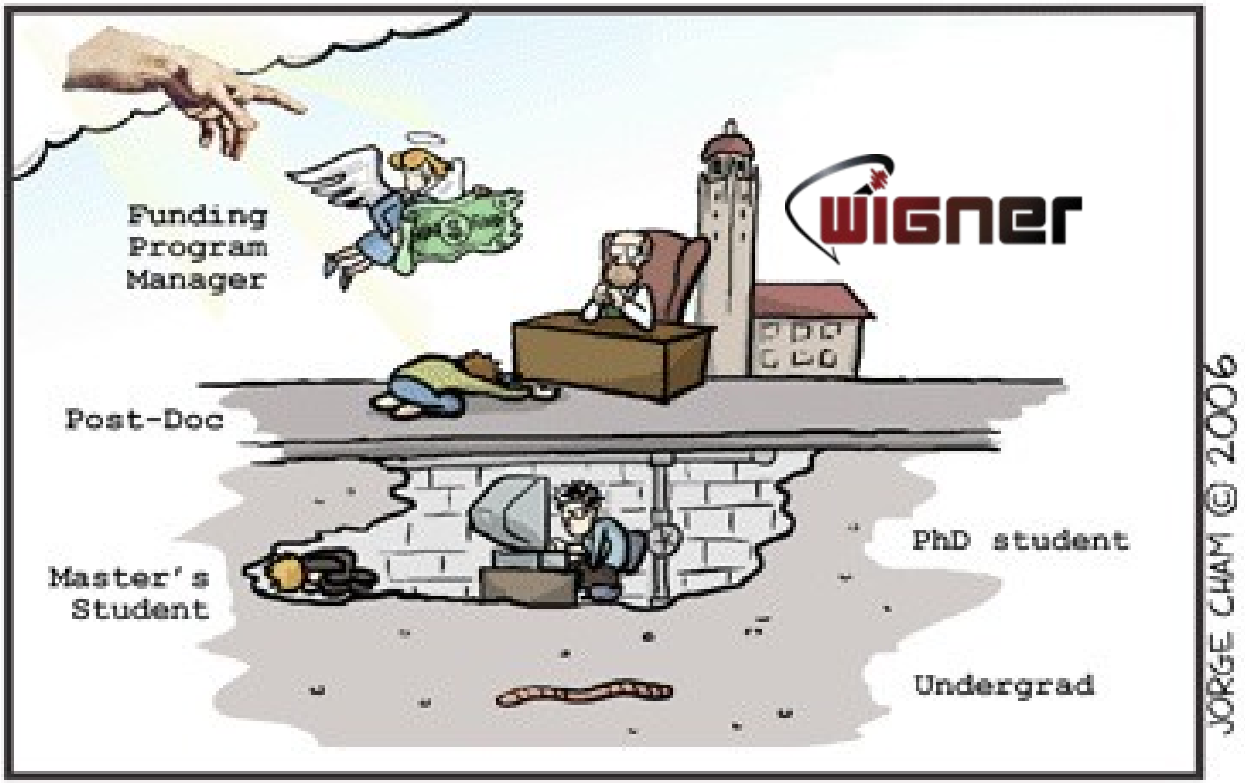
The Wigner Group

Hungarian ALICE Group @ Wigner RCP of the HAS



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

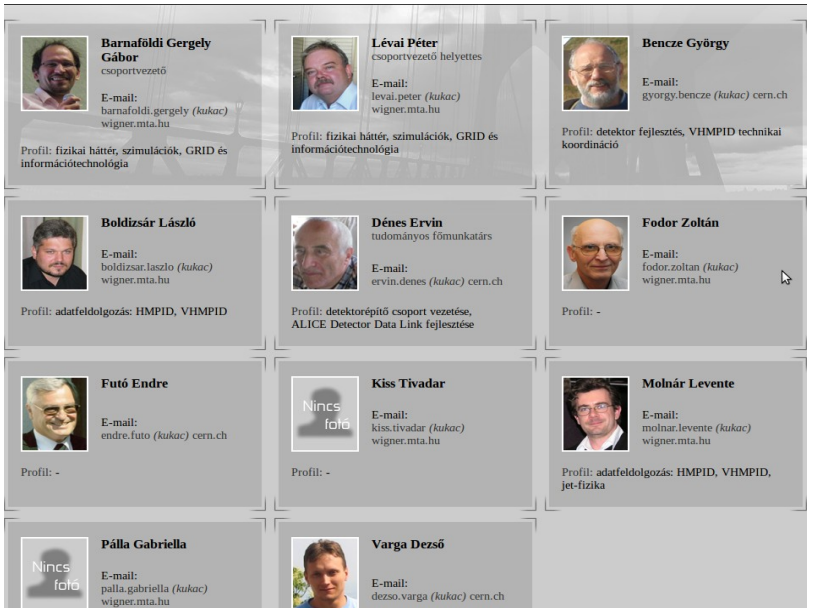
OUTLINE

- 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,

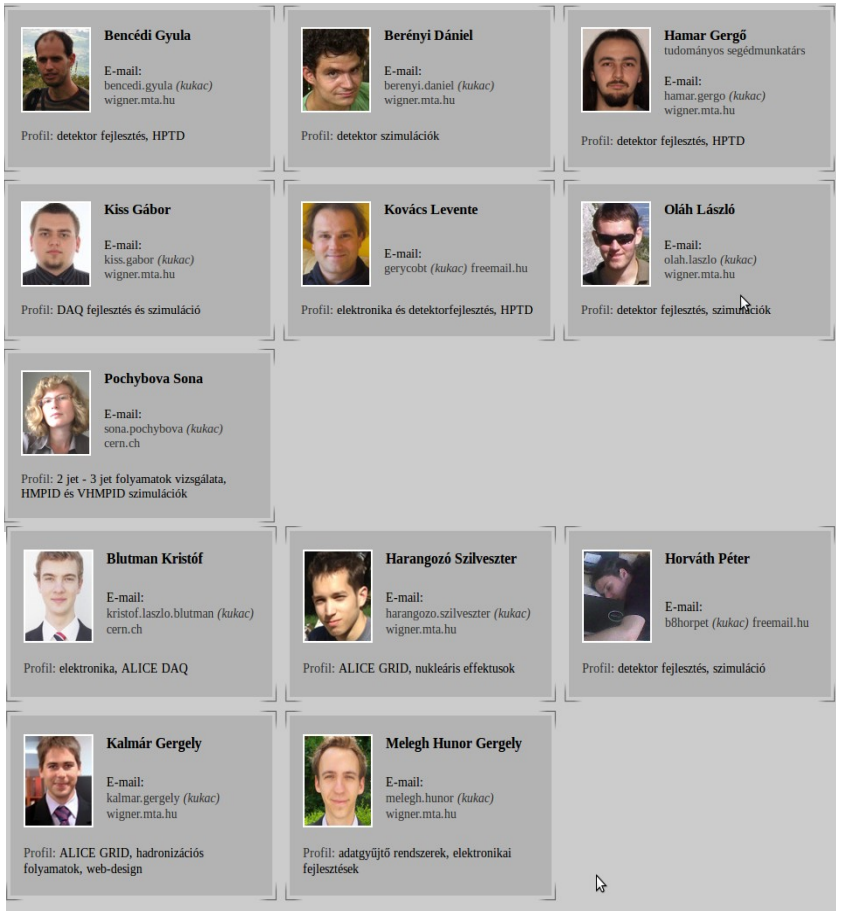
The Hungarian ALICE Group

The most valuable: Human Resource

Senior Staff



Students



5 permanent + engineers

11 students MSc, PhD

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

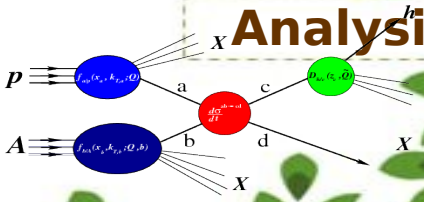
Hungarian Participation in the ALICE

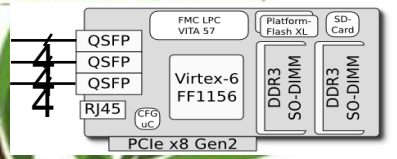
TPC R&D

Theory

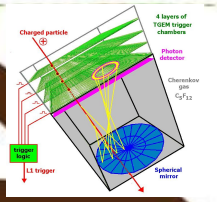
CRU R&D

Analysis



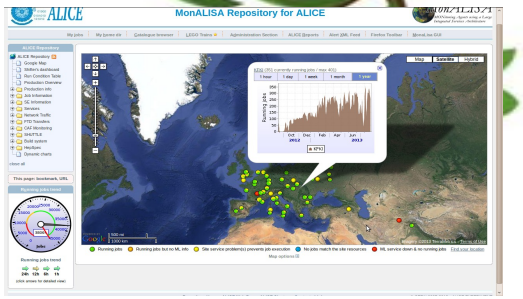


Detector R&D



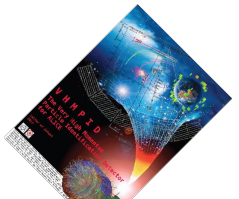
DAQ UG

ALICE Tier2



Wigner

ALICE
A JOURNEY OF DISCOVERY



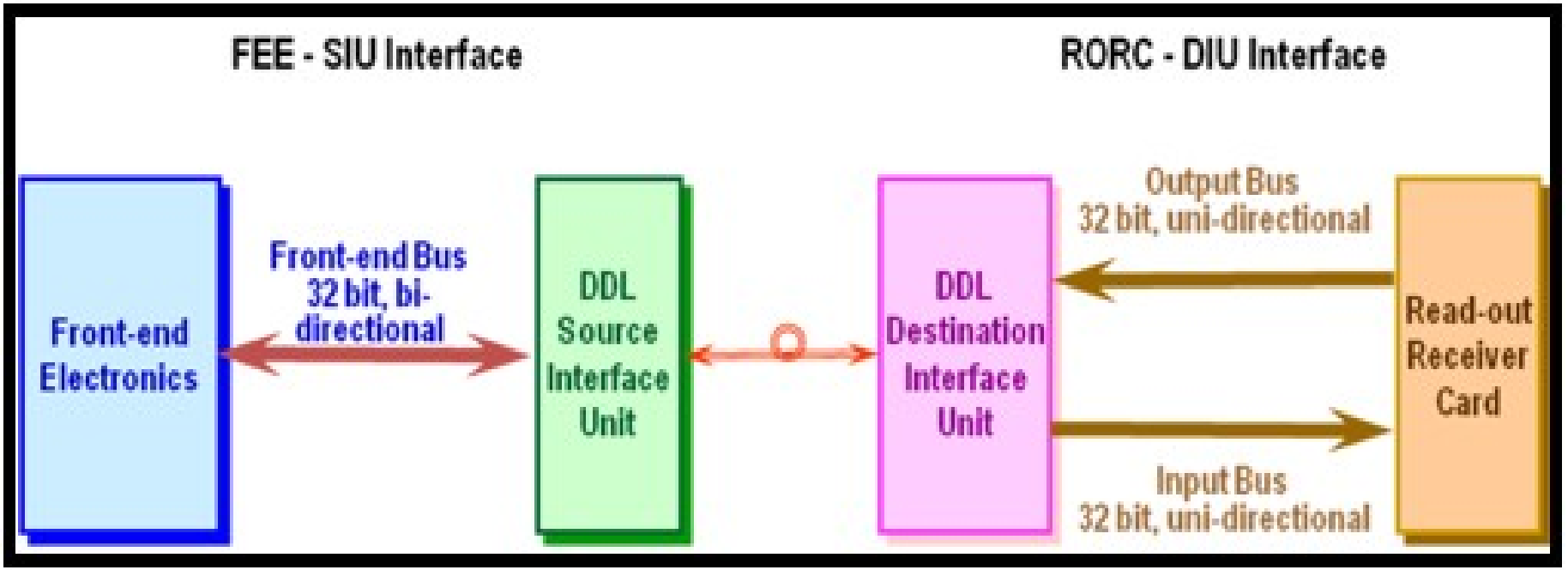
Contributions by the Hungarian ALICE Group

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

- 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, Harangozó 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

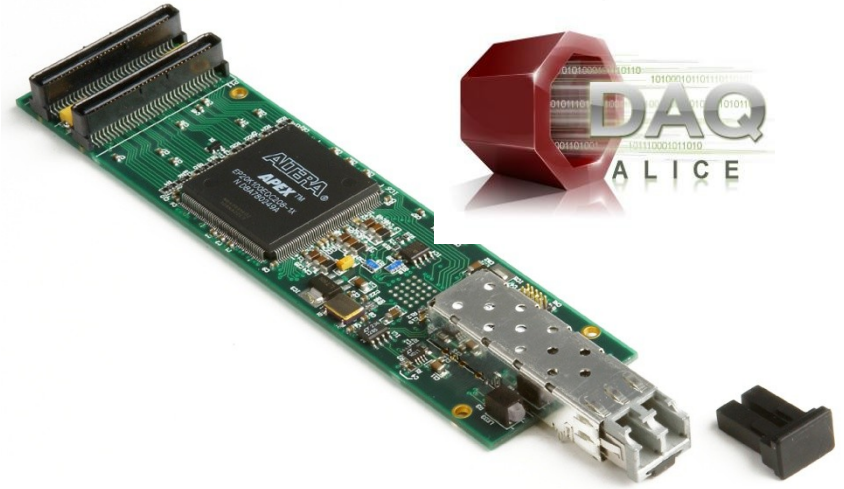
2 PB/yr

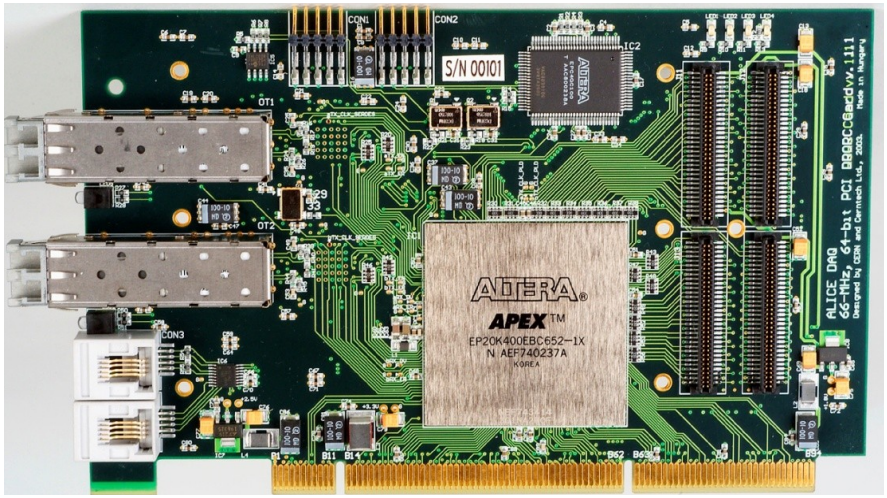
High radiation background (kRad)

Mainly in the TPC

Used by other CERN experiments

Success reloaded.. ALICE DAQ UG

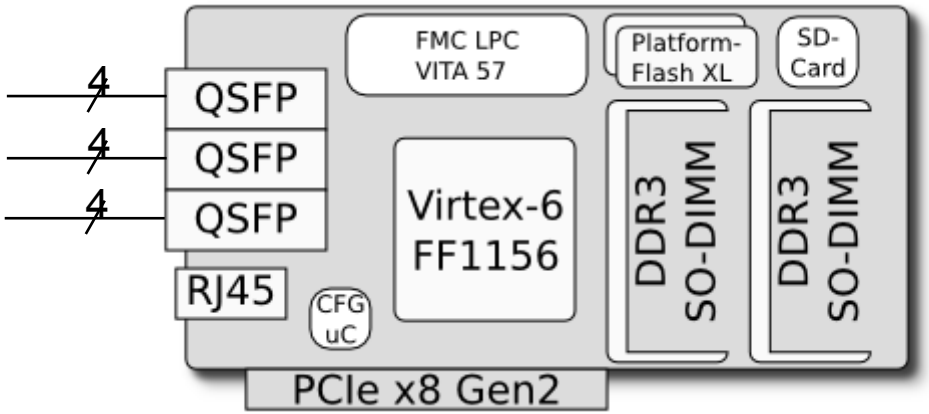




ALICE DDL/DAQ: data on the Highway

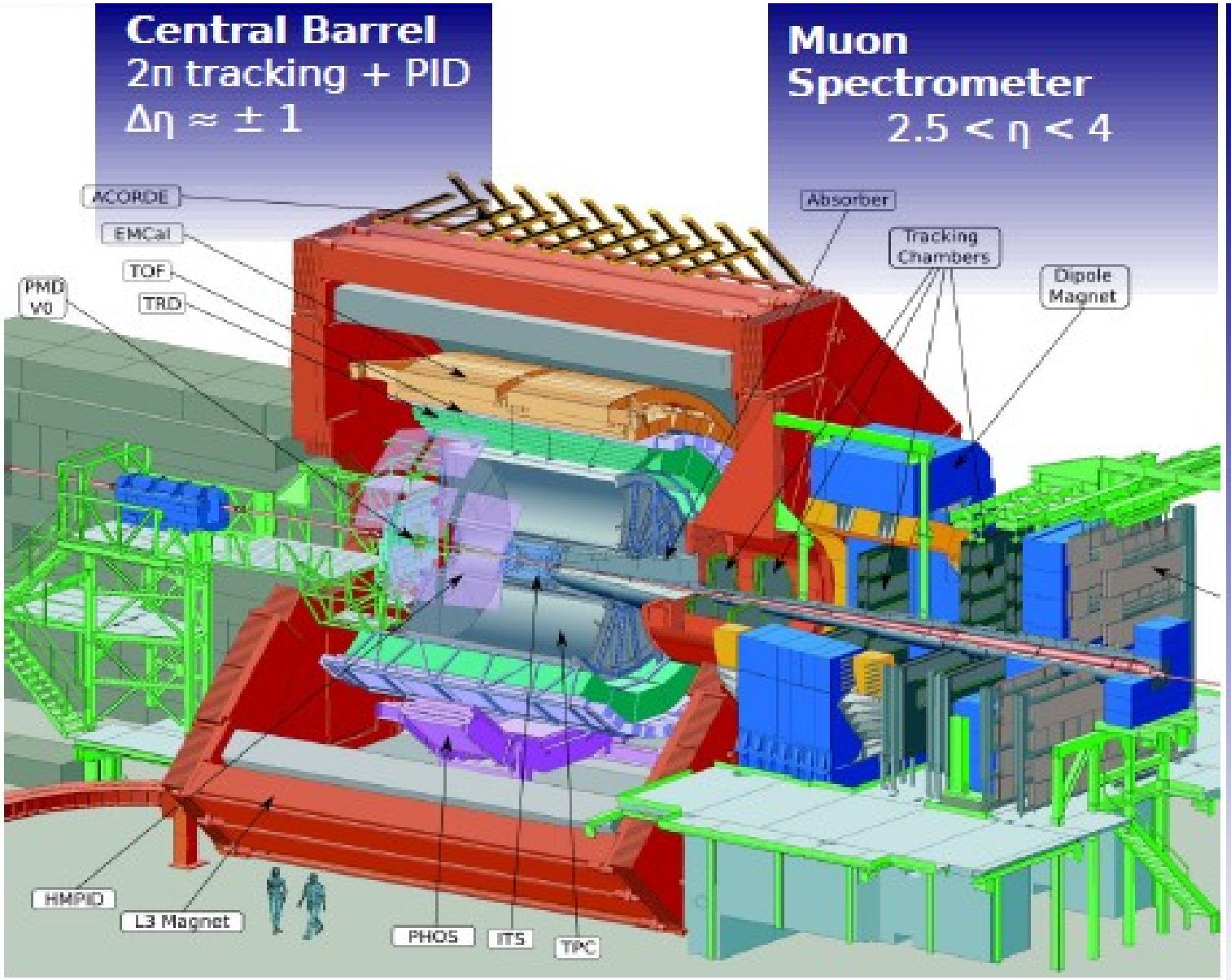
CommonDAQ & trigger DAQ/HLT DDL2, RORC2

- 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



ITS:
PID: dE/dx
low pt tracking

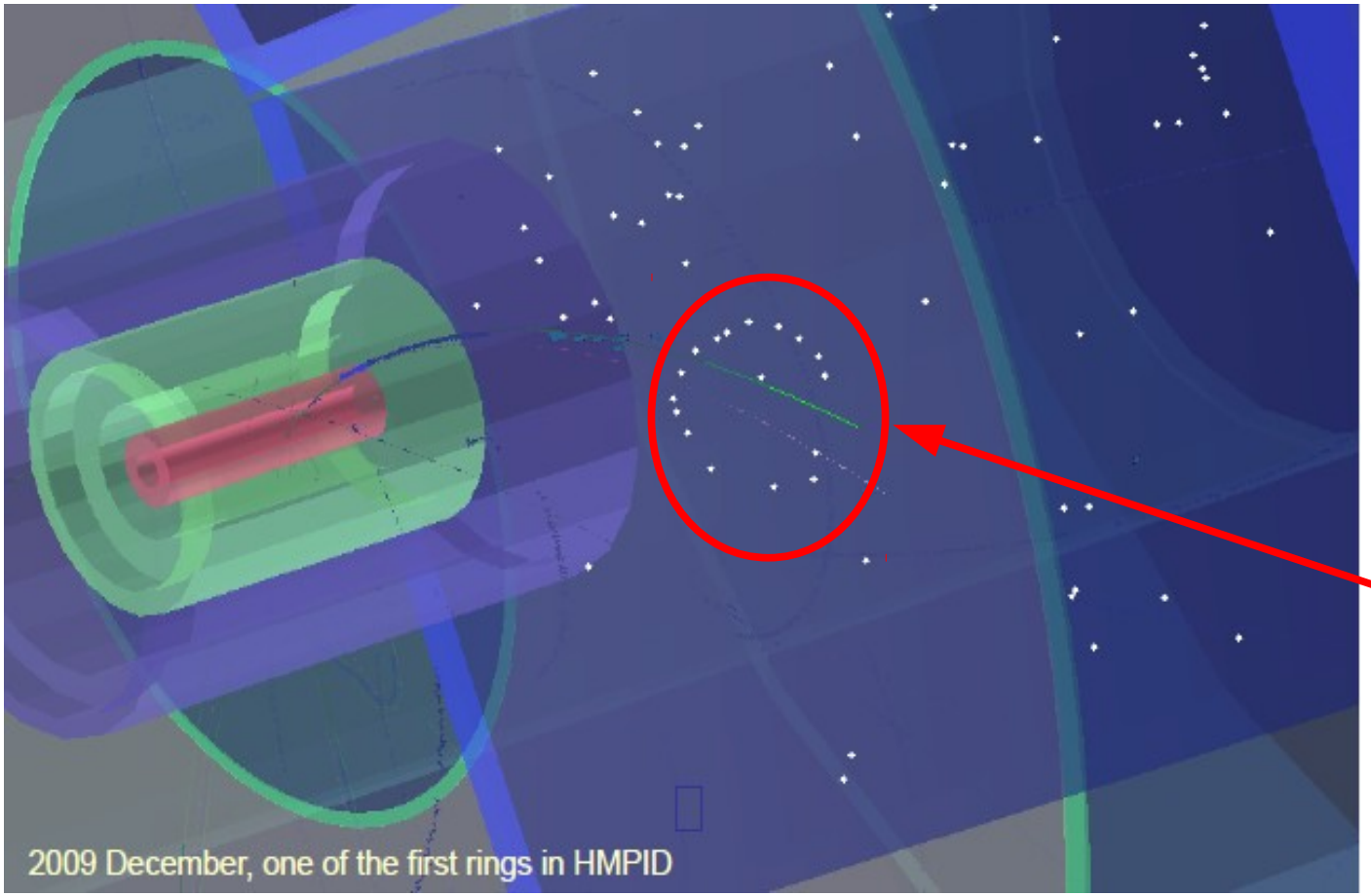
TPC:
- PID: dE/dx
- Global tracking

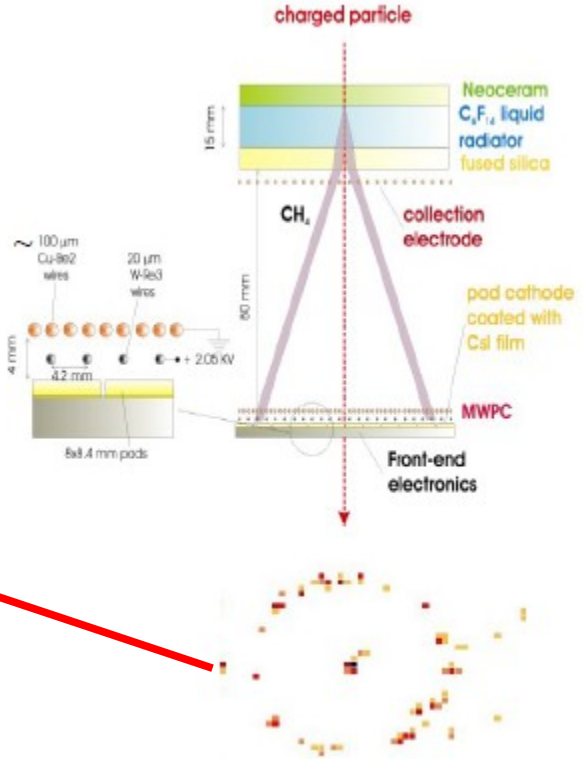
TOF:
- PID: ToF
- PID + TPC matching

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

HMPID:
- PID: Cherenkov
- π/K/p

High Momentum Particle Identification Detector: CERN ALICE HMPID

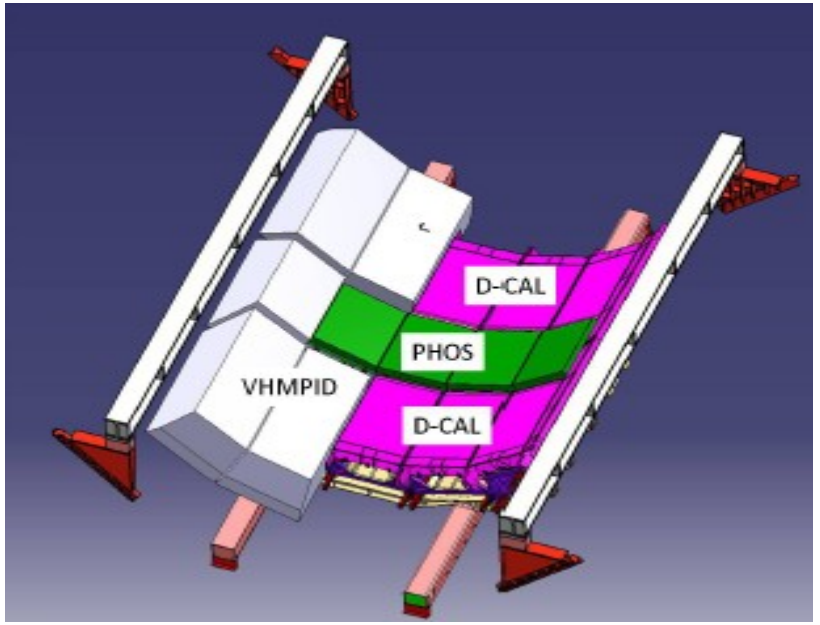




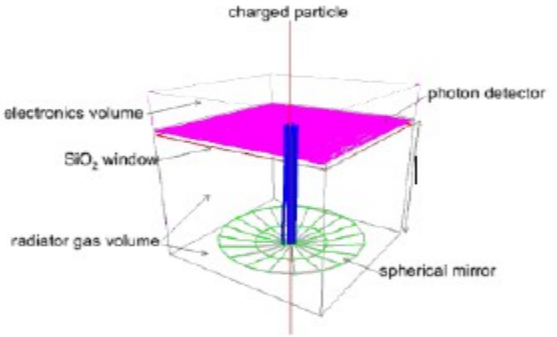
RICH: Ring Imaging Cherenkov Detector:
the only way for event-by-event particle identification

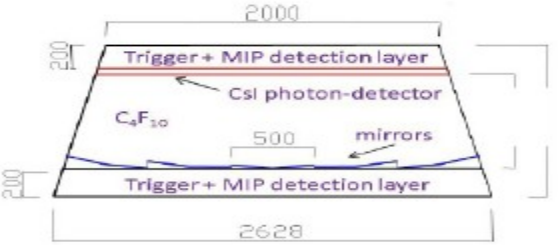
CERN ALICE upgrade: VHMPID

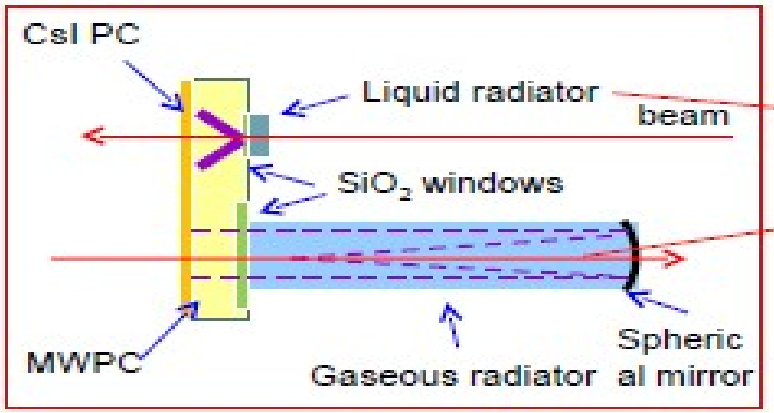
A proposed ALICE upgrade: beyond high momentum particle identification: 1-5 GeV/c helyett 5-25 GeV/c



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

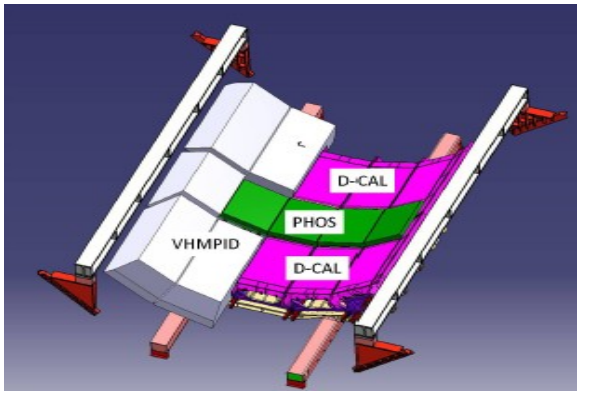


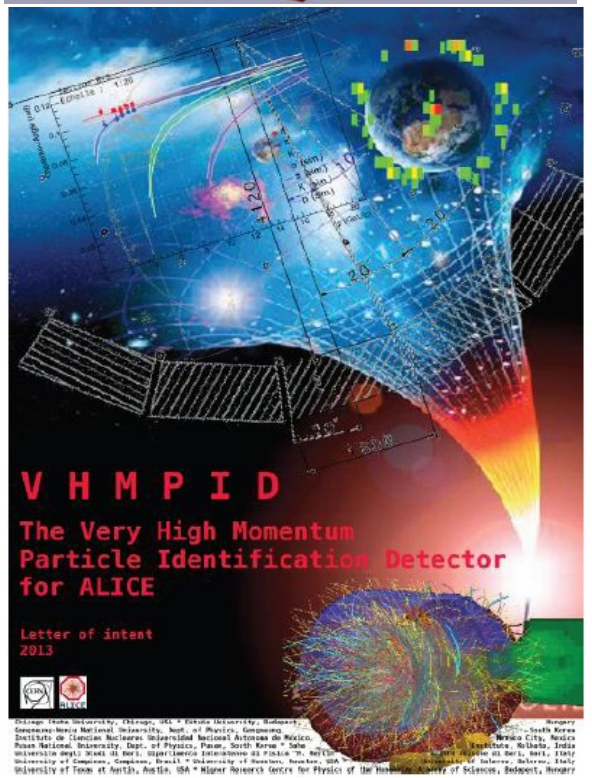




LoI: Very High Momentum PID Detector

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

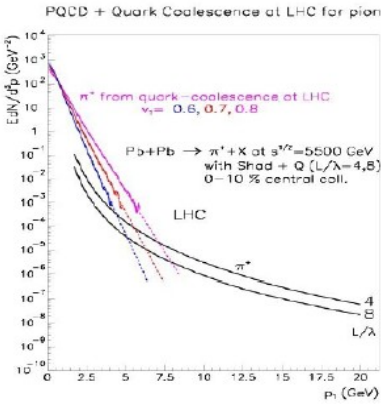


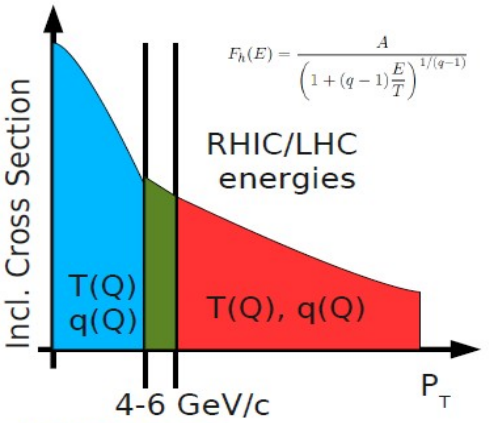


Physics/Analysis & Theory

- Theoretical background

  High-pT @ pQCD

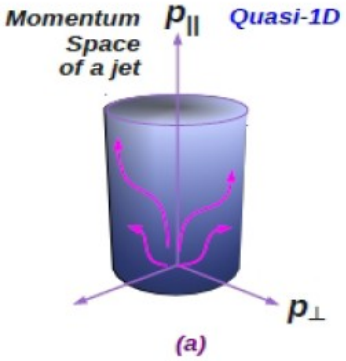


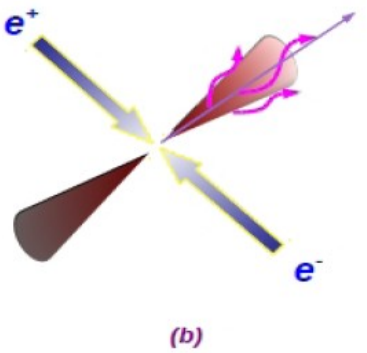


P. Lévai, GGB, G. Fai: JPG35, 104111 (2008)

New theoretical developments

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

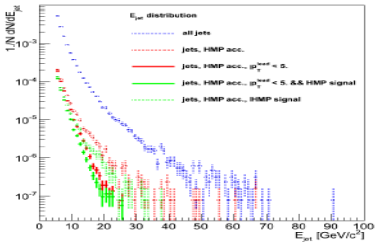


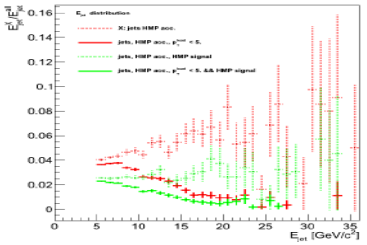


Physics/Analysis & Theory

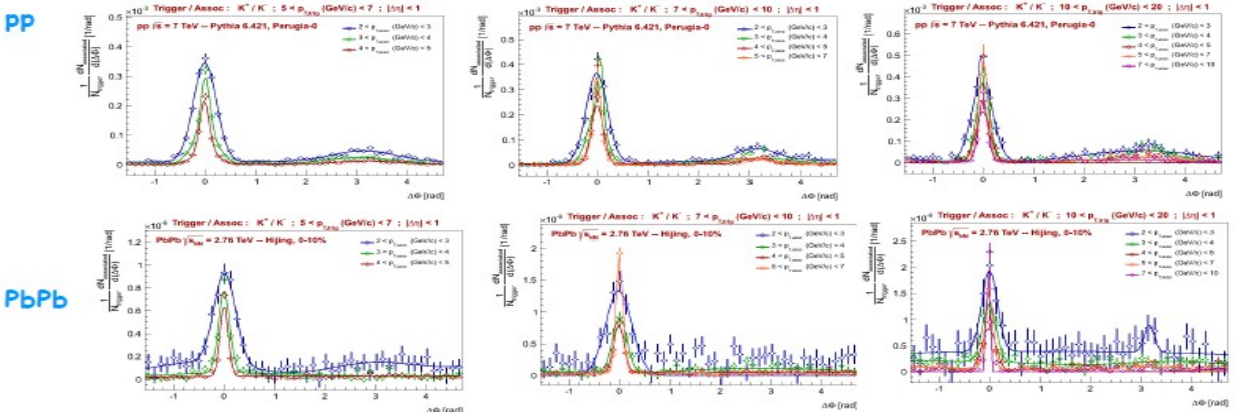
- The analysis

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





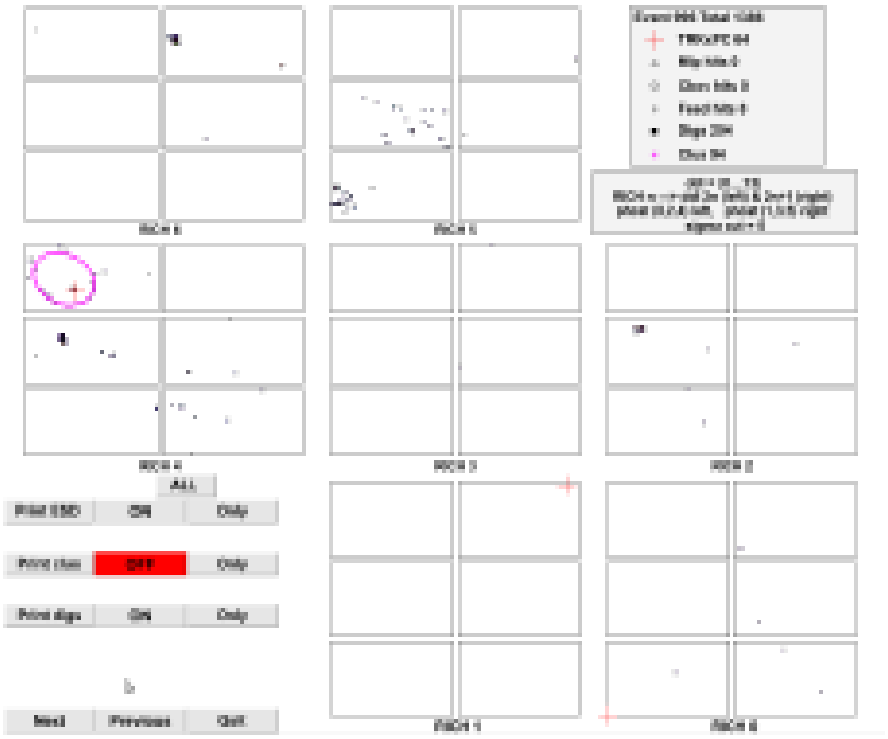
  PID-triggered hadron correlation



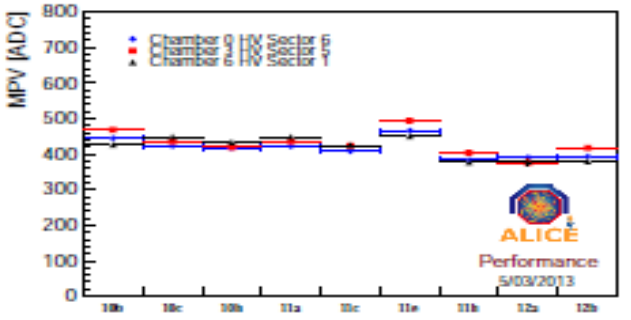
- Aging test of the HMPID detector

Physics/Analysis & Theory

- Aging test of the HMPID detector



Period	Ph. Clu. Info.	Events [$\times 10^6$]
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. 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

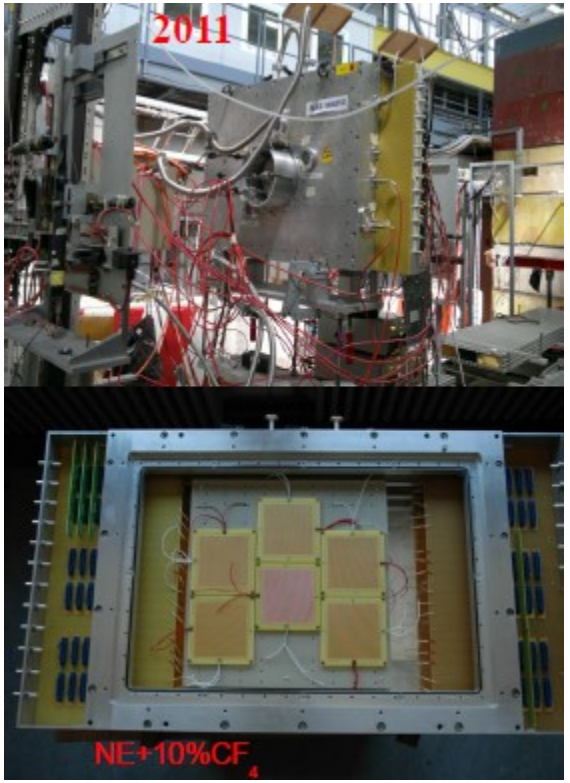
- PID & correlation studies
- How to share the work
- We have the infrastructure

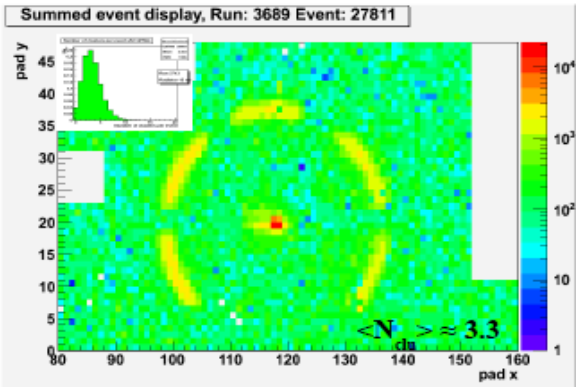
- Would be nice to join
- We are ready to take
- Yessss

- Must do...

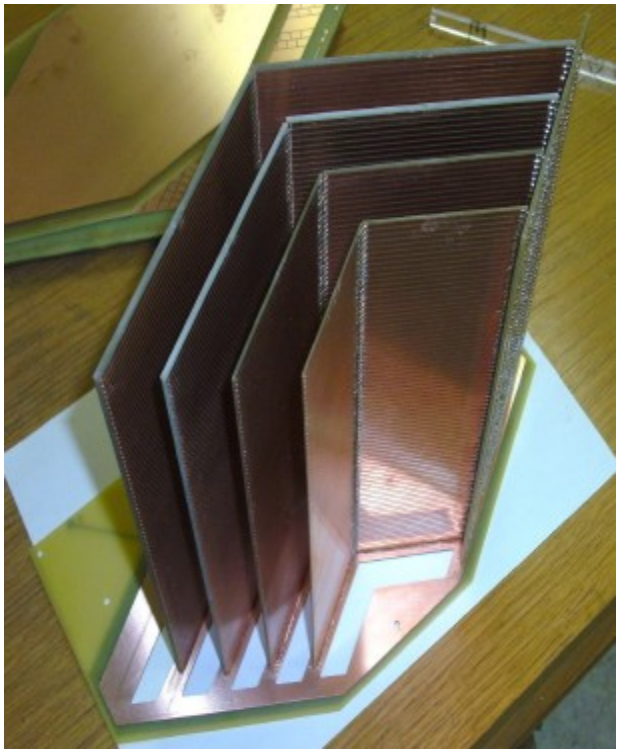
ALICE TPC fits into ReGaRD's portfolio

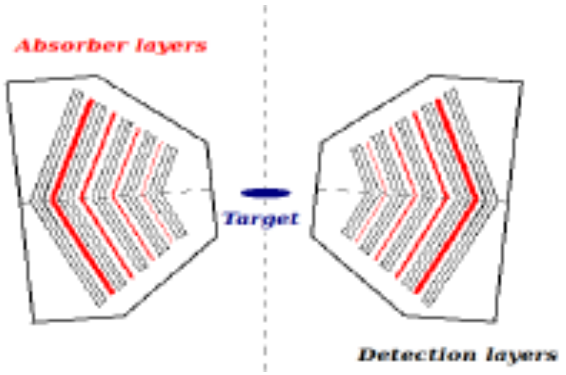
VHMPID



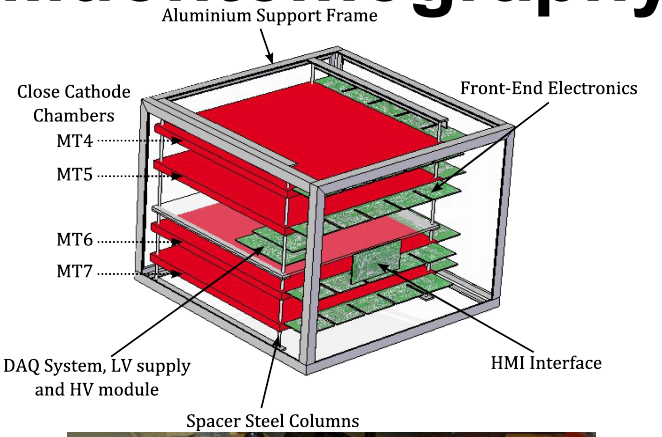


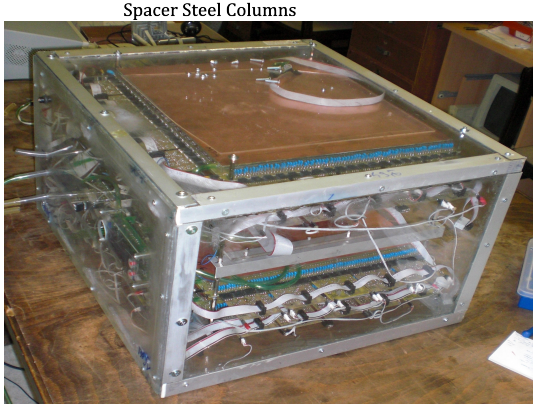
NA61 SHINE

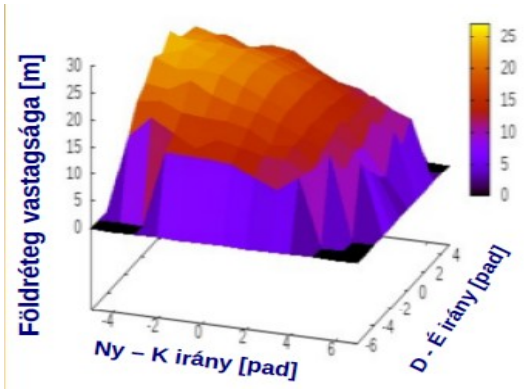




Muontomography





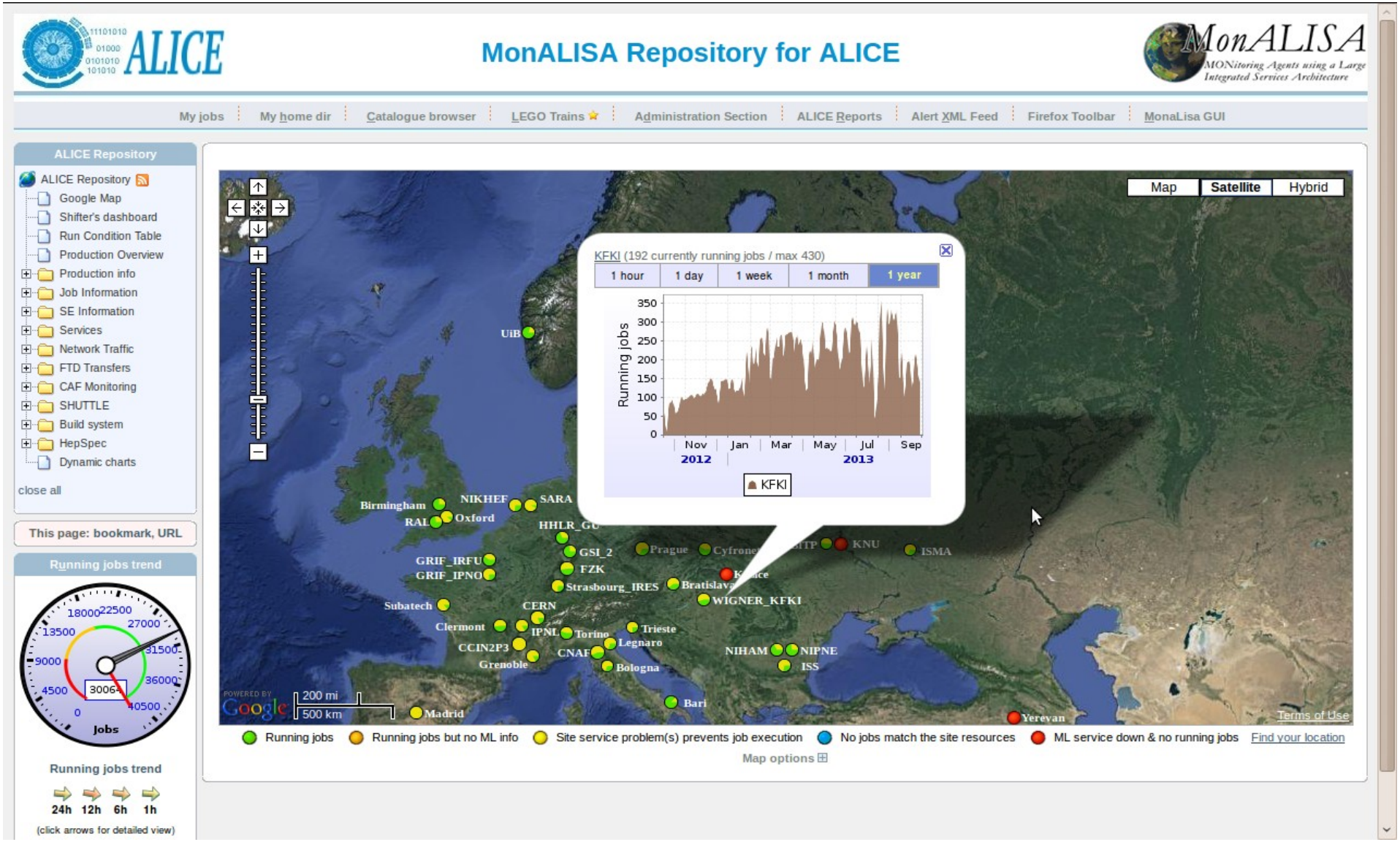


GRID – ALICE Tier-2

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 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

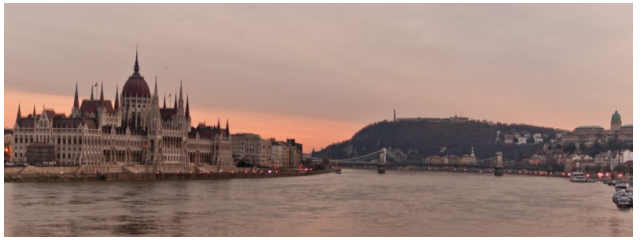
Search for the future HR for High Energy Physics

Teaching and PR activities

- BSc and MSc level teachnig & supervising at
  - Eötvös Loránd University (Intruductory talks
  - Connection to Technical University of Budapest
  - Connection to University of Miskolc
  - Public rectures (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?

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