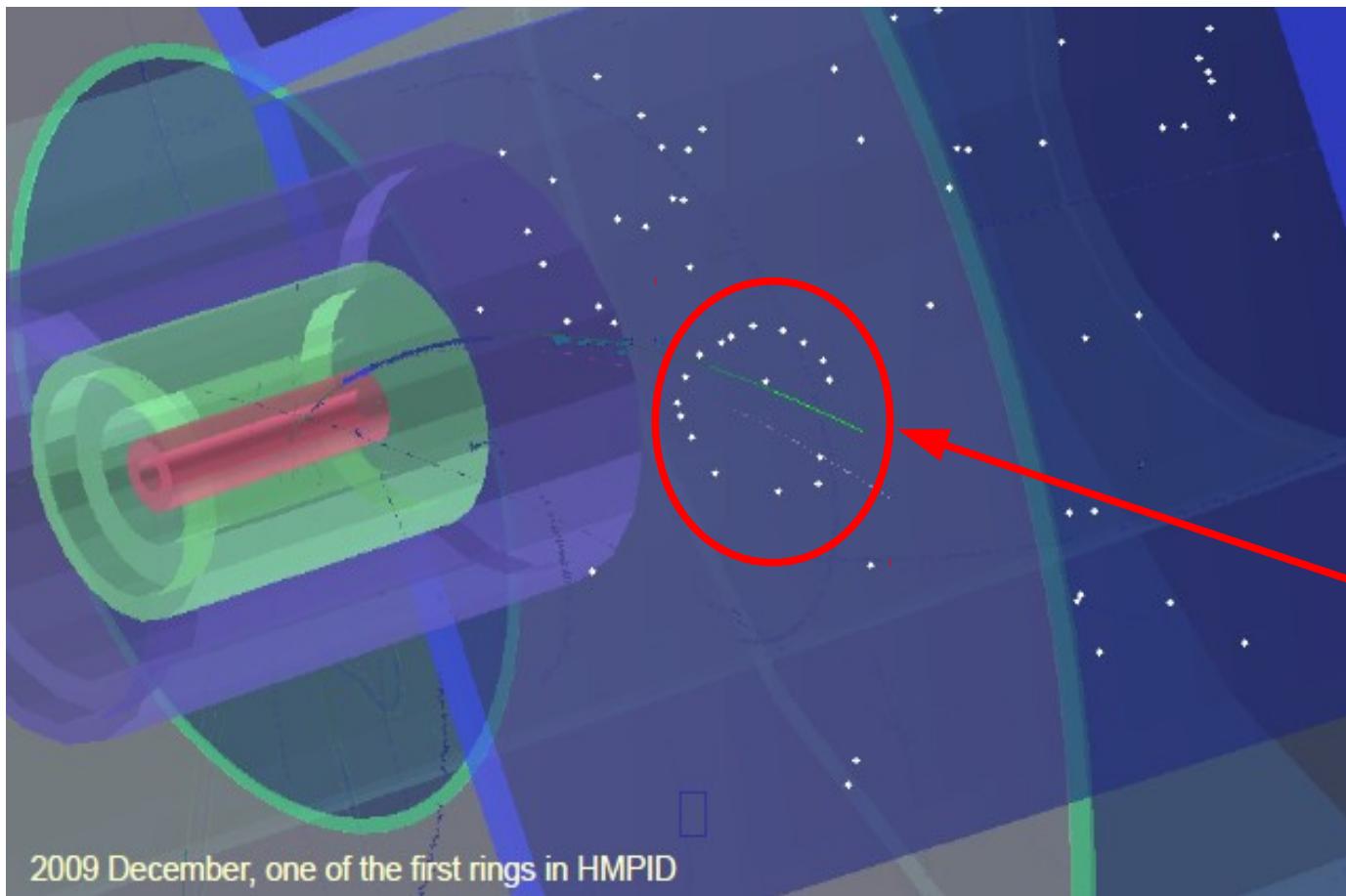
**TPC:**  
PID:  $dE/dx$   
Global tracking

**TOF:**  
• PID: ToF  
• PID + TPC matching

**TRD:**  
• PID: transition rad.  
•  $e / \pi$  separation

**HMPID:**  
• PID: Cherenkov  
•  $\pi/K/p$

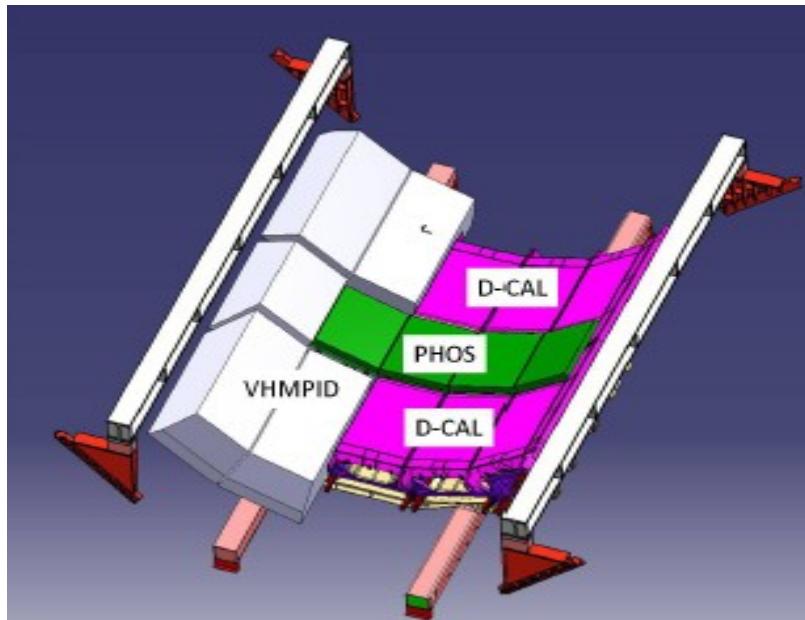
# High Momentum Particle Identification Detector: CERN ALICE HMPID



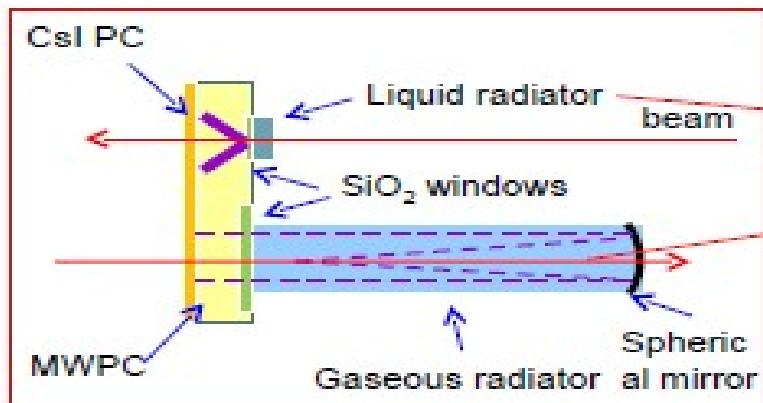
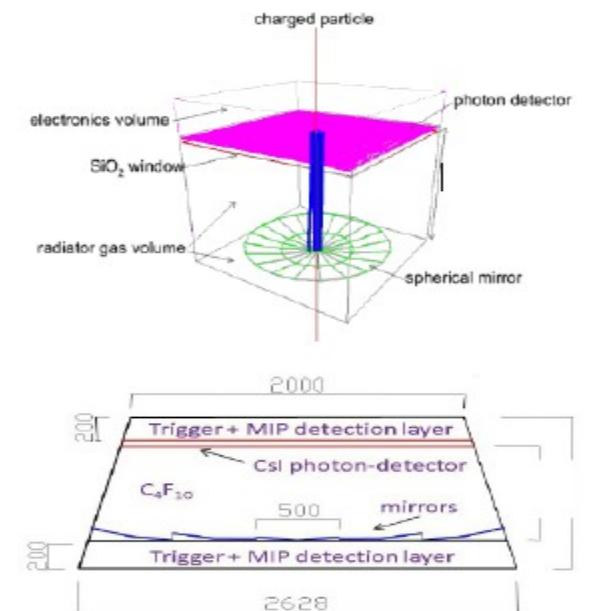
RICH: Ring Imaging Cherenkov Detector:  
the only way for **event-by-event** particle identification

# CERN ALICE upgrade: VHMPID

A proposed ALICE upgrade: beyond high momentum particle identification: 1-5 GeV/c helyett 5-25 GeV/c

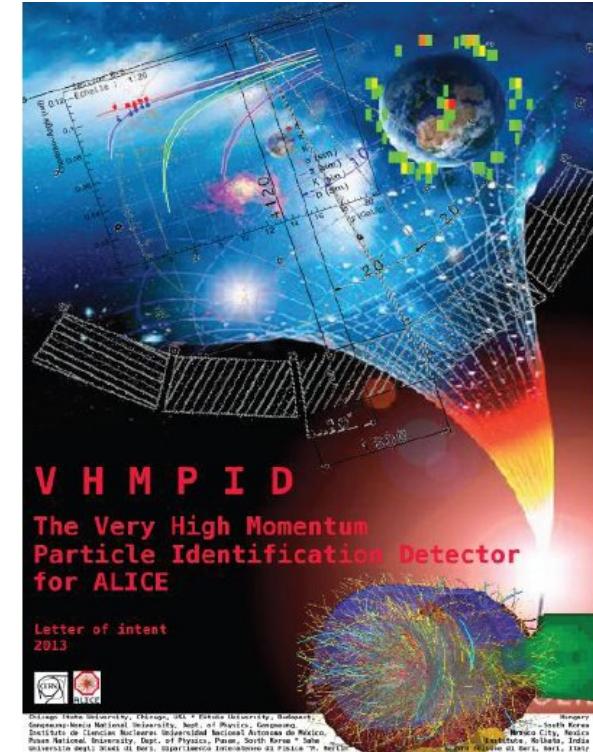
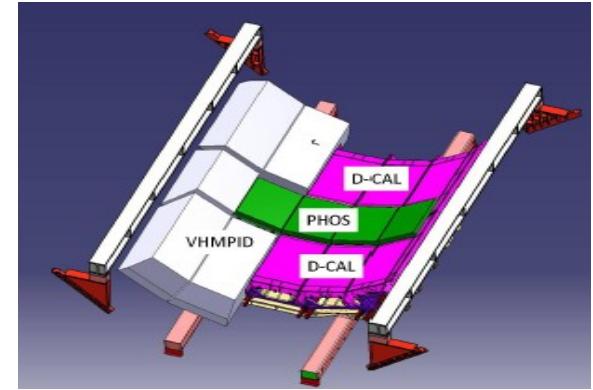


- Insertion into ALICE
- Working prototype
- CERN beam in 2011-12



# Lol: Very High Momentum PID Detector

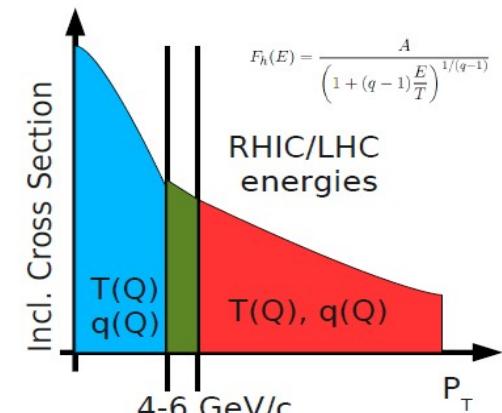
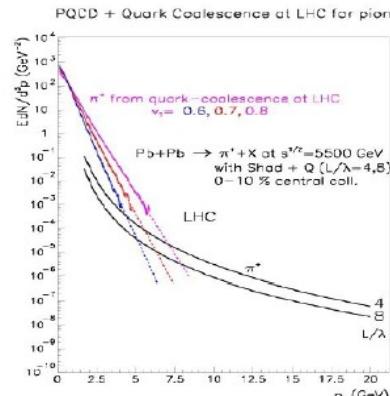
- Unique high-pT PID Capability at the LHC
- Proposed RICH Detector
- 20 institutes 5 counties
- Special technical design
- Lol has beed sumbitted arXiv:1309.5880 (in EPJ Plus)
- Result: “Not supported”
  - Excellent new Physics
  - Resources needed for TPC



# Physics/Analysis & Theory

- Theoretical background

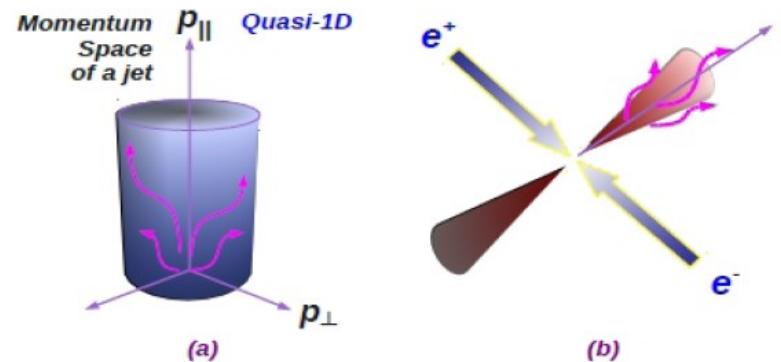
## High-pT @ pQCD



P. Lévai, GGB, G. Fai: JPG35, 104111 (2008)

## New theoretical developments

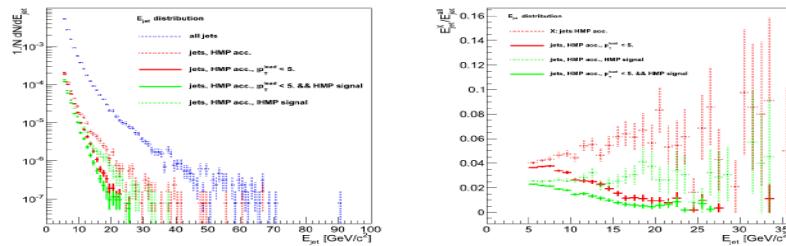
- Microcanonical Jet-Fragmentation in pp at LHC energies:  
Phys. Lett. B701 (2011) 111
- Generalized Tsallis distribution in  $e^+e^-$  collisions  
Phys. Lett. B718 (2012) 125



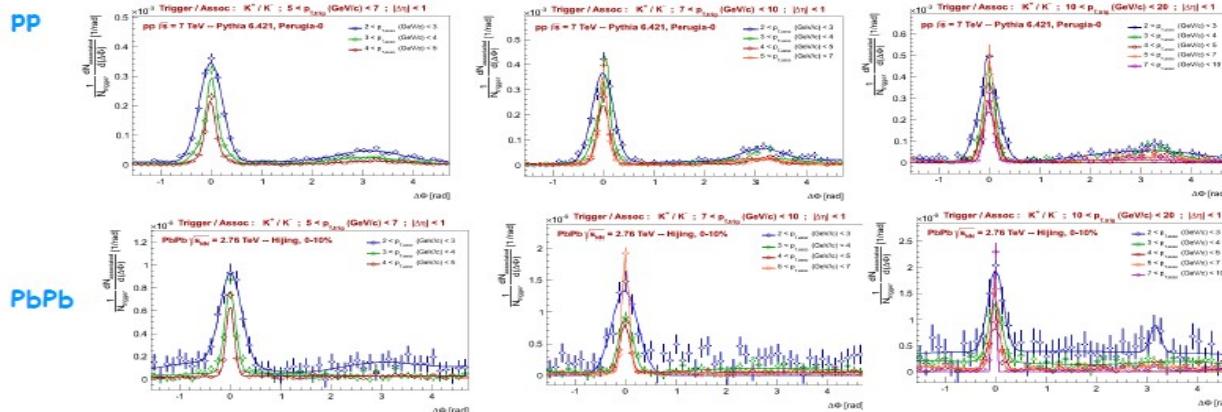
# Physics/Analysis & Theory

- The analysis

Jets: q/g separation, PID based FFs by HMPID



PID-triggered hadron correlation



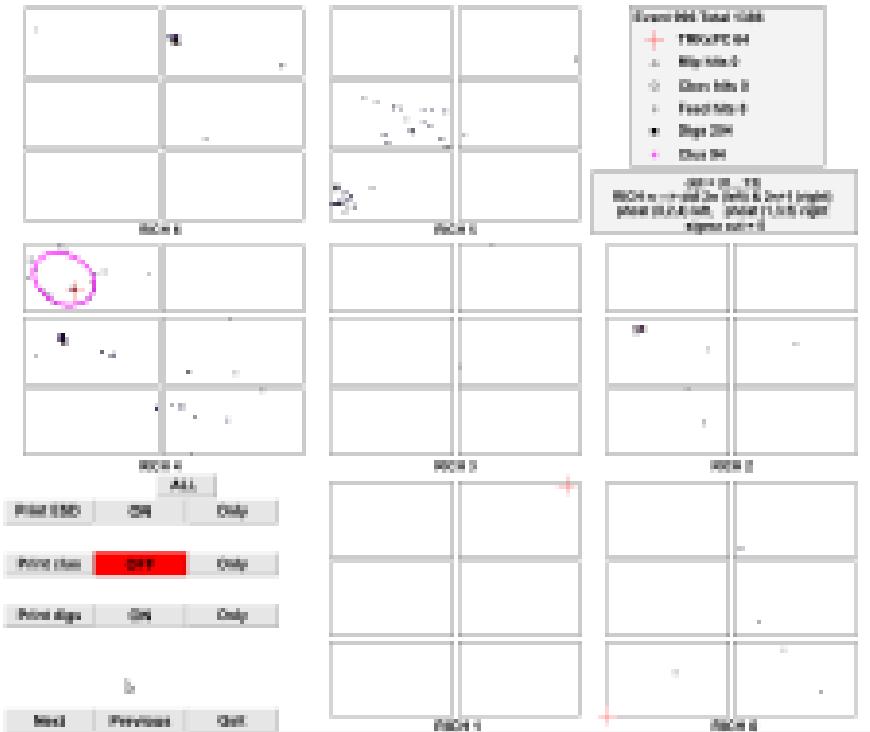
- Aging test of the HMPID detector

11/14/13

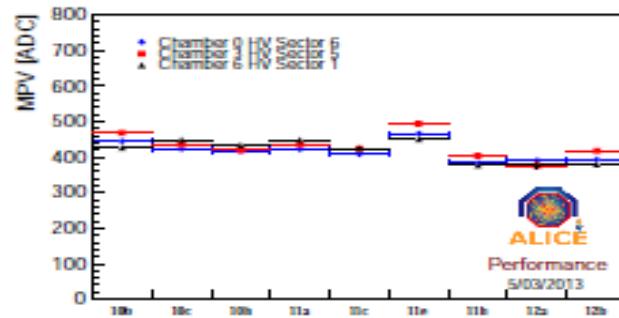
G.G. Barnaföldi: The Wigner ALICE Group

# Physics/Analysis & Theory

- Aging test of the HMPID detector



Period	Ph.	Clu.	Info.	Events [ $\times 10^3$ ]
LHC10b pass3	Yes			3.76
LHC10c pass3	Yes			2,900
LHC10d pass2	No			2.2
LHC10h pass2	Yes			3,600
LHC11a pass4	Yes			2,150
LHC11b pass1	Yes			13
LHC11c pass1	Yes			386
LHC11e pass1	Yes			186
LHC11h pass2	Yes			10,000
LHC12a pass1	No			50
LHC12b pass1	No			177
LHC12c pass1	No			360
LHC12d pass1	No			2.5



# Detector Development: TPC upgrade

## In the TDR's language

???



### 1. Physics objectives and design considerations

H. Appelshäuser, J. Harris

### 2. Mechanical structure, field cage and gas system

C. Garabatos

### 3. Gas Choice

C. Garabatos

### 4. Readout chambers

B. Ketzer, Fabbietti, C. Garabatos

### 5. Front-end electronics and readout

A. Oskarsson, D. Röhrl, C. Lippmann

### 6. Monitoring, calibration and online reconstruction

J. Wiechula, J. Thaeder

### 7. Simulation and detector performance

P. Christiansen, M. Ivanov

### 8. Tests with prototypes

P. Gasik, M. Ball, T. Gunji

### 9. Alternative R&D options

T. Gunji, N. Smirnoff

### 10. Detector Control System

C. Lippmann

### 11. Installation, services and commissioning

R. Renfordt

### 12. Organization

H. Appelshäuser, J. Harris

???



???



???



???



In our language

- PID & correlation studies
- How to share the work
- We have the infrastructure

- Would be nice to join

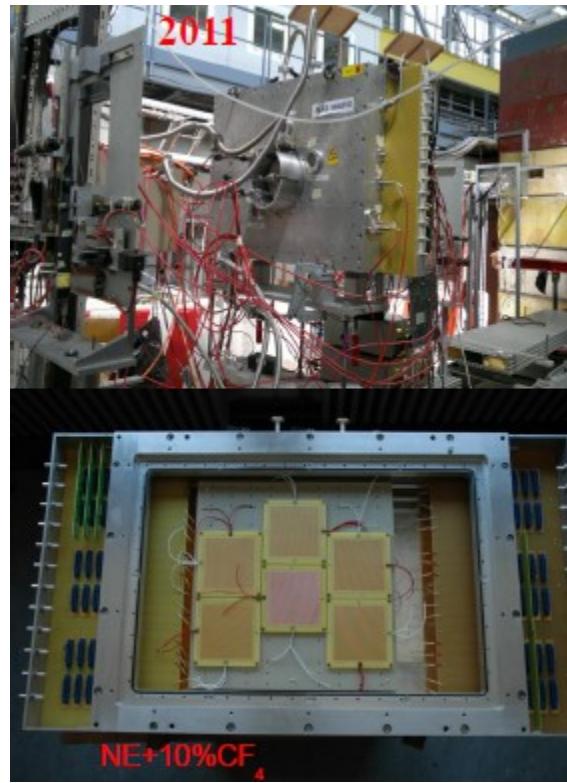
- We are ready to take

- Yessss

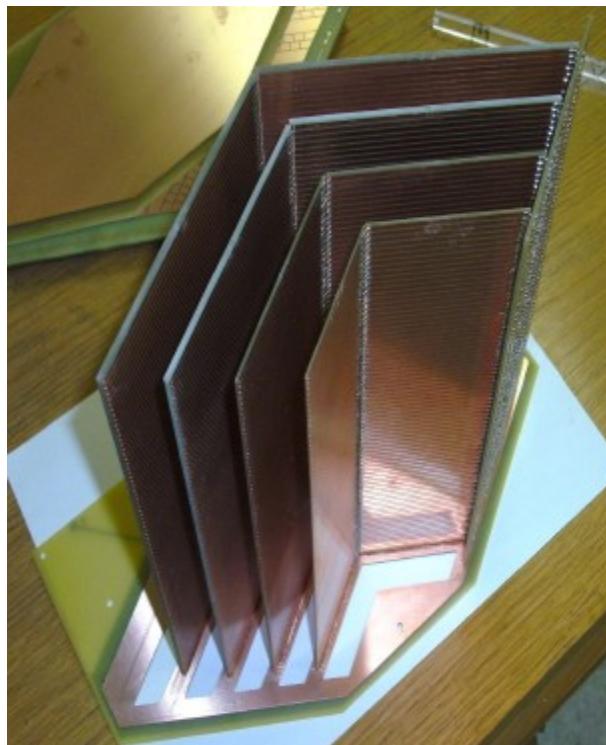
- Must do...

# ALICE TPC fits into ReGaRD's portfolio

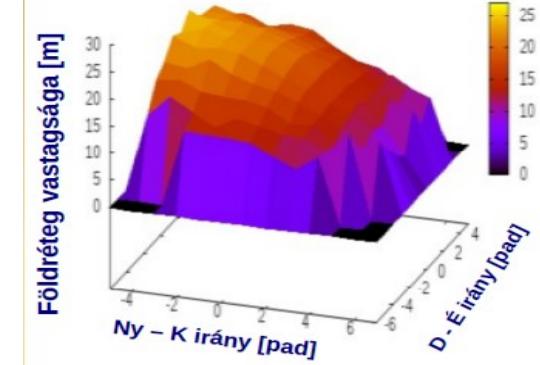
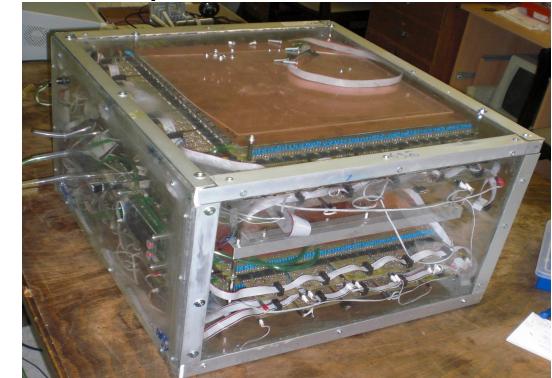
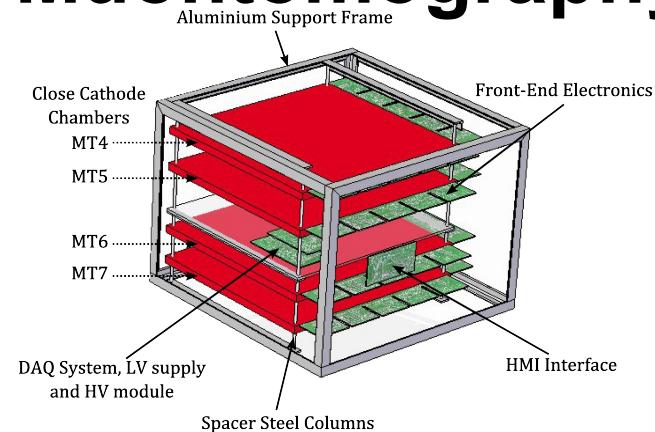
## VHMPID



## NA61 SHINE



## Muontomography



# GRID – ALICE Tier-2

The Wigner WLCG Tier-2 site is

- HR: 1-2 technicians
- cc 500 cores shared between ALICE & CMS
- Storage Element 73 TB
- Local CAF for R&D

# GRID – ALICE Tier-2

The figure shows the MonALISA Repository for ALICE interface. At the top, there are logos for ALICE and MonALISA, followed by a navigation bar with links: My jobs, My home dir, Catalogue browser, LEGO Trains, Administration Section, ALICE Reports, Alert XML Feed, Firefox Toolbar, and MonaLisa GUI.

The main content area is titled "ALICE Repository" and contains a map of Europe. A callout box for the KFKI site shows a line graph of "Running jobs" from November 2012 to September 2013, with a peak around 350 jobs. The map also features a circular "Running jobs trend" gauge and a legend for job status markers.

**ALICE Repository**

- ALICE Repository
- Google Map
- Shifter's dashboard
- Run Condition Table
- Production Overview
- Production info
- Job Information
- SE Information
- Services
- Network Traffic
- FTD Transfers
- CAF Monitoring
- SHUTTLE
- Build system
- HepSpec
- Dynamic charts

close all

This page: bookmark, URL

Running jobs trend

POWERED BY

Map options

Running jobs trend

24h 12h 6h 1h

(click arrows for detailed view)

Legend:

- Running jobs (Green circle)
- Running jobs but no ML info (Yellow circle)
- Site service problem(s) prevents job execution (Yellow circle with dot)
- No jobs match the site resources (Blue circle)
- ML service down & no running jobs (Red circle)

Map options

Map Satellite Hybrid

KFKI (192 currently running jobs / max 430)

1 hour 1 day 1 week 1 month 1 year

Running jobs

350  
300  
250  
200  
150  
100  
50  
0

Nov Jan Mar May Jul Sep

2012 2013

KFKI

UIB

Birmingham NIKHEF SARA RAL Oxford HHLR\_GU GSI\_2 Prague Cyfronet MTP KNU ISMA

GRIF\_IRFU GRIF\_IPNO Subatech CERN IPNL Strasbourg\_IRES Bratislava WIGNER\_KFKI

IPNL Torino Trieste Legnaro Bologna NIPNE ISS

CCIN2P3 Grenoble CNAF Bari

Subatech Clermont CERN IPNL Strasbourg\_IRES Bratislava WIGNER\_KFKI

IPNL Torino Trieste Legnaro Bologna NIPNE ISS

CCIN2P3 Grenoble CNAF Bari

NIHAN NIPNE ISS

Yerevan

200 mi 500 km

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# The Future of the Hungarian ALICE Group

# Direction to the Future: Projects

- Participation in ALICE Upgrade Projects

## ALICE UG Projects

- PID analysis with ALICE HMPID detector
- ALICE Tier-2 upgrade (Storage +50%)
- ALICE DAQ & CRU development
- TPC R&D and partial production?

## Funds:

- NIH
- OTKA (2013-2016)
- Joint project D. Varga (momentum)

# Direction to the Future: HR, PR

## Search for the future HR for High Energy Physics

### Teaching and PR activities

- BSc and MSc level teachnig & supervising at
  - Eötvös Loránd University (Introductory talks)
  - Connection to Technical University of Budapest
  - Connection to University of Miskolc
  - Public lectures (AtomCsill)

### Organization of Schools and Workshops

- ISOTDAQ2014, 28.02.-05.01.2014  
<http://isotdaq2014.wigner.mta.hu>
- Summer School at Eötvös University
- ALICE Week 2015?



G.G. Barnaföldi: The Wigner ALICE Group

