



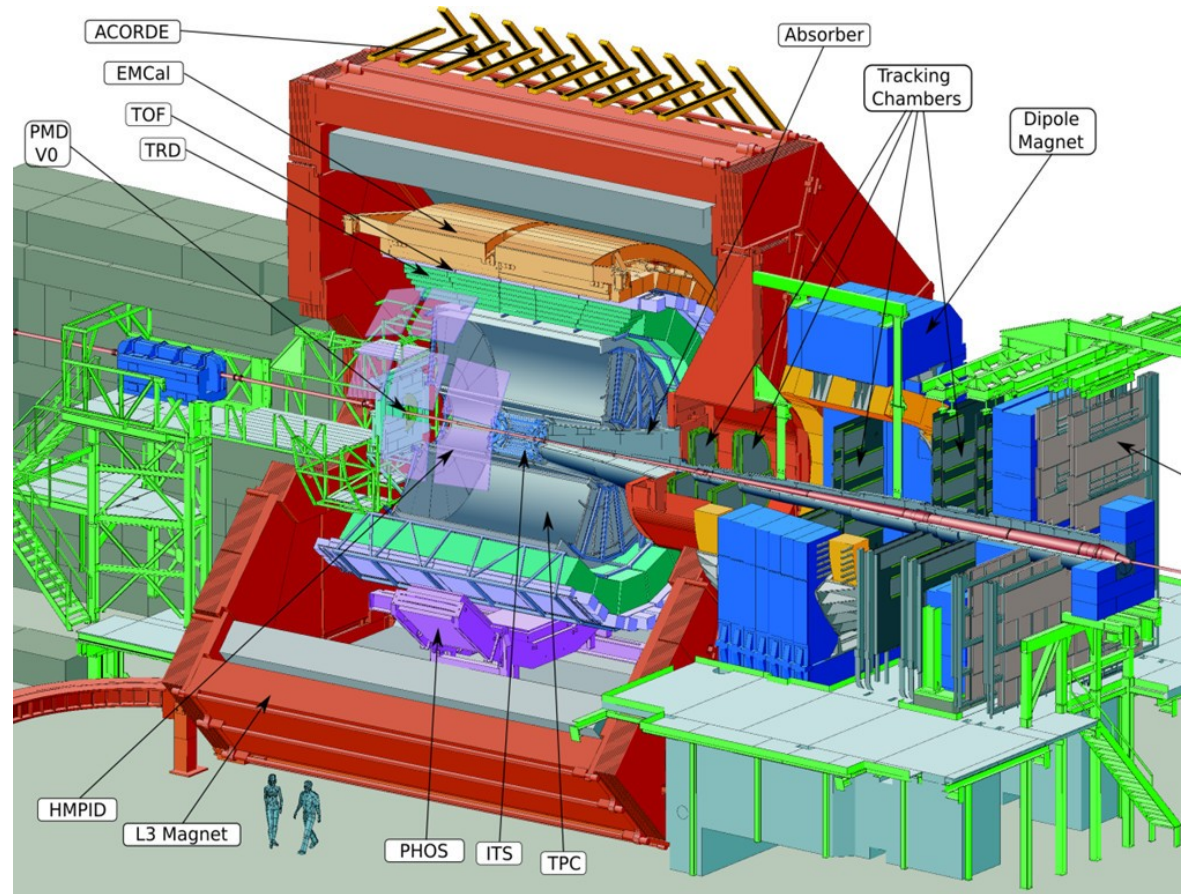
Hungarian Contribution to the ALICE TPC Upgrade Project

Dezső Varga, MTA Wigner RCP
for the Budapest ALICE group and for the REGARD group

- The ALICE TPC Upgrade: overview
- Detector physics group at Wigner
- R&D, prototyping activities
- Contribution to the construction: the “Budapest QA center”
- Outlook, encouragement for future colleagues

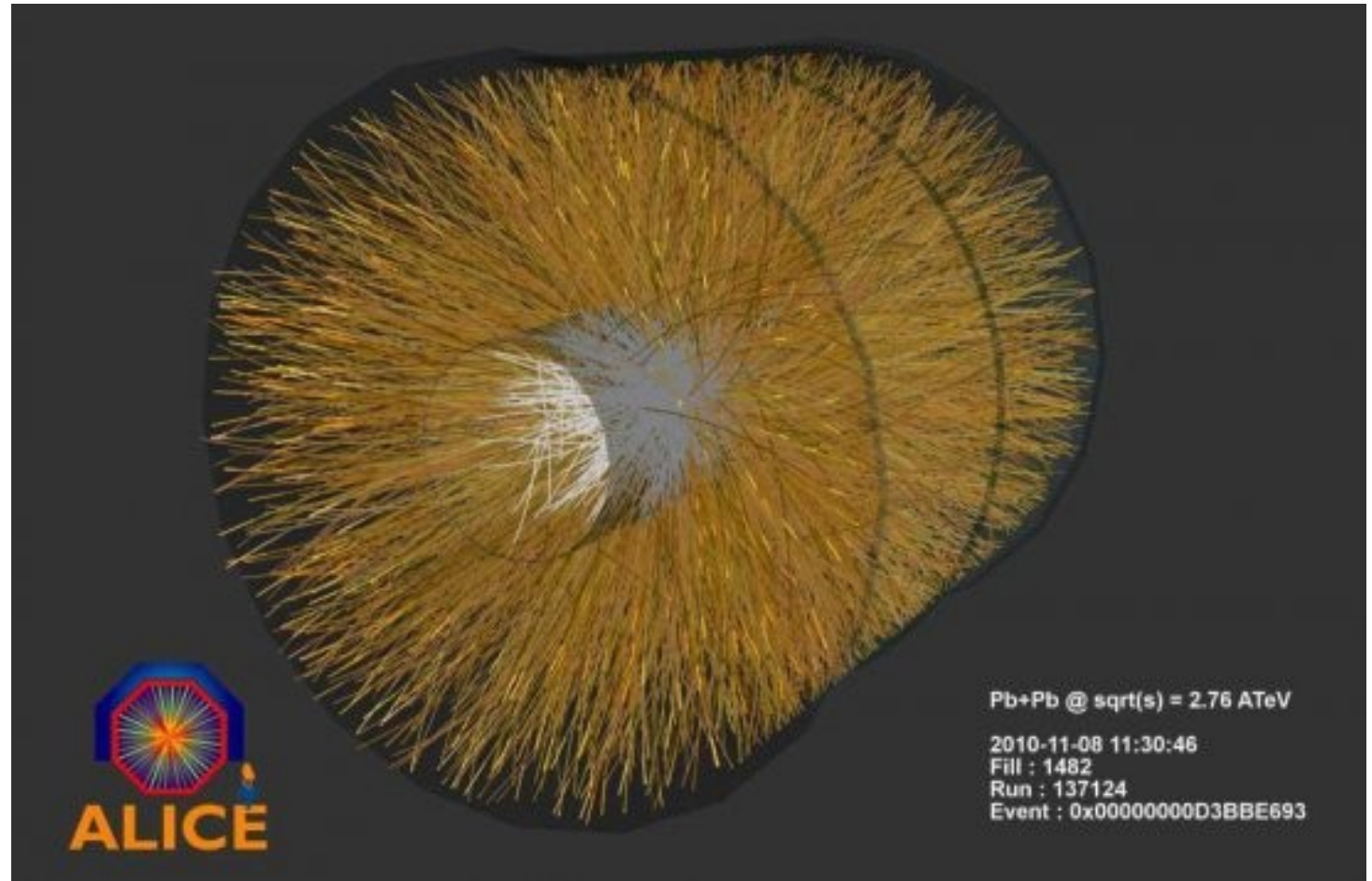
ALICE: heavy ion collider at LHC

- Key component: TPC in the central region



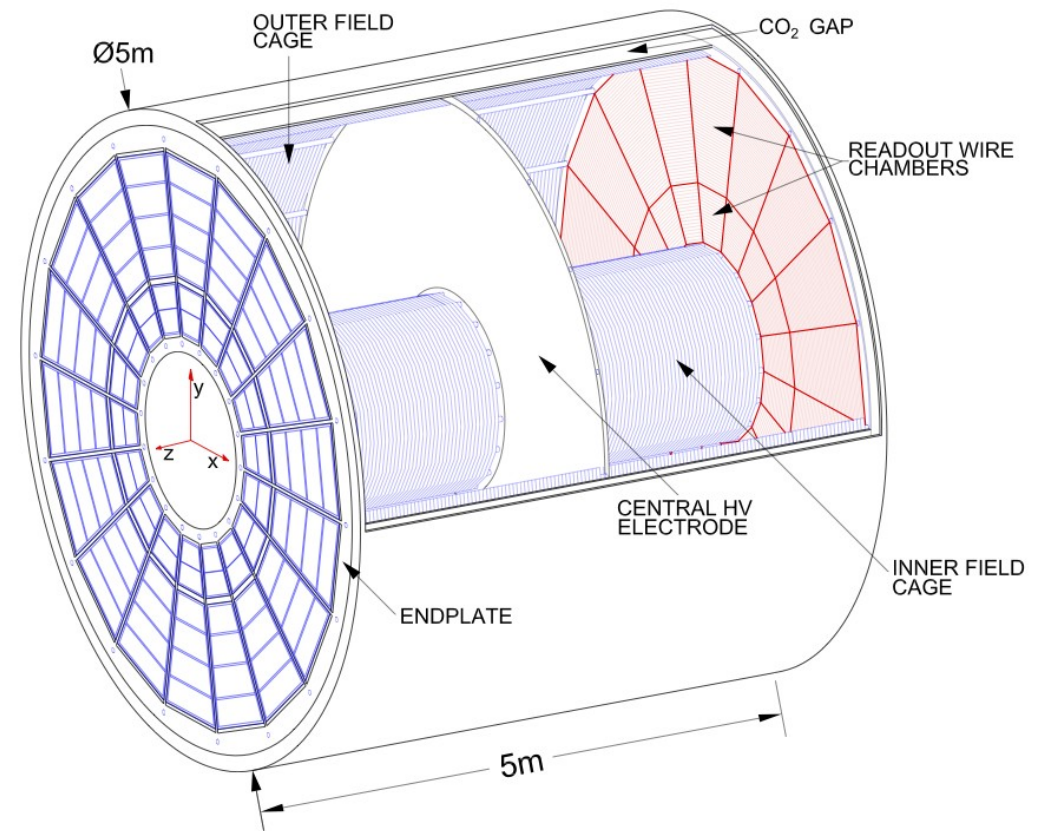
TPC as ultimate tracking device: a true 3D camera

- 88 m³
- 500 megapixel (voxels)
- Presently 500 images/sec



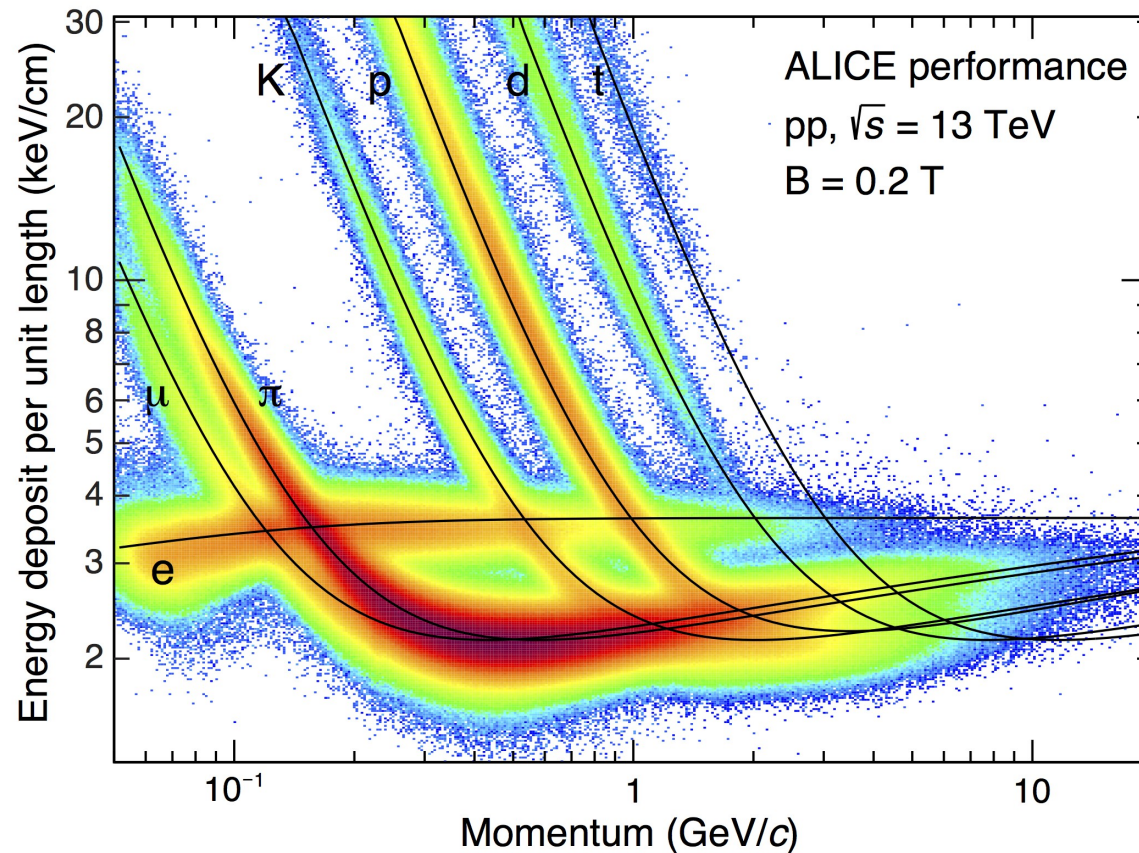
Time projection chamber principle

- Large gas volume
- Electrons drift to the sides of the barrel
- Amplification on the discs, 30 m² area
- Signal arrival time determines third coordinate



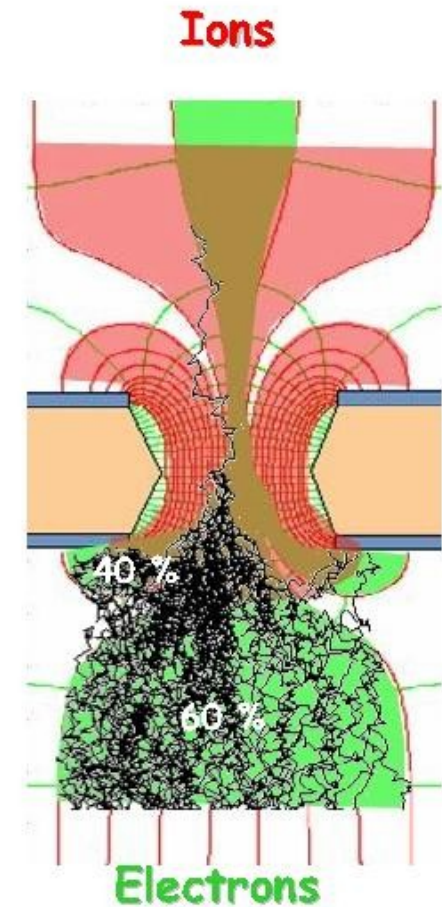
Particle identification with TPC

- Ionization for each tracks measurable



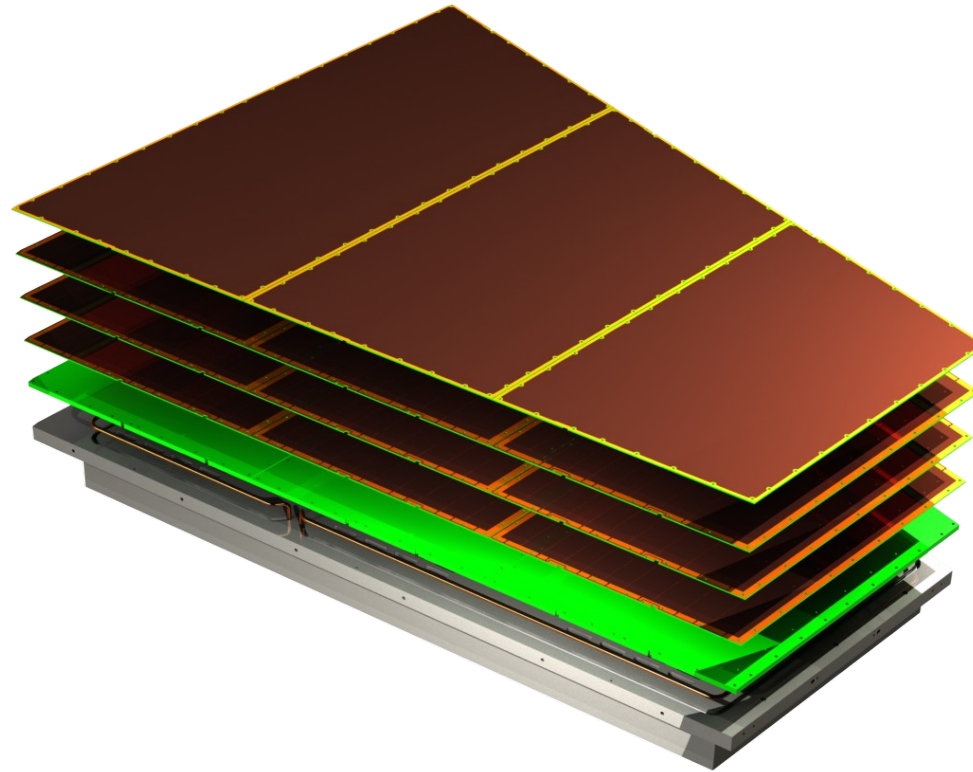
Upgrade goal: 20-fold increase in readout rate

- Continuous readout: 50kHz event rate in proton+proton (“movie” instead of “images”)
- Detector limitation with space-charge accumulation
- Solution: GEM technology (instead of MWPC)



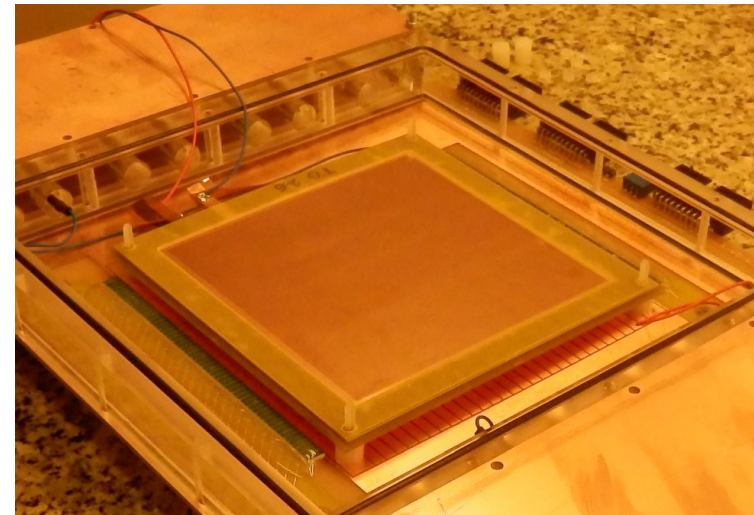
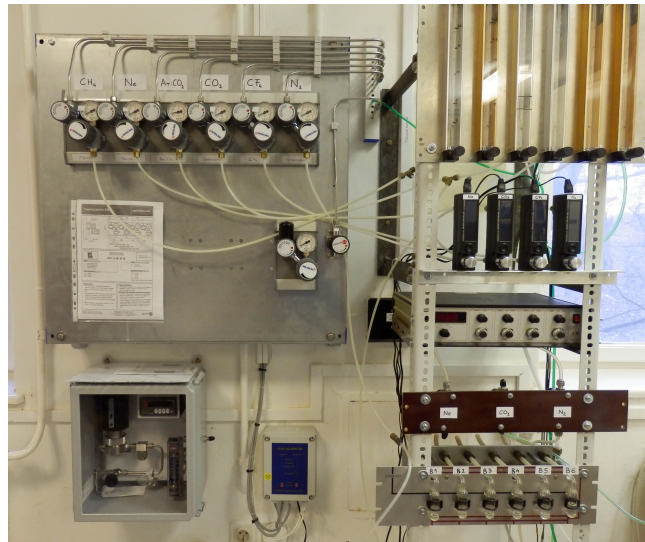
Readout chamber outline

- 4-GEM system, with ion blocking setting



Research group and infrastructure in Budapest

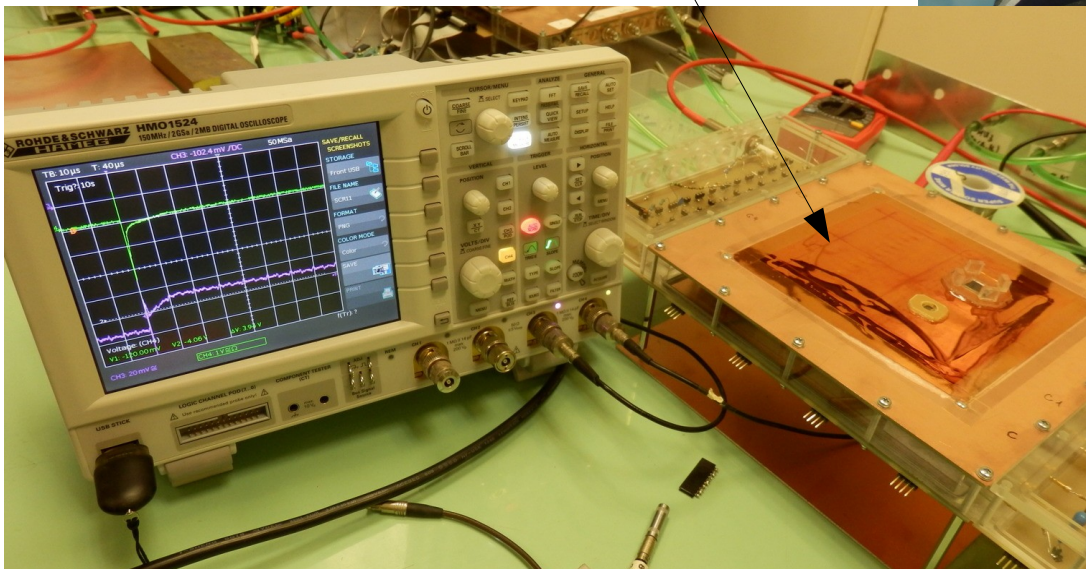
- "Momentum" grant for Innovative Gaseous Detector Development (R&D)
- Well functioning synergy with the Budapest-ALICE group



R&D activity: test chamber for readout electronics survival tests

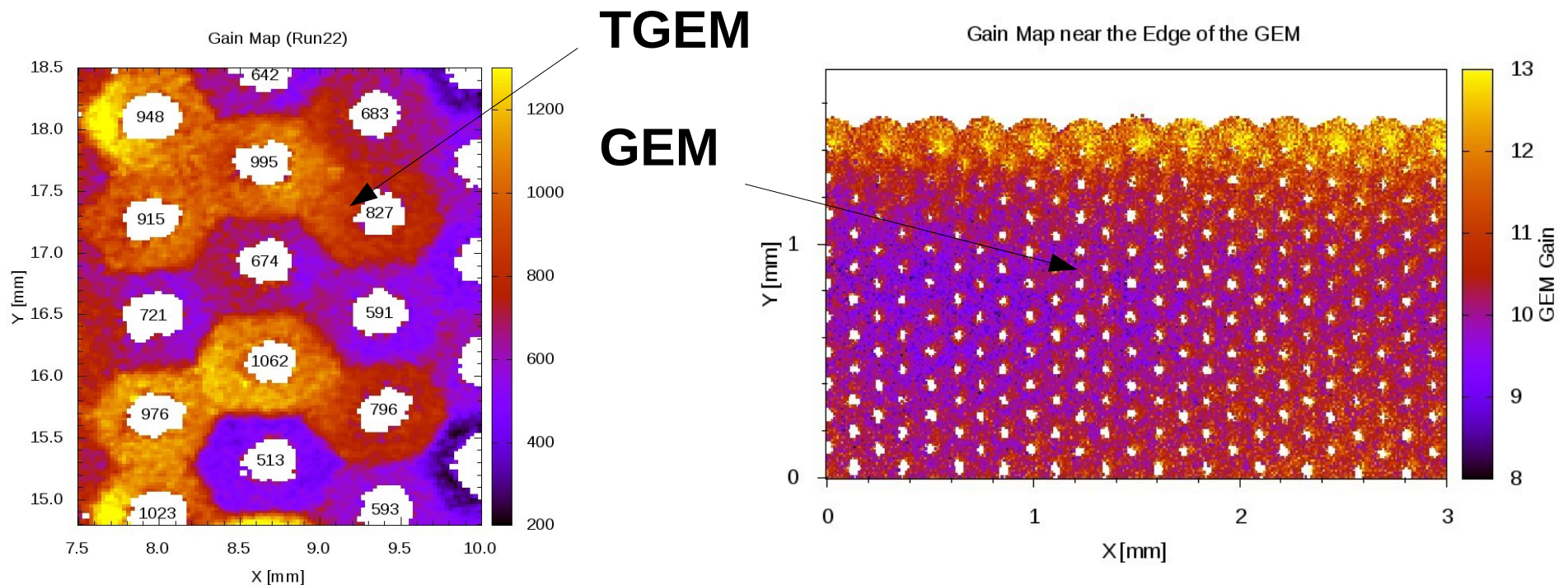
- In collaboration with Bergen Uni.

4-GEM test chamber



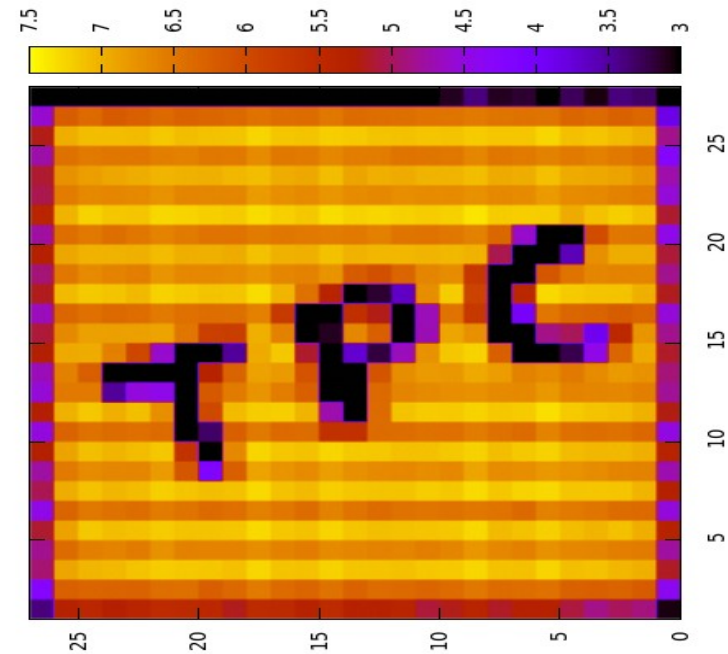
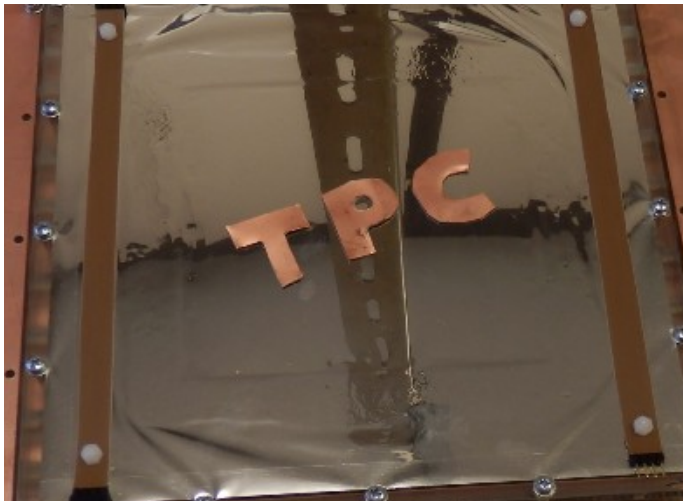
R&D activity: high resolution GEM gain mapping with single photons

- In the framework of the CERN RD51
- Now part of the AIDA-2020 project (see G. Galgóczi talk in same session)



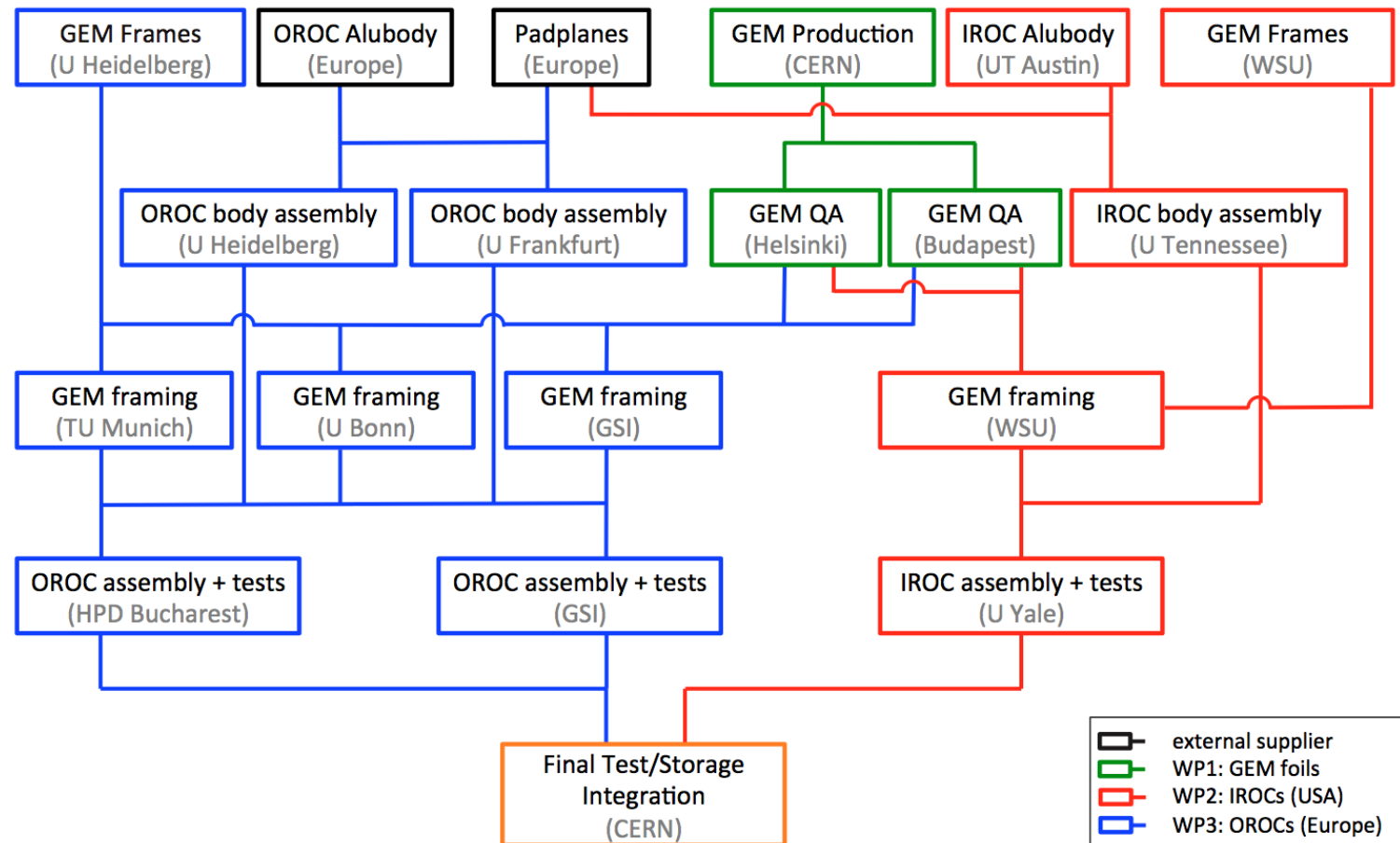
R&D activity: gain mapping of GEM-s

- In collaboration with Helsinki Uni.
- High general interest especially towards the ALICE TPC UG (see K. Kapás in same session)



Budapest in the UG construction

- Broad international undertaking!



- Key step: Quality Assurance

it means HV, optical scanning and gain scanning of foils before installation

Device for gain scanning, HV leakage testing and visual check

- As big as a foil, sensitive 90cm by 50cm!



For those who may join...

- There is a LOT to do, with direct international relevance (CERN, Europe or outside)
- Very broad scope: hardware, design, analysis, electronics, hands-on...
- Possibility to join from every level, first years undergrad up to PhD-s
- High priority and well supported activities