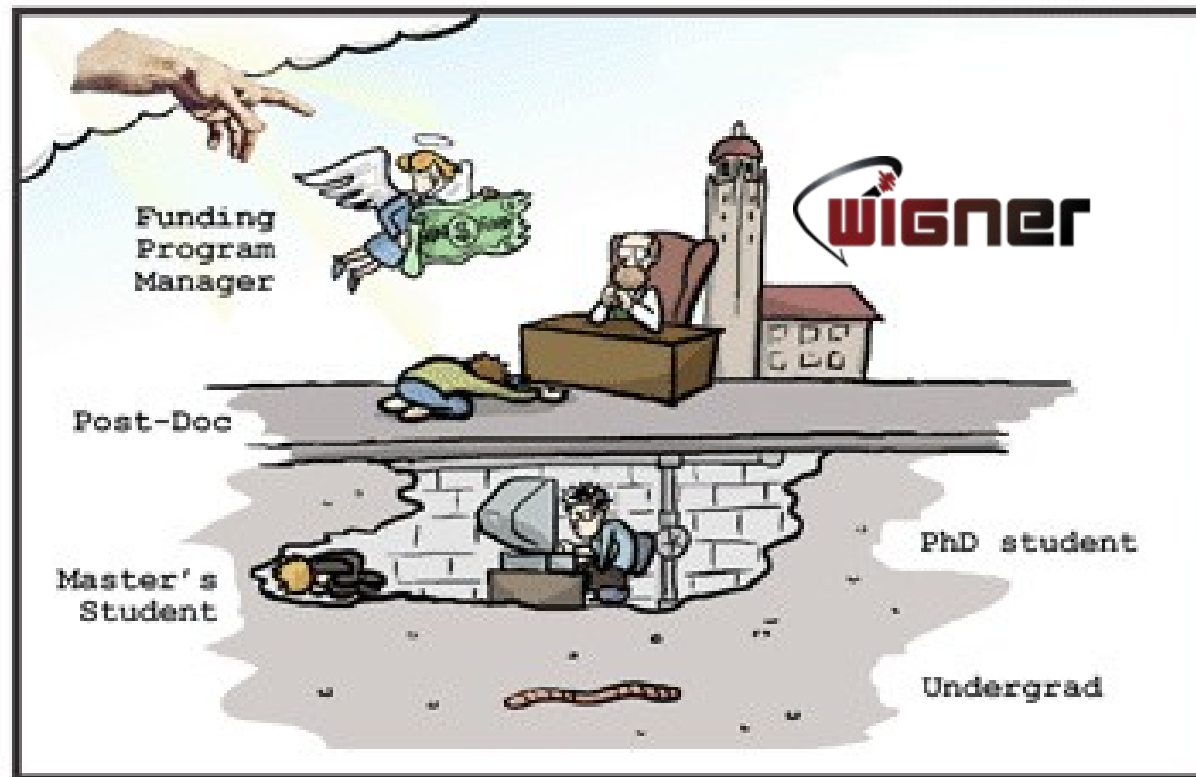


The **WIGNER**



Group

Hungarian ALICE Group @ Wigner RCP of the HAS



G.G. Barnaföldi,
Zagreb-Budapest Meetup 2013, Wigner RCP, Budapest, 15th 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

 Barnaföldi Gergely csoportvezető E-mail: barnafoldi.gergely (kukac) wigner.mta.hu Profil: fizikai háttér, szimulációk, GRID és információtechnológia	 Lévai Péter csoportvezető helyettes E-mail: levai.peter (kukac) wigner.mta.hu Profil: fizikai háttér, szimulációk, GRID és információtechnológia	 Bencze György E-mail: gyorgy.bencze (kukac) cern.ch Profil: detektor fejlesztés, VHMPID technikai koordináció
 Boldizsár László E-mail: boldizsar.laszlo (kukac) wigner.mta.hu Profil: adatfeldolgozás: HMPID, VHMPID	 Dénes Ervin tudományos főmunkatárs E-mail: ervin.denes (kukac) cern.ch Profil: detektorépítő csoport vezetése, ALICE Detector Data Link fejlesztése	 Fodor Zoltán E-mail: fodor.zoltan (kukac) wigner.mta.hu Profil: -
 Futó Endre E-mail: endre.futo (kukac) cern.ch Profil: -	 Kiss Tivadar E-mail: kiss.tivadar (kukac) wigner.mta.hu Profil: -	 Molnár Levente E-mail: molnar.levente (kukac) wigner.mta.hu Profil: adatfeldolgozás: HMPID, VHMPID, jet-fizika
 Pálai Gabriella E-mail: palai.gabriella (kukac) wigner.mta.hu Profil: -	 Varga Dezső E-mail: dezszo.varga (kukac) cern.ch Profil: -	

Students

 Bencédi Gyula E-mail: bencedi.gyula (kukac) wigner.mta.hu Profil: detektor fejlesztés, HPTD	 Berényi Dániel E-mail: berenyi.daniel (kukac) wigner.mta.hu Profil: detektor szimulációk	 Hamar Gergő tudományos segédmunkatárs E-mail: hamar.gergo (kukac) wigner.mta.hu Profil: detektor fejlesztés, HPTD
 Kiss Gábor E-mail: kiss.gabor (kukac) wigner.mta.hu Profil: DAQ fejlesztés és szimuláció	 Kovács Levente E-mail: gerycobt (kukac) freemail.hu Profil: elektronika és detektorfejlesztés, HPTD	 Oláh László E-mail: olah.laszlo (kukac) wigner.mta.hu Profil: detektor fejlesztés, szimulációk
 Pochybova Sona E-mail: sona.pochybova (kukac) cern.ch Profil: 2 jet - 3 jet folyamatok vizsgálata, HMPID és VHMPID szimulációk		
 Blutman Kristóf E-mail: kristof.laszlo.blutman (kukac) cern.ch Profil: elektronika, ALICE DAQ	 Harangozó Szilveszter E-mail: harangozo.szilveszter (kukac) wigner.mta.hu Profil: ALICE GRID, nukleáris effektusok	 Horváth Péter E-mail: b8horpet (kukac) freemail.hu Profil: detektor fejlesztés, szimuláció
 Kalmár Gergely E-mail: kalmar.gergely (kukac) wigner.mta.hu Profil: ALICE GRID, hadronizációs folyamatok, web-design	 Melegh Hunor Gergely E-mail: melegh.hunor (kukac) wigner.mta.hu Profil: adatgyűjtő rendszerek, elektronikai fejlesztések	

5 permanent + engineers

11 students MSc, PhD



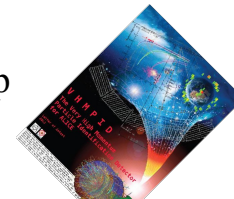
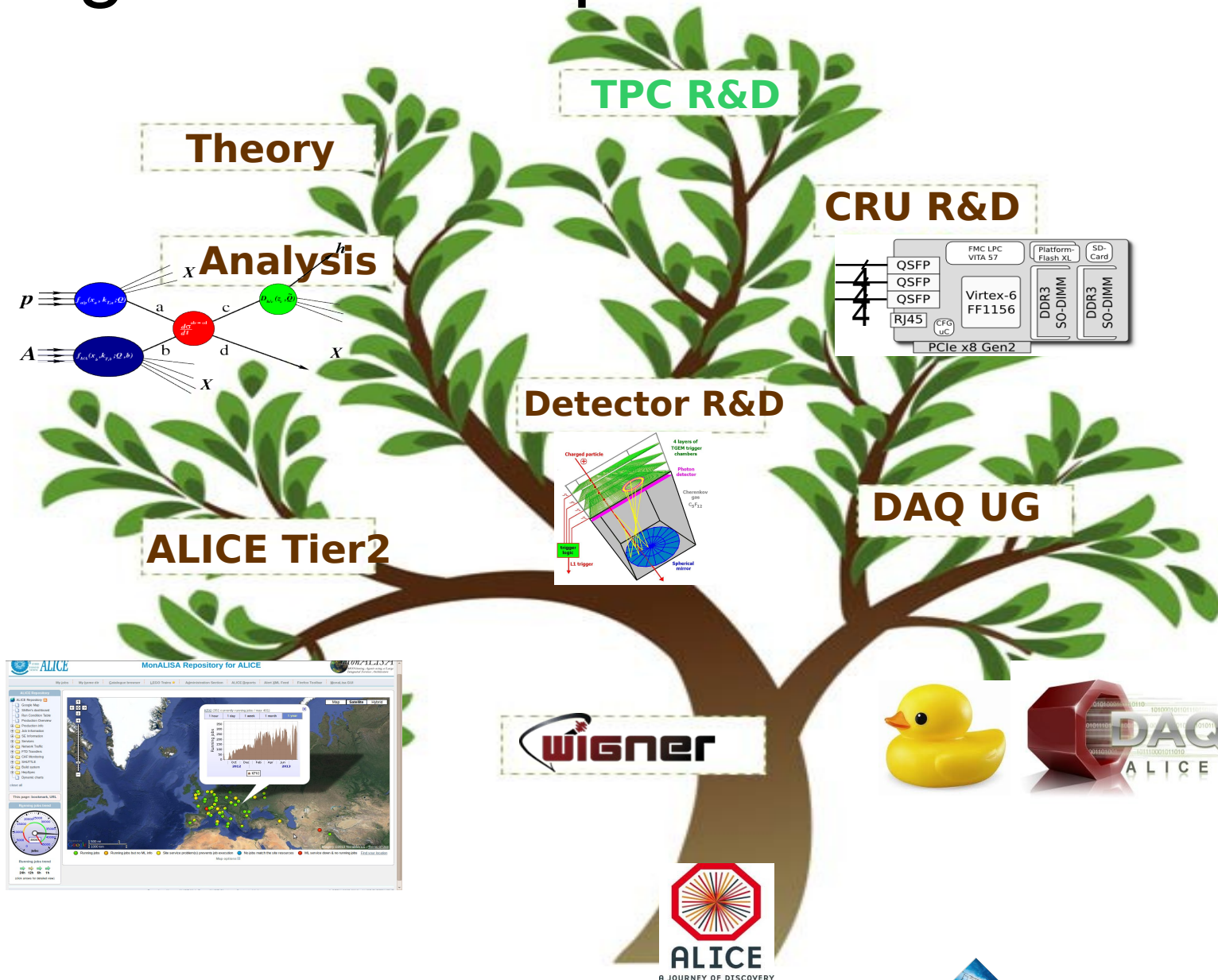
Hungarian ALICE Group, Wigner RCP
of the HAS, Budapest Hungary



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

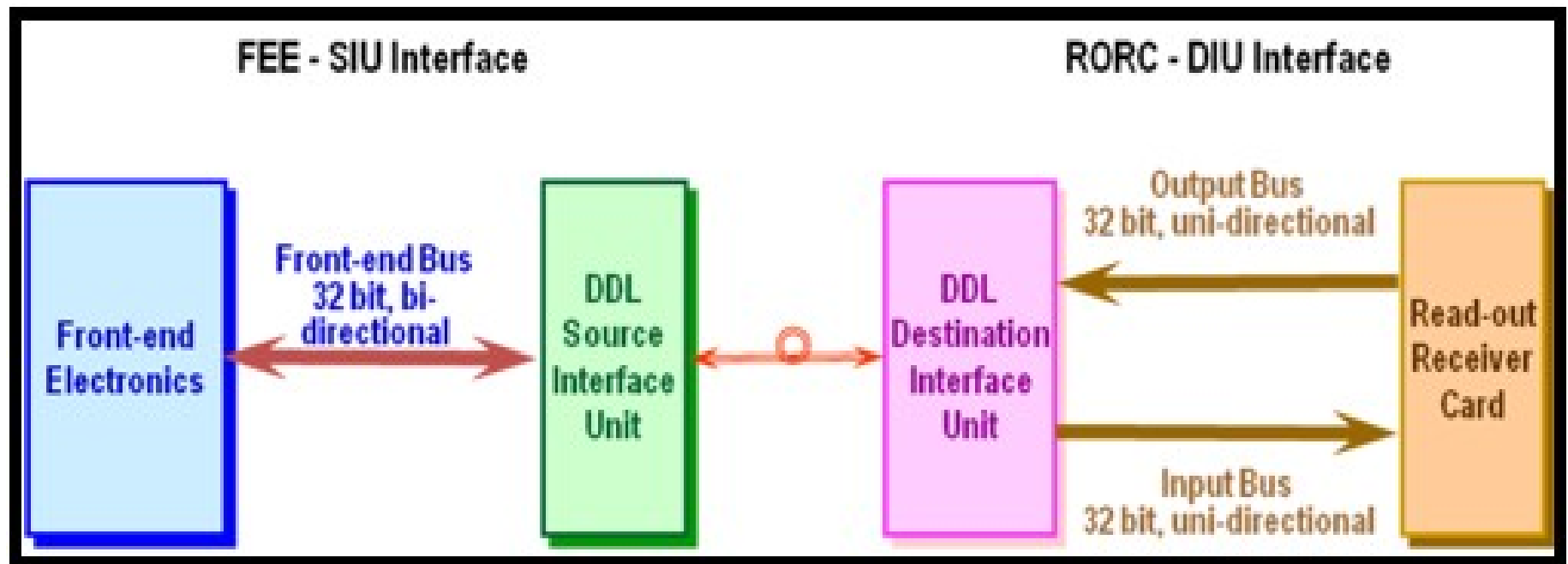


Contributions by the Hungarian ALICE Group

- 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, Endrőczy G, [Kovács L](#), [Kiss G](#)
- GRID – ALICE Tier-2 Site
 - T2 Budapest: 200 cores, 73 TB HDD
 - BGG, Kalmár G, [Harangozó Sz](#)

ALICE DAQ: Highway for Information

ALICE DAQ/DDL (Data Acquisition & Link Connection between FEE and Data Collector Computers: Detector Data Link (DDL) & Read-Out Receiver Card (RORC)



ALICE DAQ: Highway for Information

ALICE DAQ/DDDL

500 DDLs

450 D-RORCs

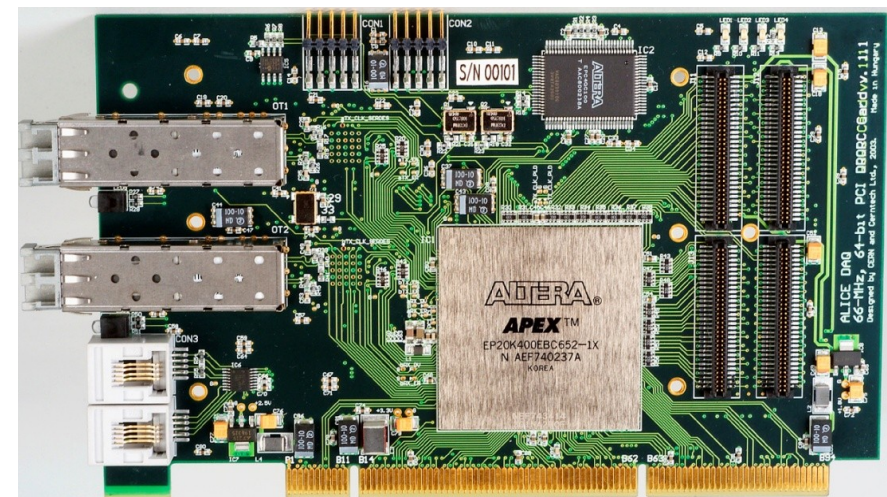
2 PB/yr

High radiation background (kRad)

Mainly in the TPC

Used by other CERN experiments

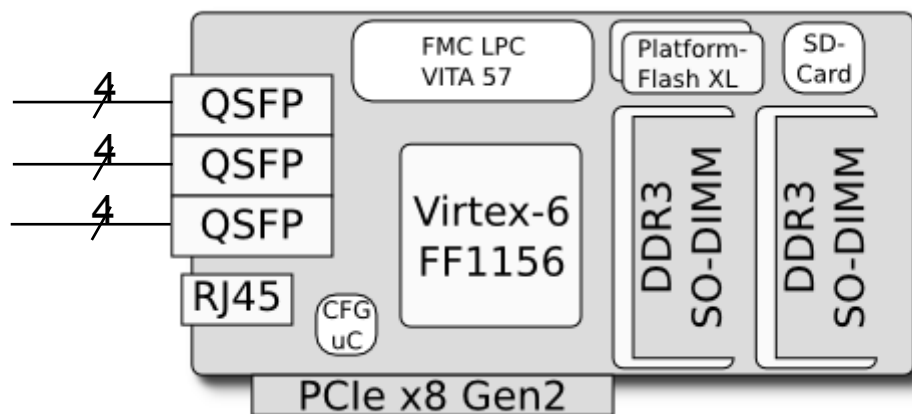
Success reloaded.. ALICE DAQ UG



ALICE DDL/DAQ: data on the Highway

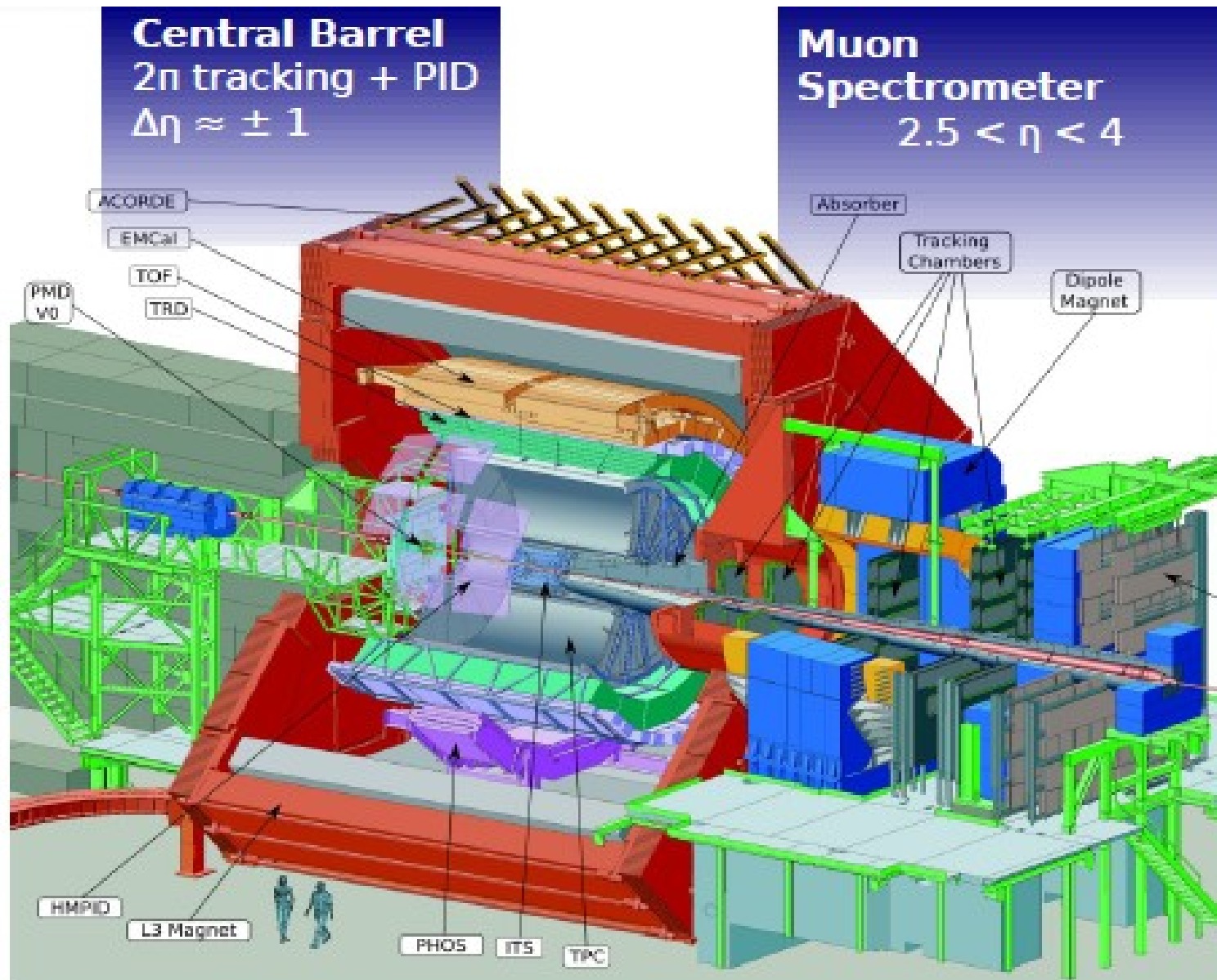
CommonDAQ & trigger DAQ/HLT DDL2, RORC2

- 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



ITS:
· PID: dE/dx
· low pt tracking

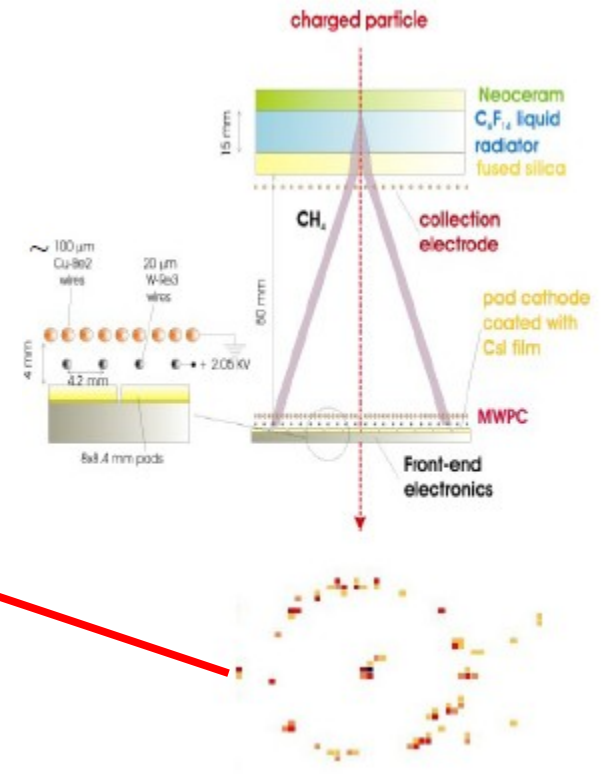
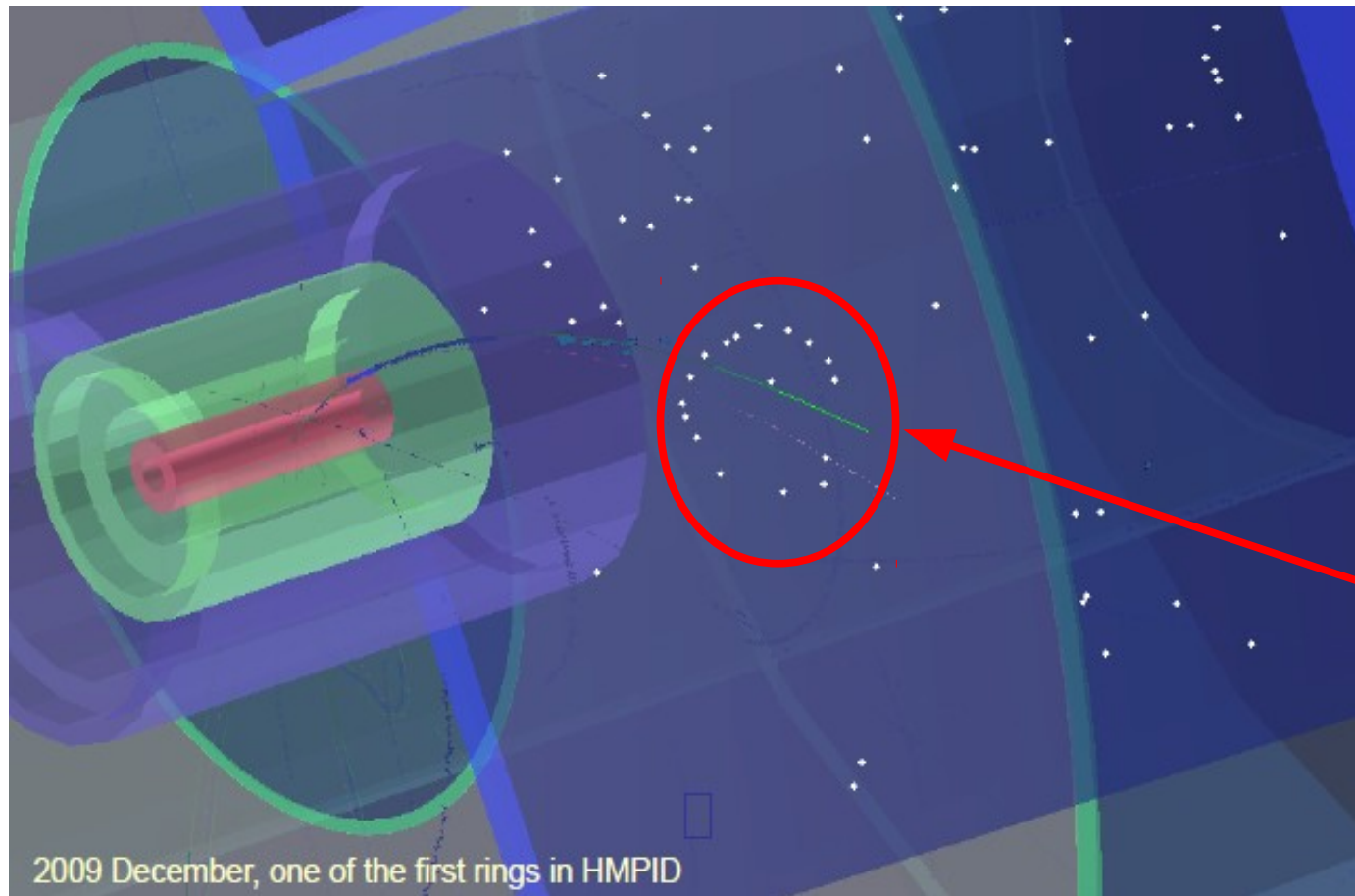
TPC:
· PID: dE/dx
· Global tracking

TOF:
· PID: ToF
· PID + TPC matching

TRD:
· PID: transition rad.
· e / π separation

HMPID:
· PID: Cherenkov
· $\pi/K/p$

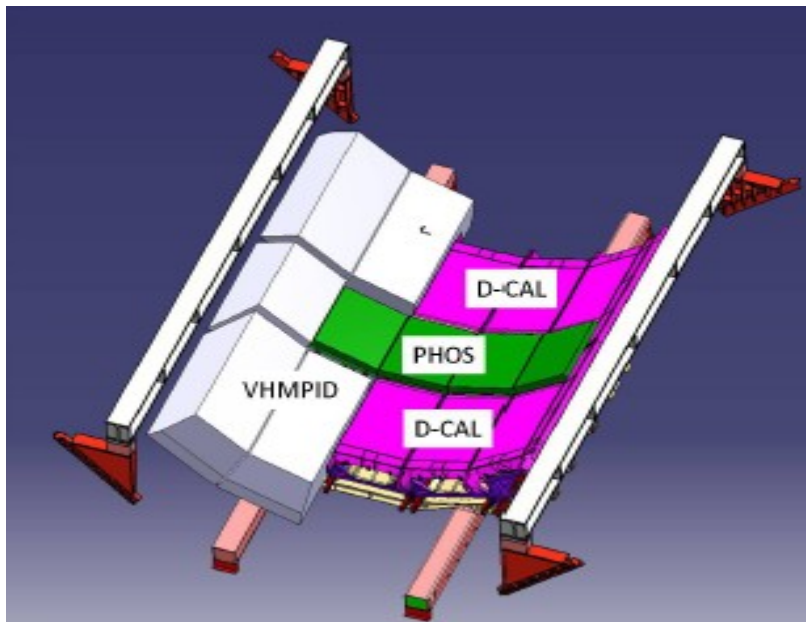
High Momentum Particle Identification Detector: CERN ALICE HMPID



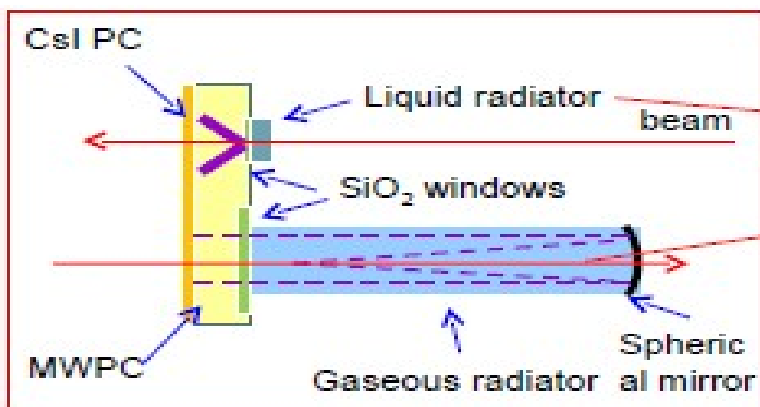
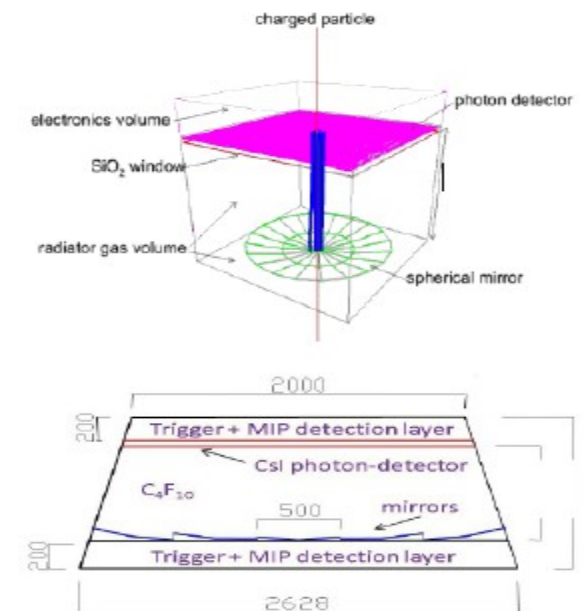
RICH: Ring Imaging Cherenkov Detector:
the only way for **event-by-event particle identification**

CERN ALICE upgrade: VHMPID

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

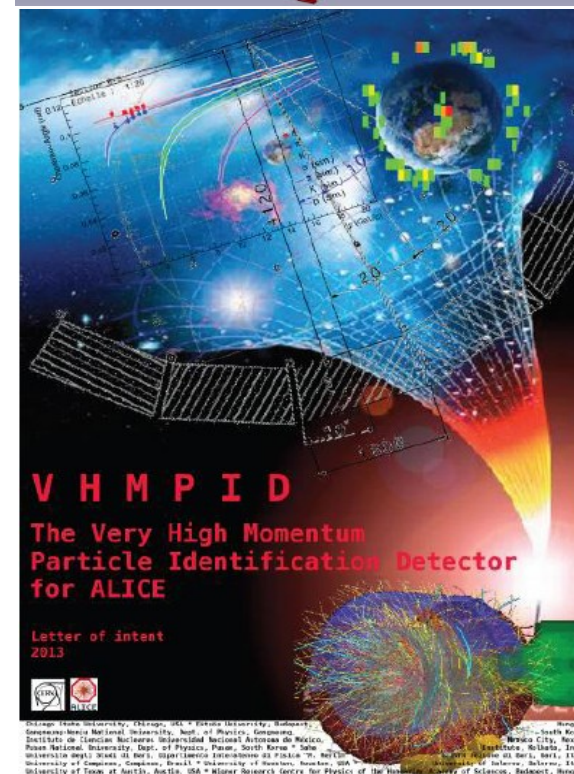
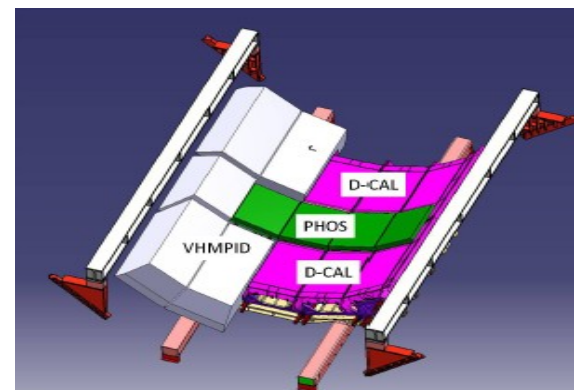


- Insertion into ALICE
- Working prototype
- CERN beam in 2011-12



Lol: Very High Momentum PID Detector

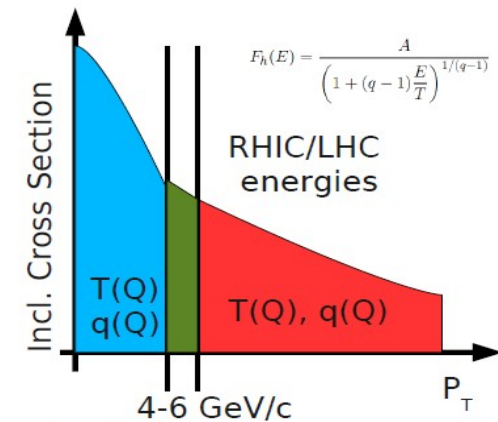
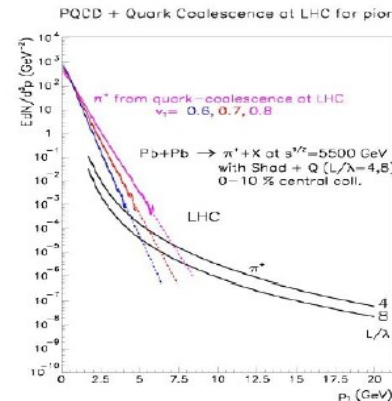
- Unique high-pT PID Capability at the LHC
- Proposed RICH Detector
- 20 institutes 5 countries
- Special technical design
- Lol has been submitted
arXiv:1309.5880 (in EPJ Plus)
- Result: “Not supported”
 - Excellent new Physics
 - Resources needed for TPC



Physics/Analysis & Theory

- Theoretical background

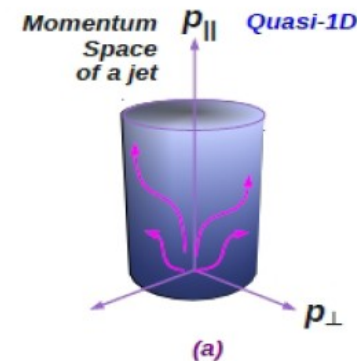
High-pT @ pQCD



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

New theoretical developments

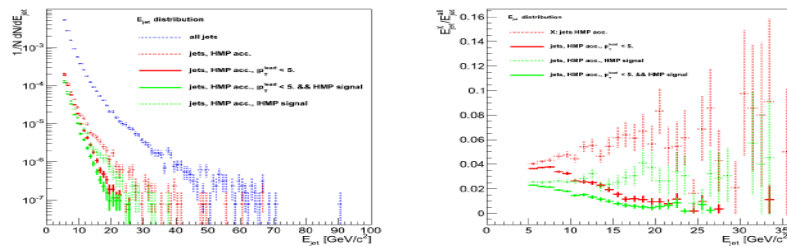
- Microcanonical Jet-Fragmentation in pp at LHC energies:
Phys. Lett. B701 (2011) 111
- Generalized Tsallis distribution in e⁺e⁻ collisions
Phys. Lett. B718 (2012) 125



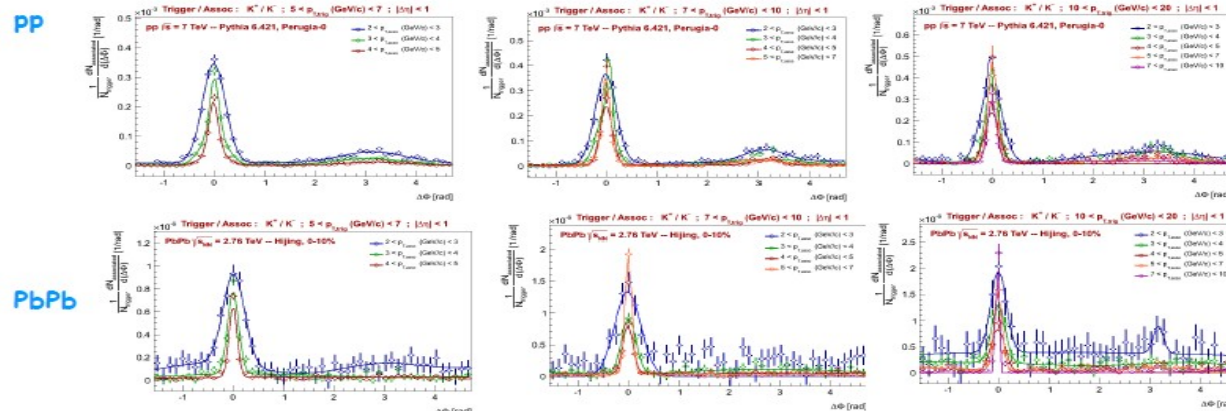
Physics/Analysis & Theory

- The analysis

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



PID-triggered hadron correlation



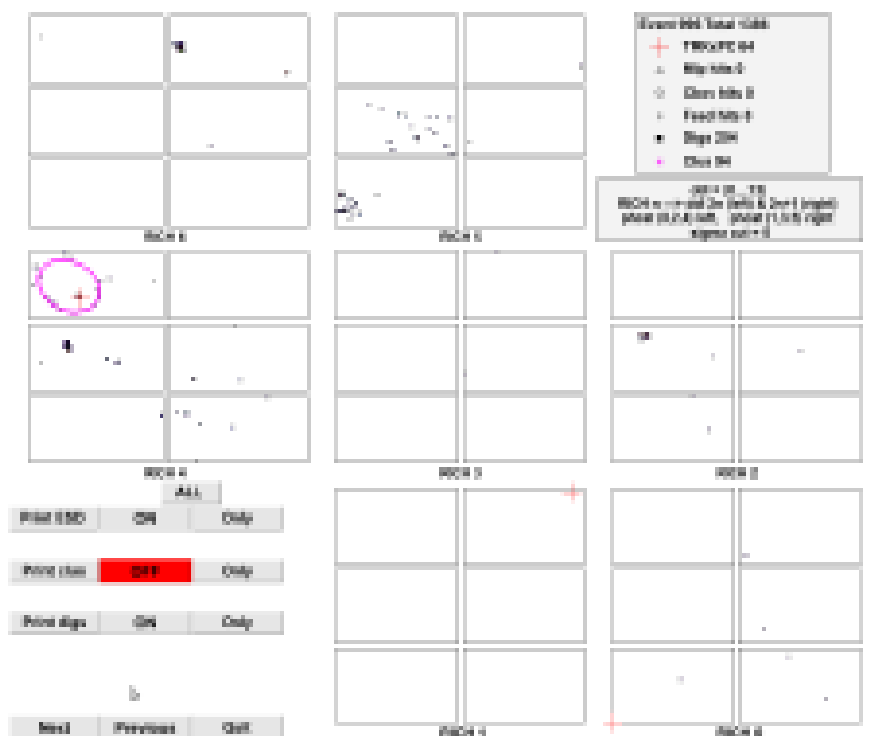
- Aging test of the HMPID detector

11/14/13

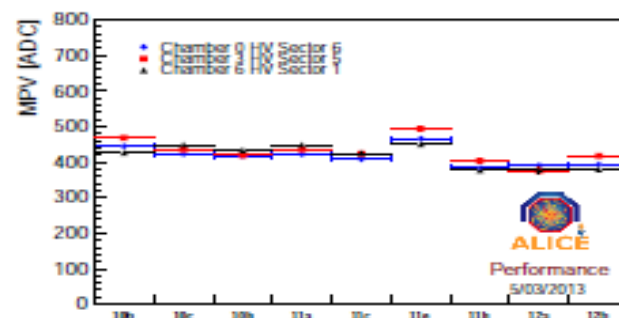
G.G. Barnaföldi: The Wigner ALICE Group

Physics/Analysis & Theory

- Aging test of the HMPID detector



Period	Ph. Chn. 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 In our 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. Röhrich, C. Lippmann

6. Monitoring, calibration and online reconstruction

J. Wiechula, J. Thaefer

???



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. Smirnov

10. Detector Control System

C. Lippmann

11. Installation, services and commissioning

R. Renfordt

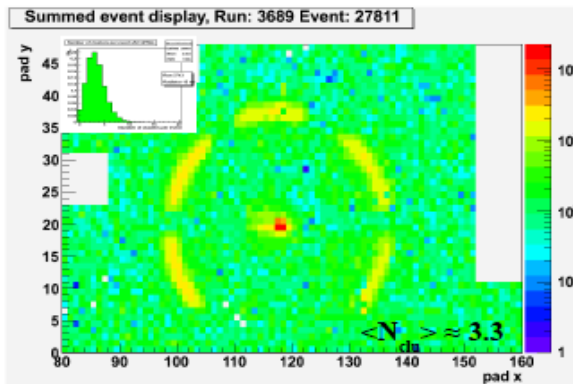
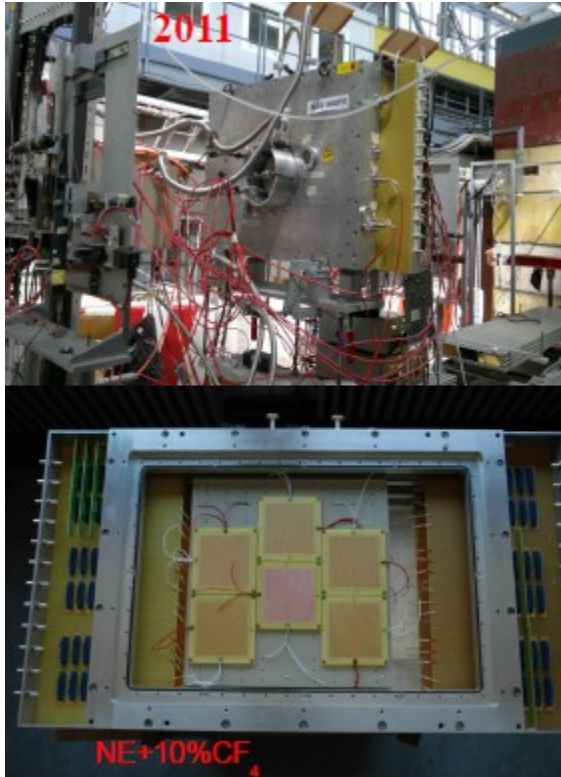
12. Organization

H. Appelshäuser, J. Harris

- 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...

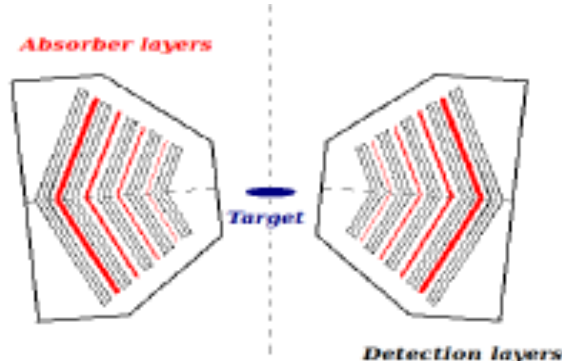
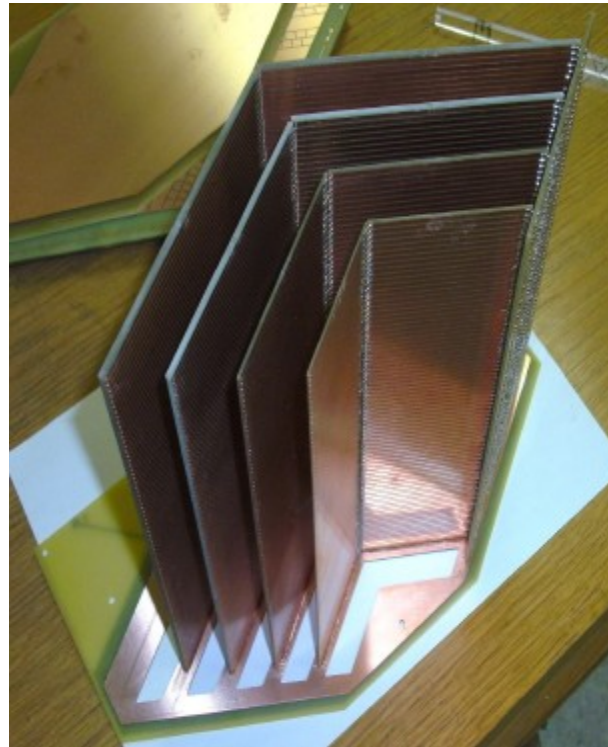
ALICE TPC fits into ReGaRD's portfolio

VHMPID

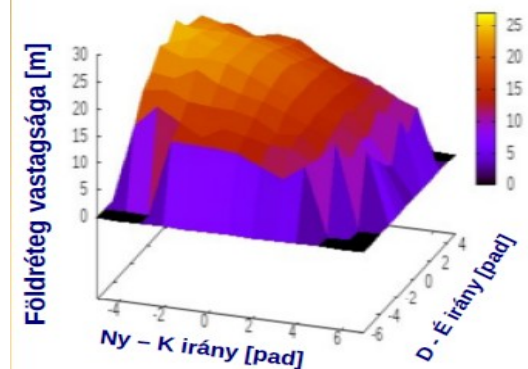
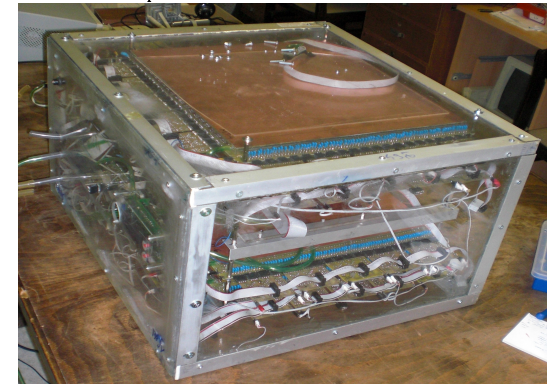
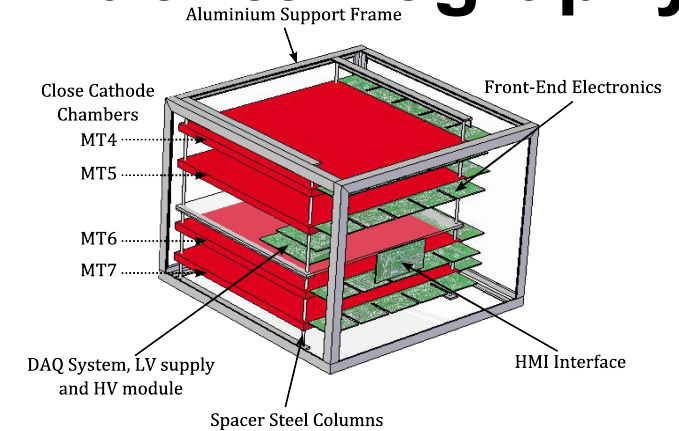


G.G. Barnaföldi, Wigner FK RMI

NA61 SHINE



Muontomography

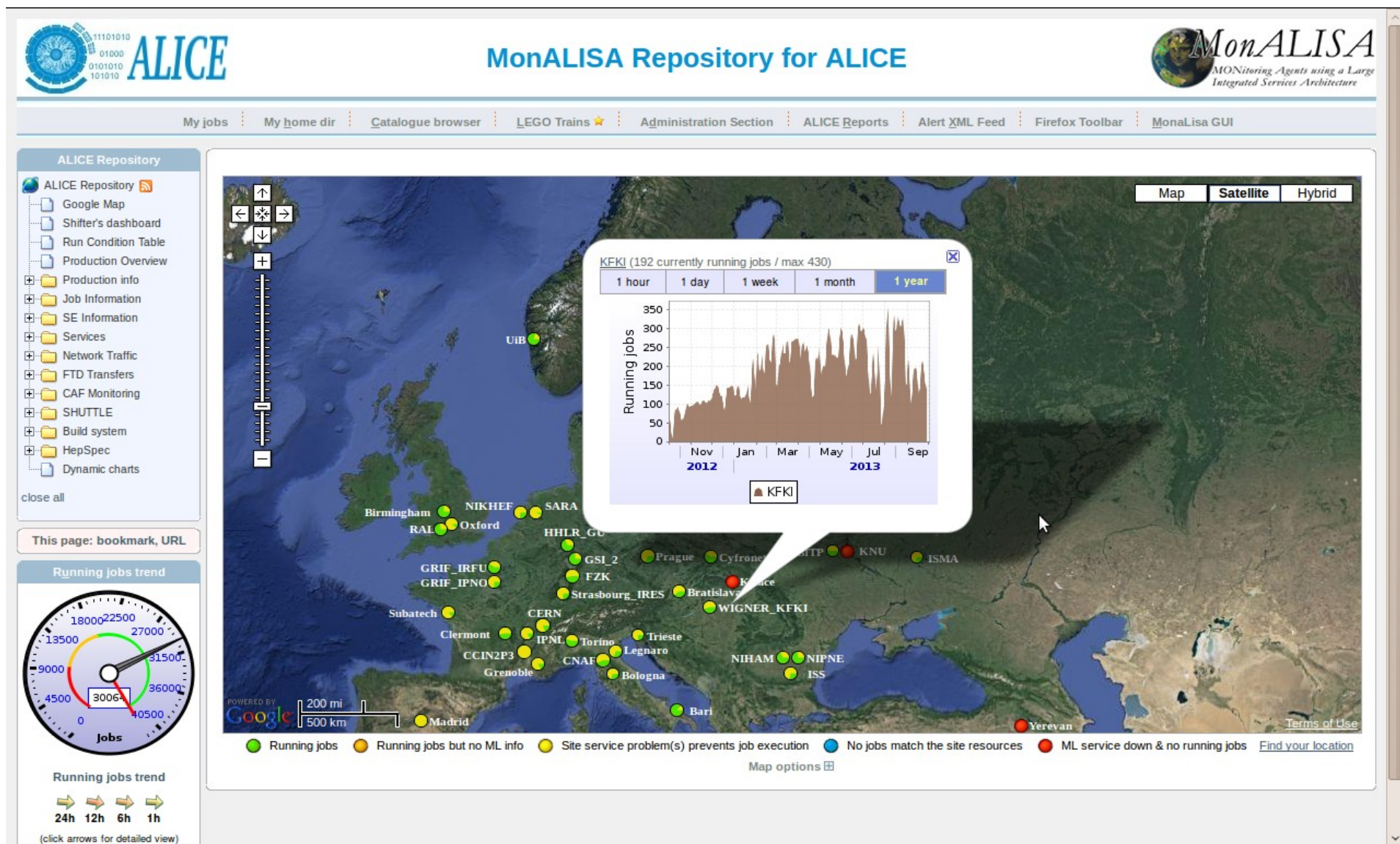


GRID – ALICE Tier-2

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 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 teaching & 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?

