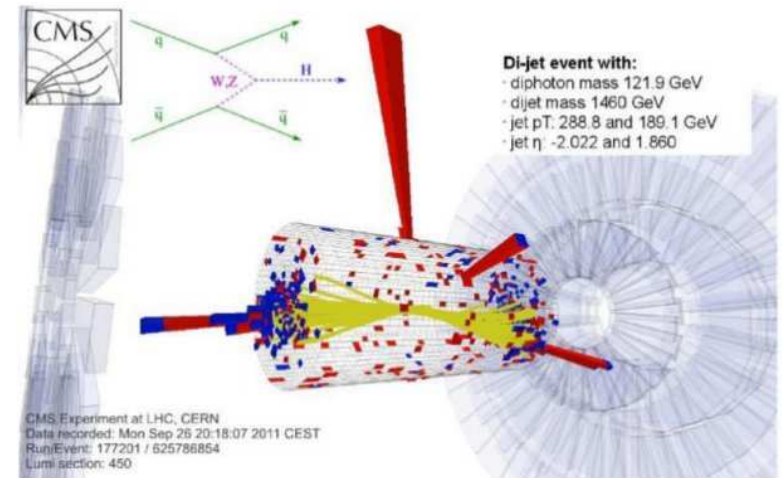
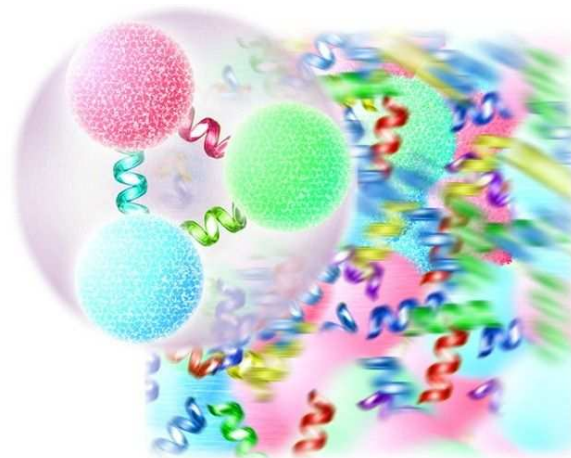
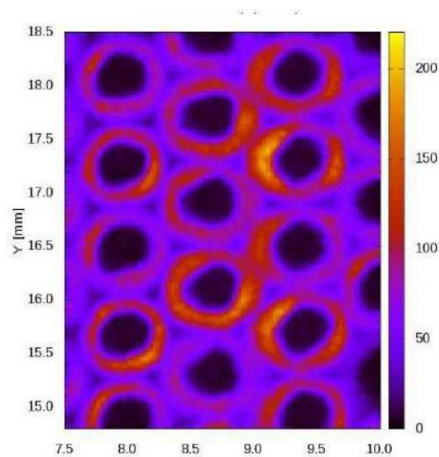


Experimental high energy physics in Wigner



Budapest, February 23, 2017

Experimental high energy physics in Wigner

- The beginnings

- after Dubna, CERN membership of Hungary (1992)
- main activities: **detectors**, **electroweak** (LEP OPAL/L3) and **strong interaction** (SPS NA49, GSI FOPI, RHIC PHENIX)

- The present

- Detector research and development
- Big: CMS (with Debrecen and Eötvös U), ALICE [various topics]
- Small: ASACUSA, TOTEM, NA61 [selected topics]
- Computing: Tier0, WLCG

- The future

- LHC detector upgrades (CMS and ALICE)
- Plasma wake-field acceleration (AWAKE), [Rb plasma]
- Accelerator physics (FCC) [beamline]

Detector construction, operation, data analysis, phenomenology

Dept of high energy physics – personnel

Detector R&D
Dezső Varga 

Hadron physics
Ferenc Siklér

SM and New Physics
Viktor Veszprémi

Emeritus



Contributor



Advisor



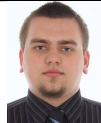
Senior



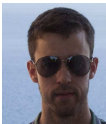
Fellow



PhD student



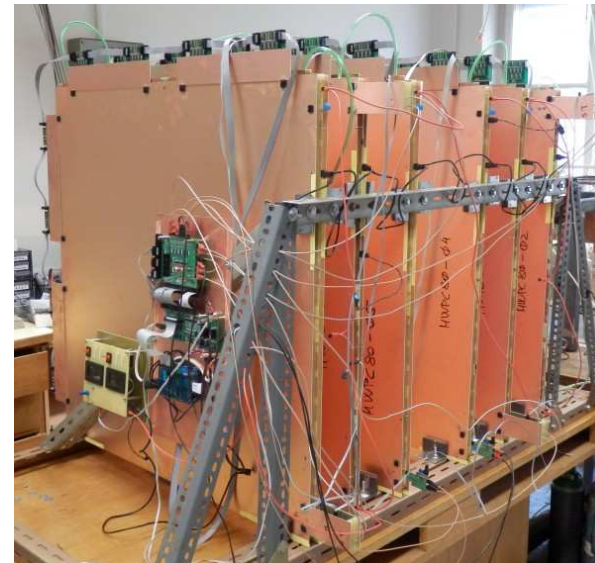
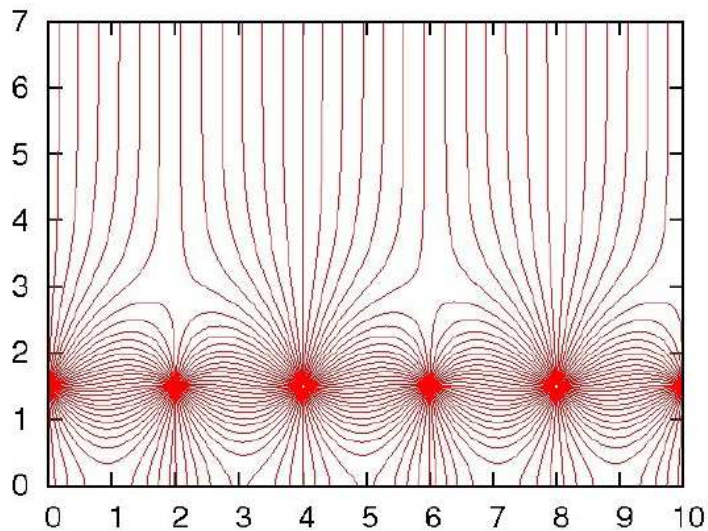
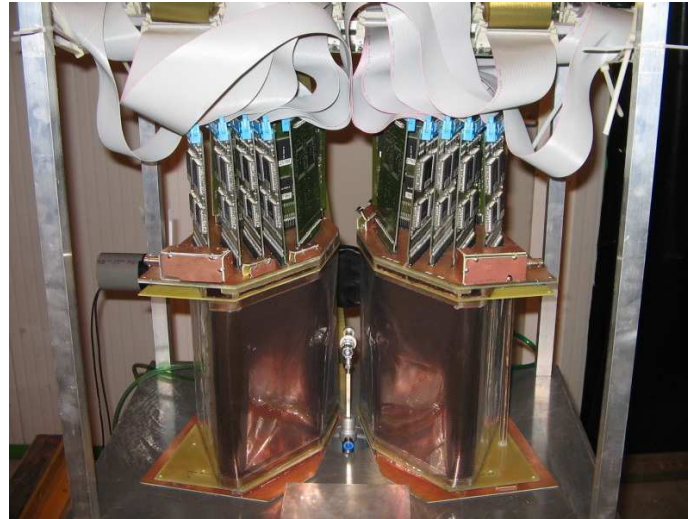
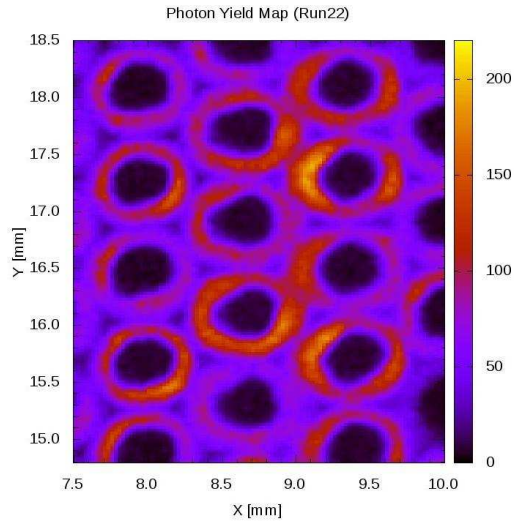
undergrad



“Momentum” grant of the Academy

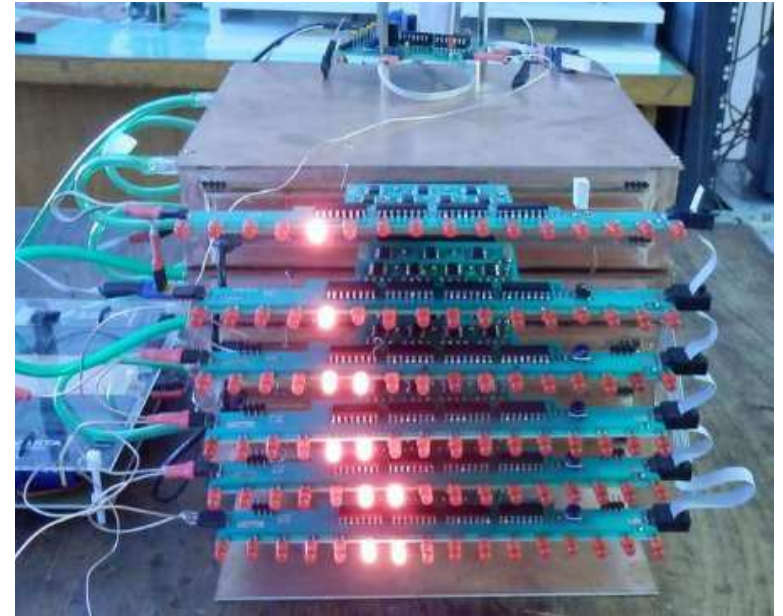
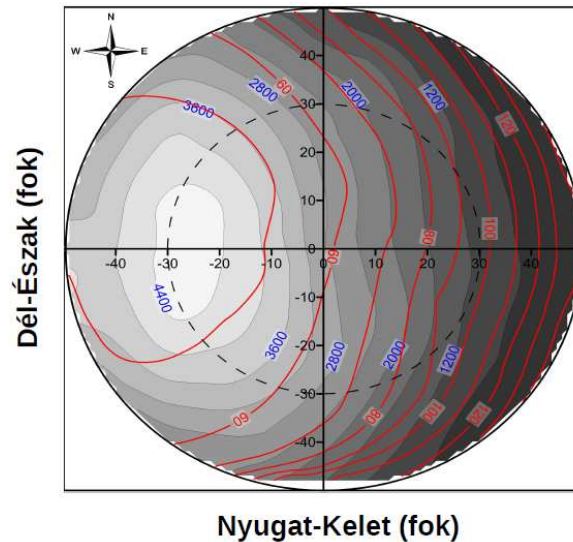
Several students (in collaboration with Eötvös U and U of Technology)

Detector research and development (D Varga)



Innovation; gas-electron multipliers, MWPC; readout

Detector research and development



L Oláh, G Hamar et al

Detection of cosmic muons, various applications
(underground cavities, materials, volcanos [Japan])

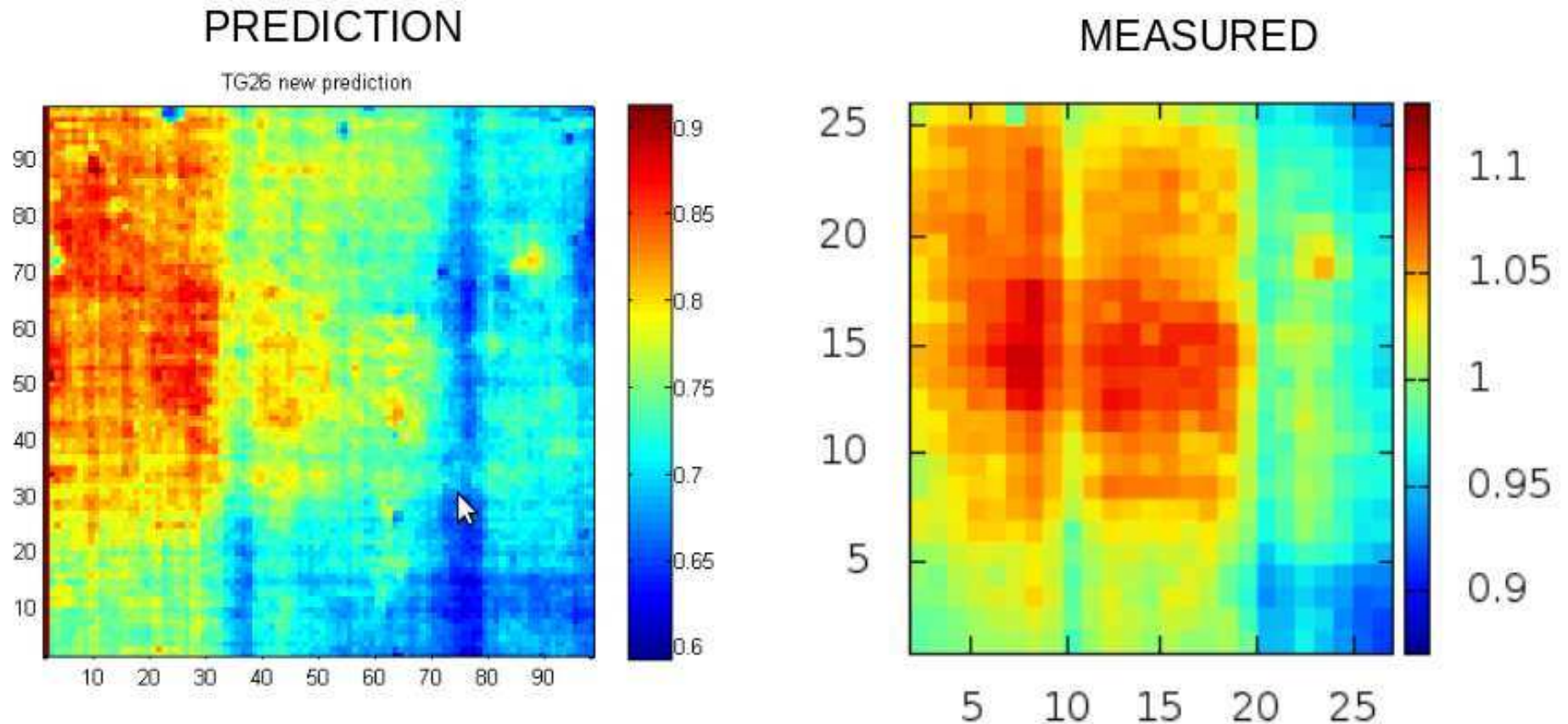
Several international connections:

RD51, AIDA-2020, ALICE, NA61, BrightnESS
Joint laboratory with Chinese Academy of Sciences

Laboratories, clean room; students; outreach

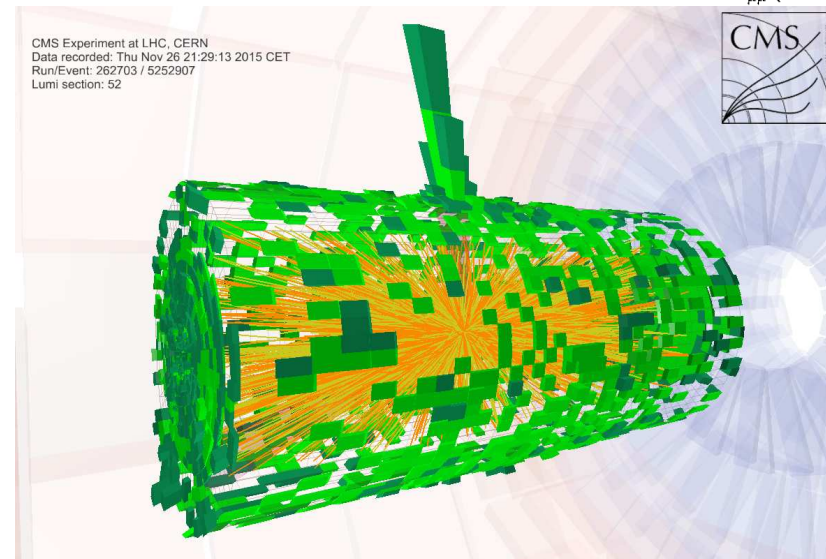
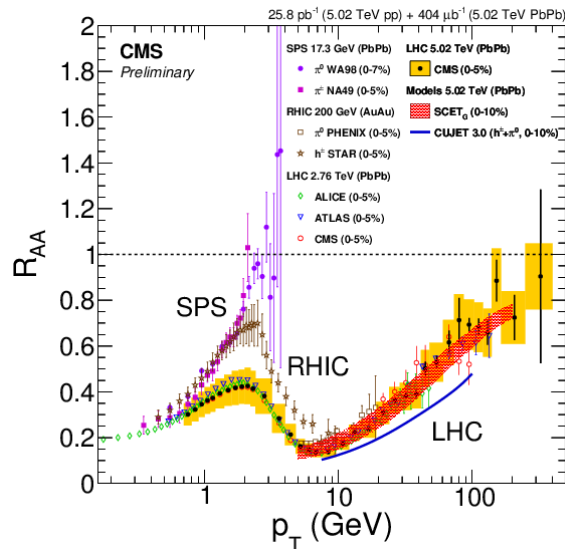
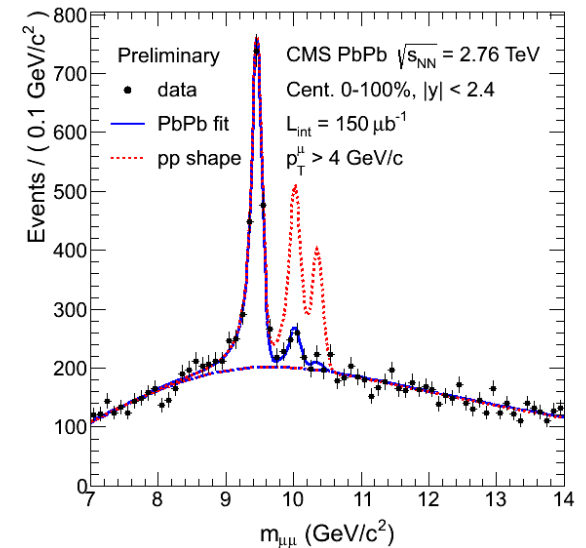
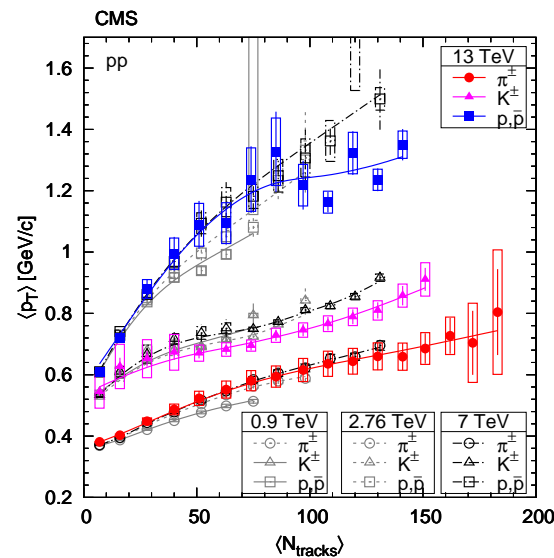
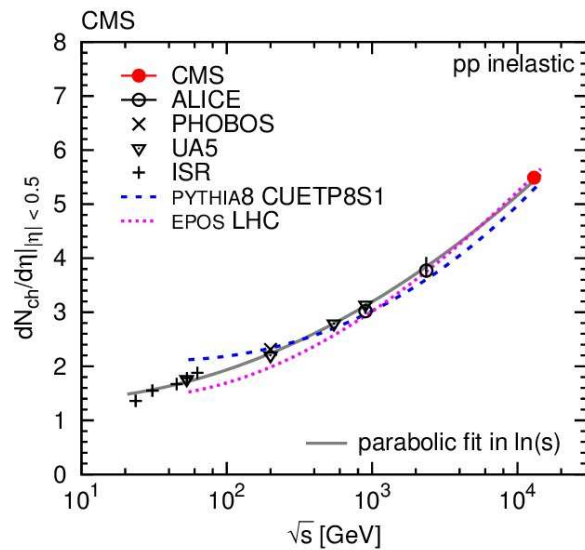
Detector research and development

GEM hole size distribution:



Qualifying GEM layers, used to read out of the upgraded ALICE TPC
In collaboration with the U of Helsinki, TU Munich, and CERN

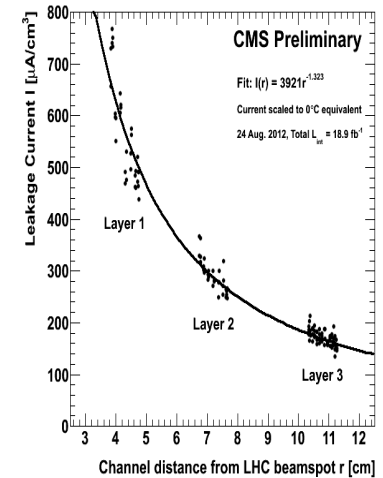
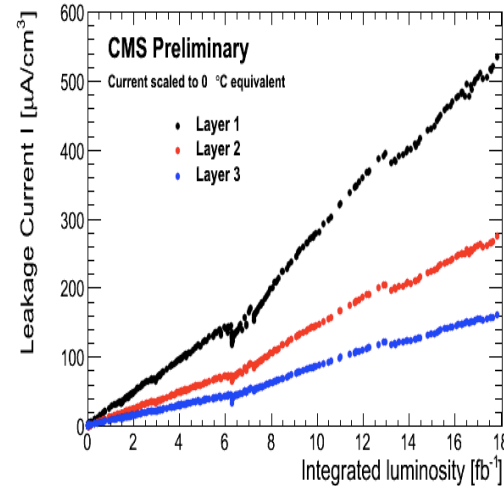
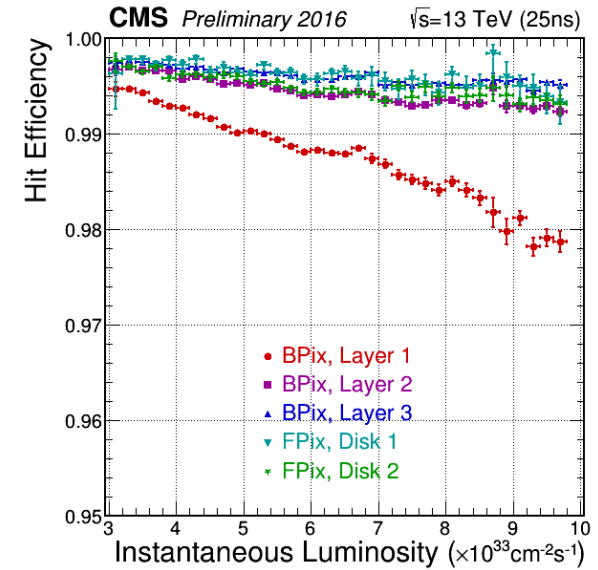
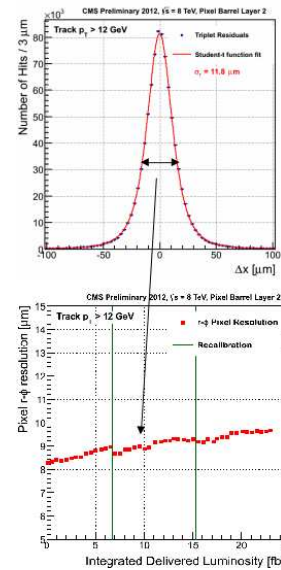
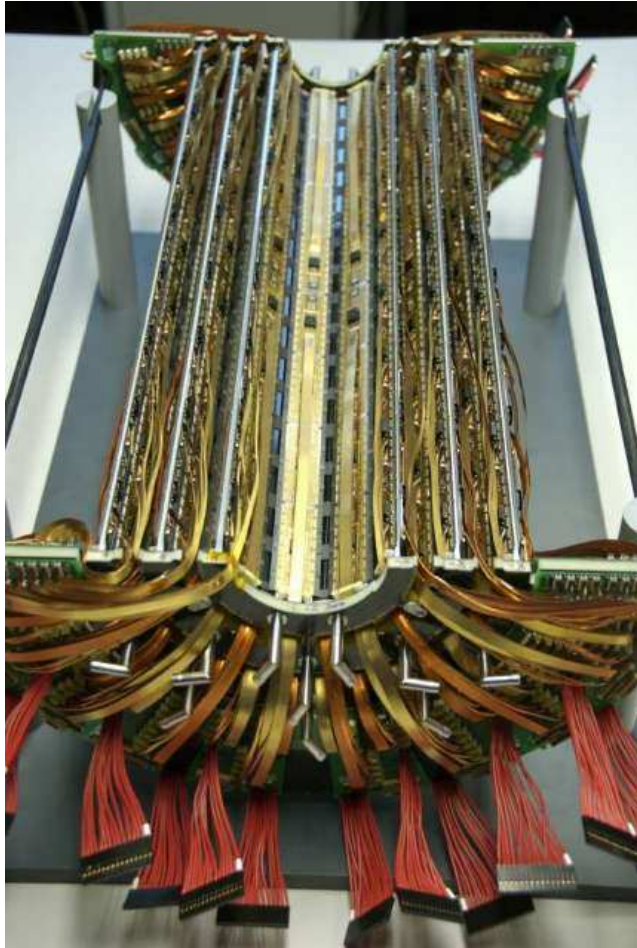
CMS – hadron physics (F Siklér)



K Krajczár, AJ Zsigmond

Strong interaction (QCD and heavy-ion physics); first measurements
Charged particle tracking, PID, spectra and correlations, resonances

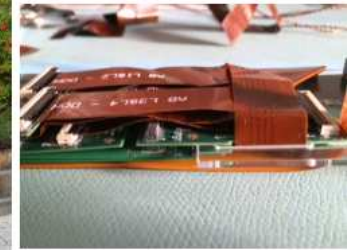
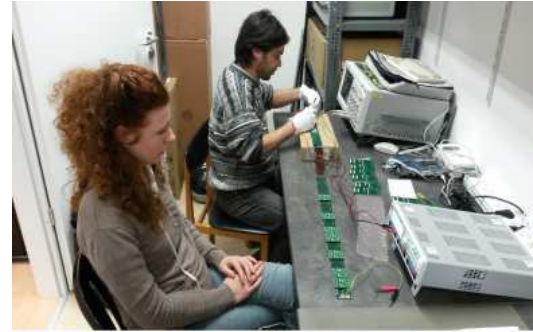
CMS – pixel detector (V Veszprémi)



Various calibrations of the pixel detector, chips

Ageing: monitoring spatial resolution vs luminosity and readout threshold

CMS – upgrades (V Veszprémi, T Kiss)



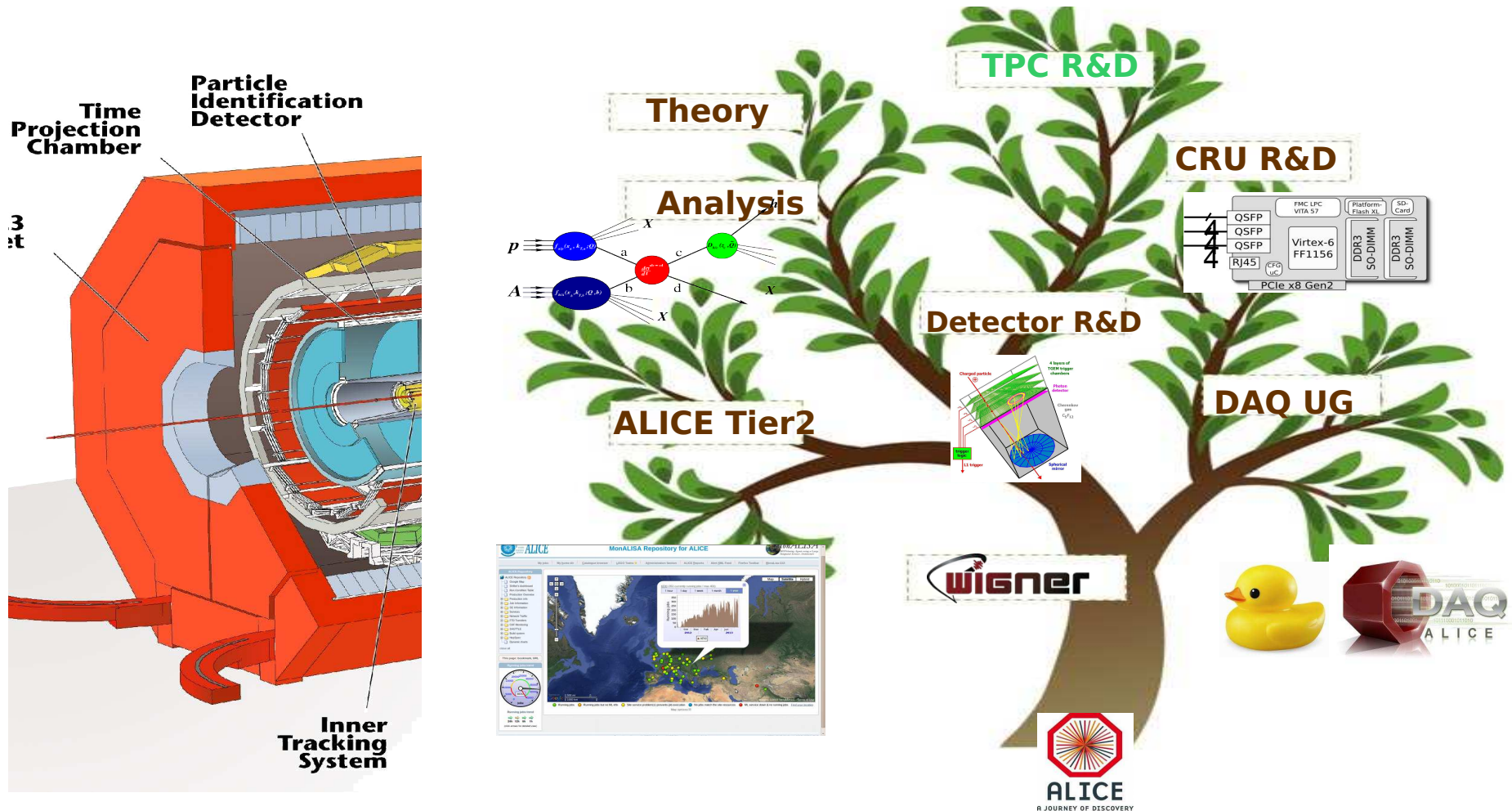
New pixel detector to be installed this spring

Designed and produced readout and controller cards with the DAQ group

Managing the development of data processing software; Simulation

Physics interest: SUSY searches

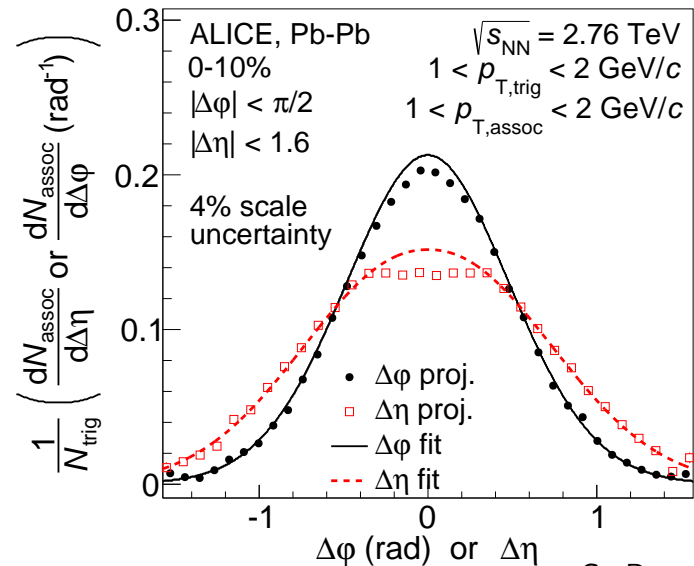
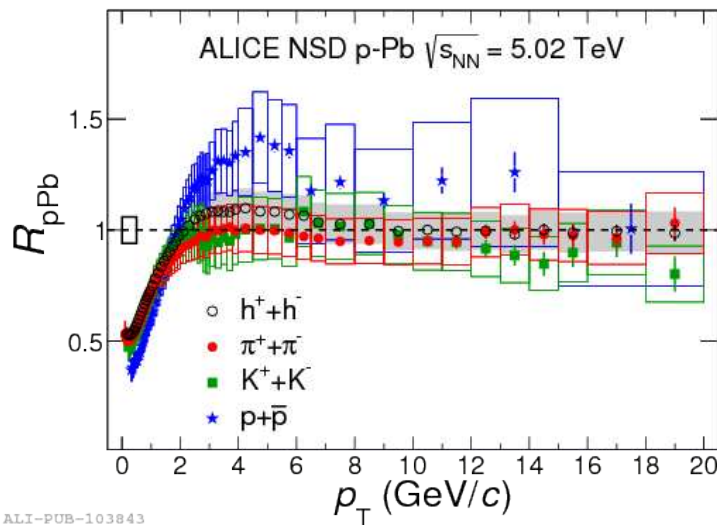
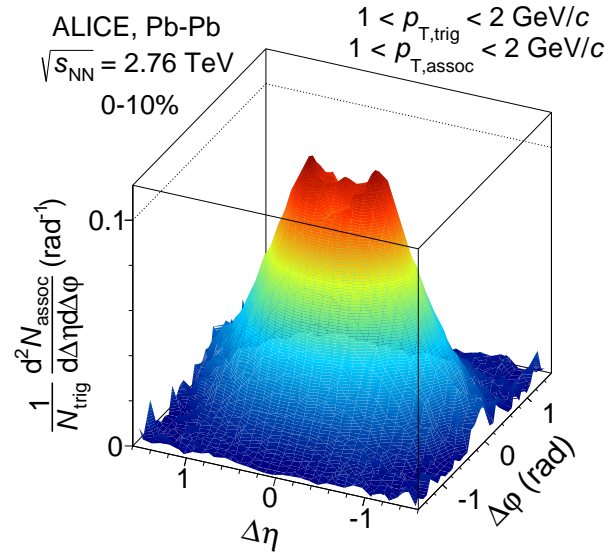
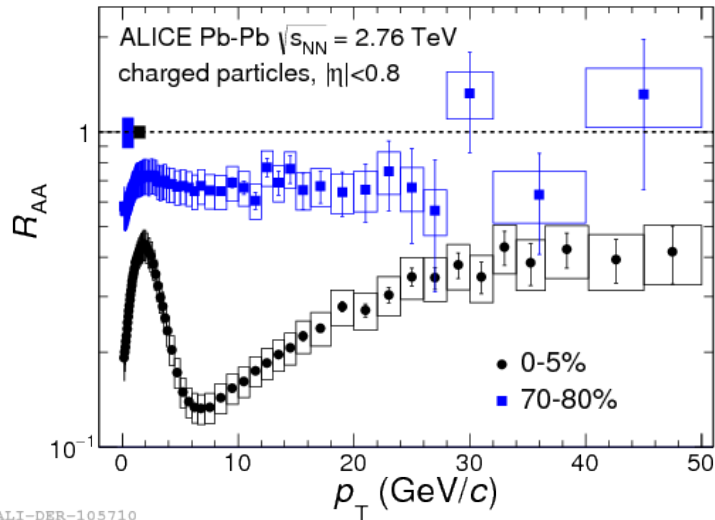
ALICE (GG Barnaföldi)



- Upgrades

- strongly involved in the det readout and DAQ: CRU development
- TPC readout: gaseous detector R&D, GEM

ALICE – hadron physics

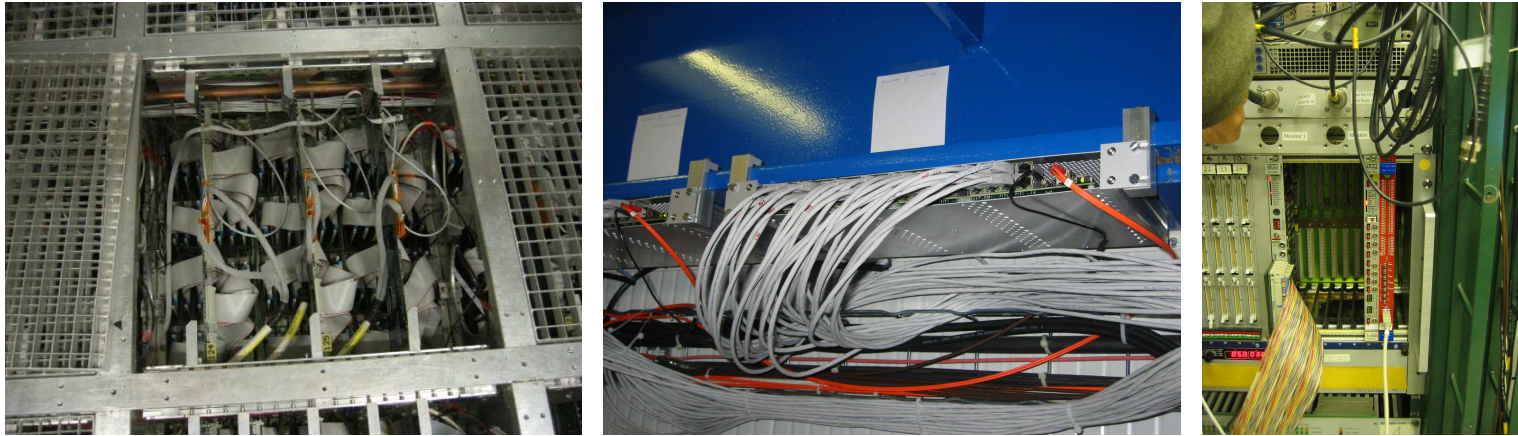


Gy Bencédi, M Kőfaragó

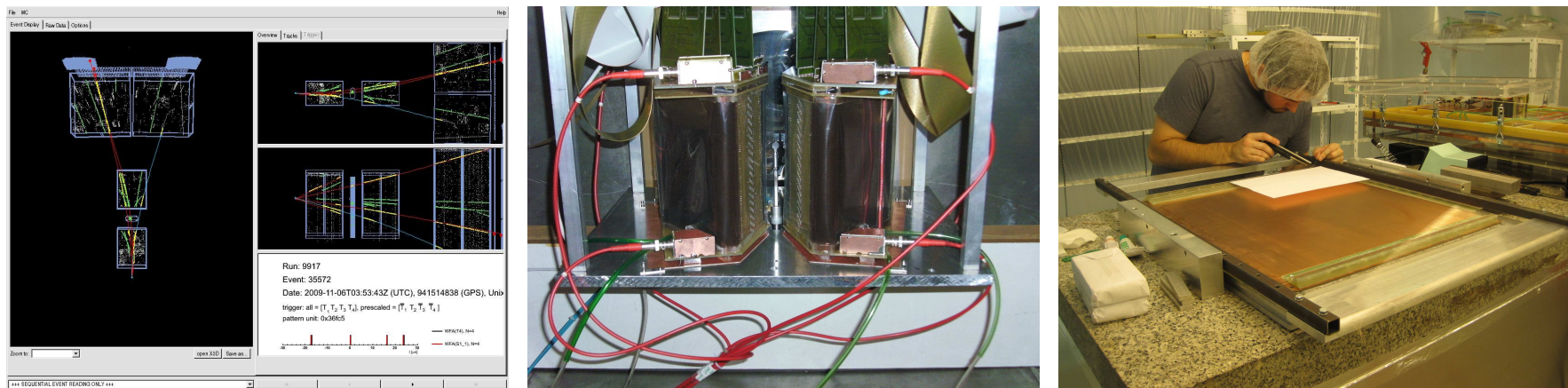
Physics analysis: High p_T , jets, PID, heavy quarks, correlations

NA61/Shine (A László)

Development, building and maintenance of DAQ



Offline software development, gaseous detector development

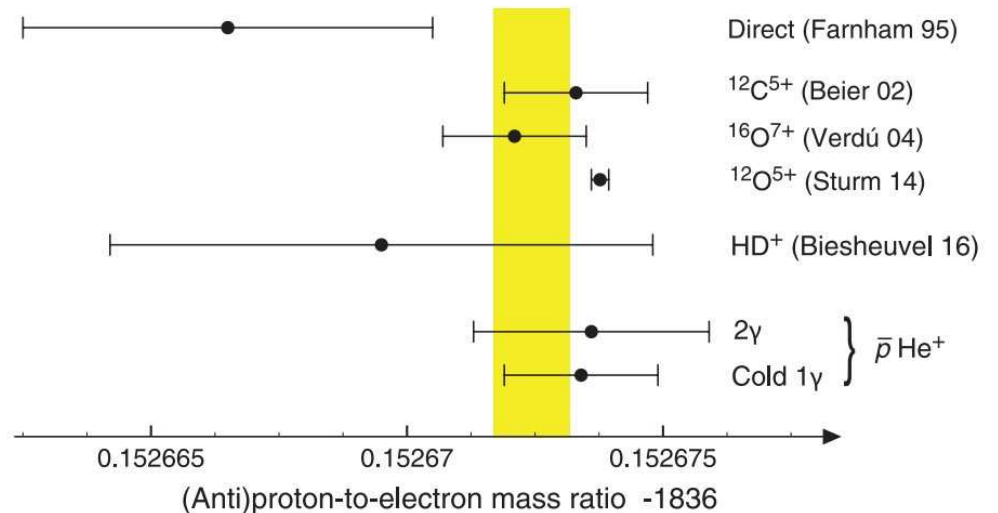
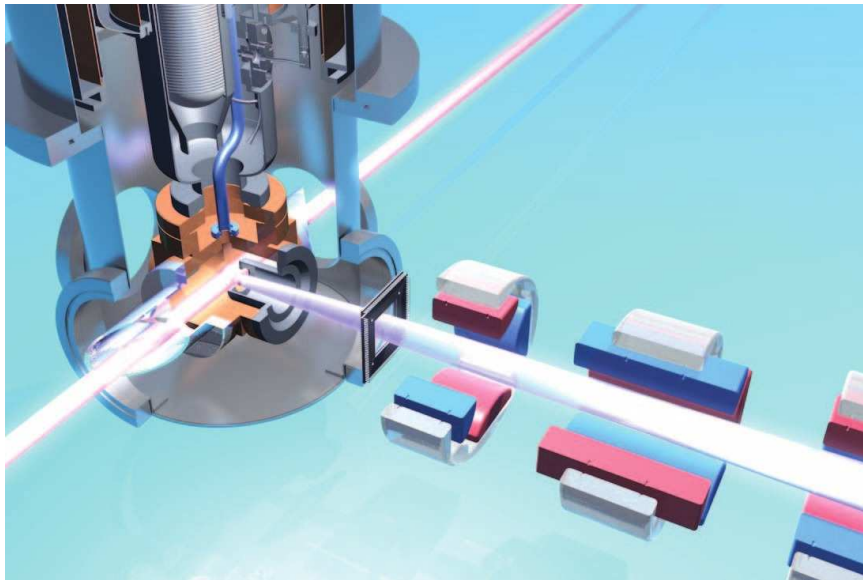


Physics: single particle spectra (R_{AA} , R_{pA} analysis)

ASACUSA (D Horváth, D Barna)

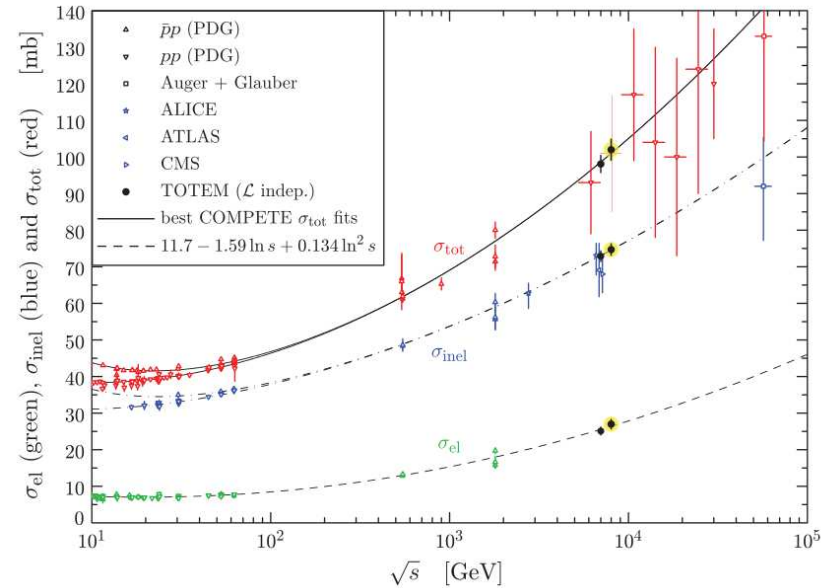
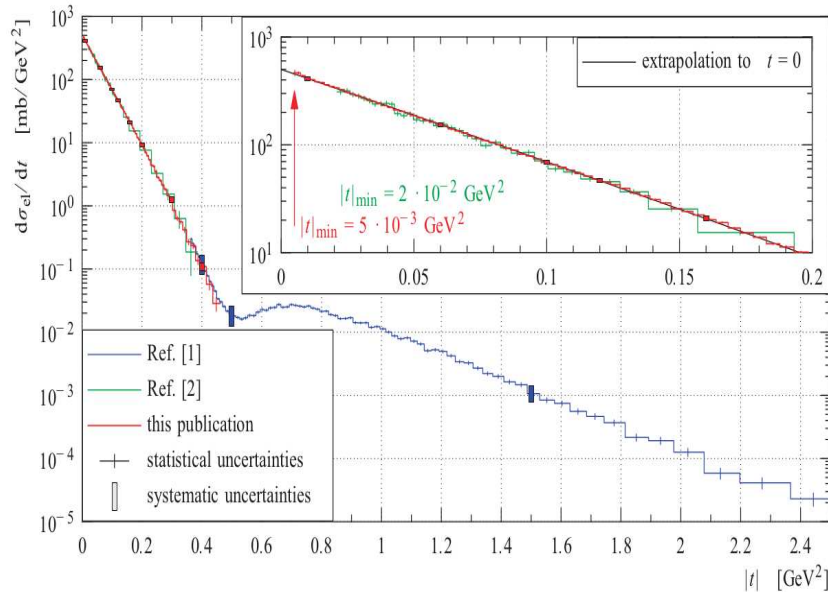
- Antimatter research

- Motivation: Testing CPT invariance via measuring \bar{p} -mass
- Method: laser spectroscopy on \bar{p} -He atoms
- CPT-limit reached: 7×10^{-10} (90% confidence level).



A recent spectacular result: antiproton-to-electron mass ratio
3 out of 12 authors are Hungarians

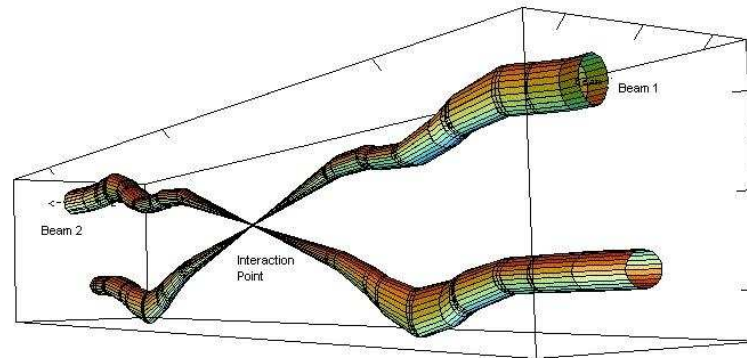
TOTEM (T Csörgő)



Differential and total pp cross sections

Crucial Hungarian contribution: determining LHC magnet optics

F Nemes



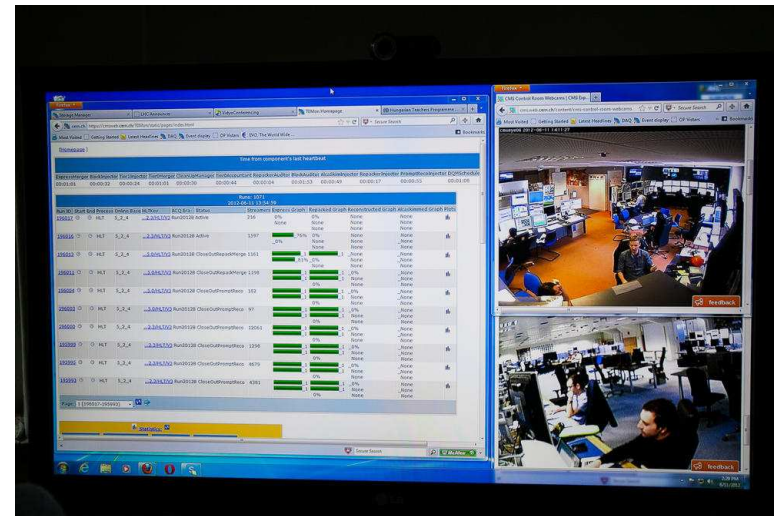
Data analysis and modelling; joint data taking with CMS

Computing

- Tier0 – Wigner Data Center

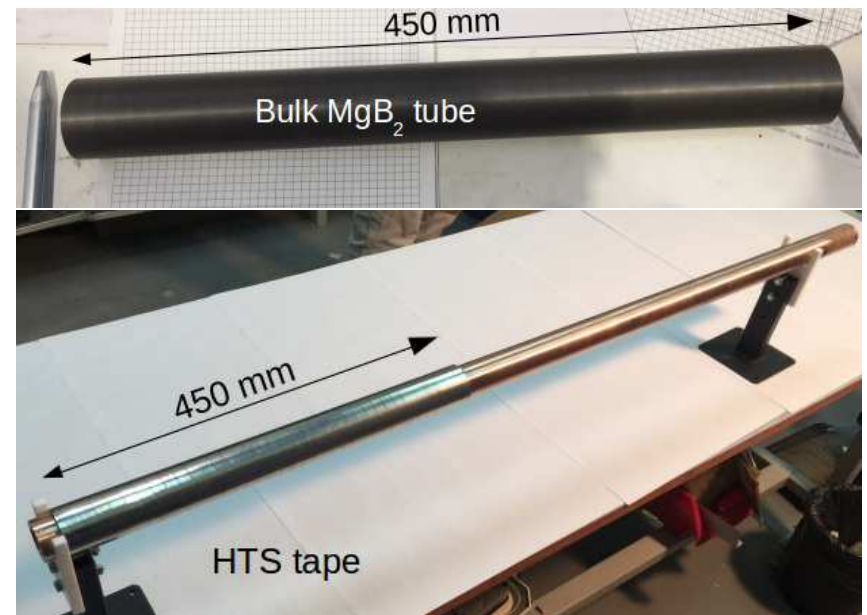
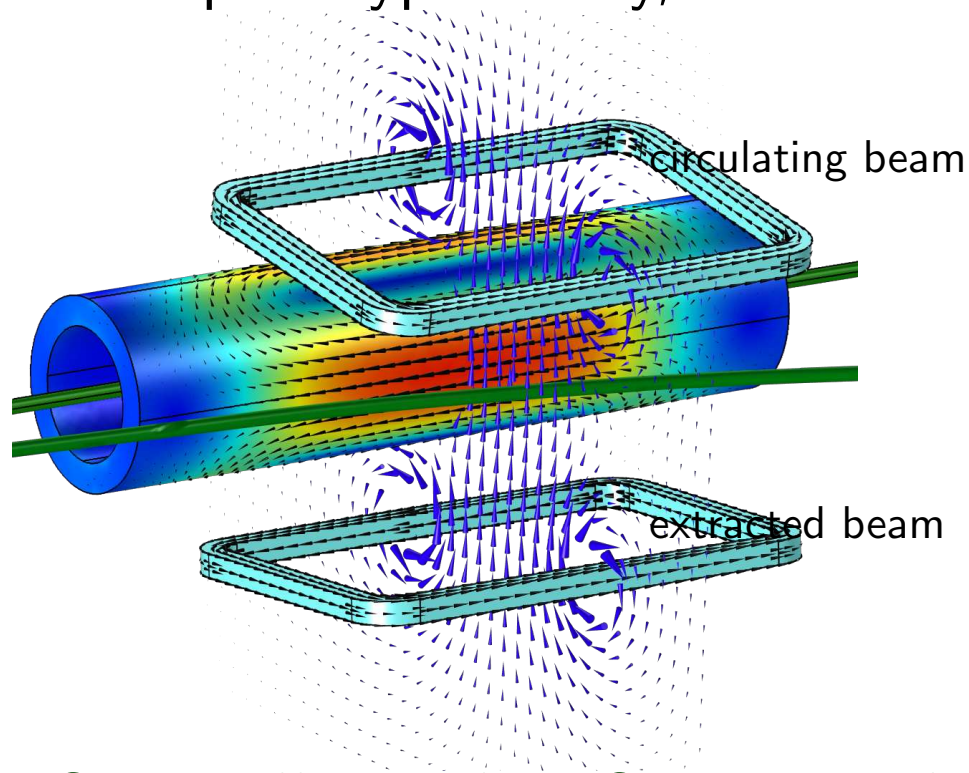


- Tier2 for CMS (Cs Hajdu) and ALICE (G Biró)
Local CMS center, for giving shifts and educational purposes



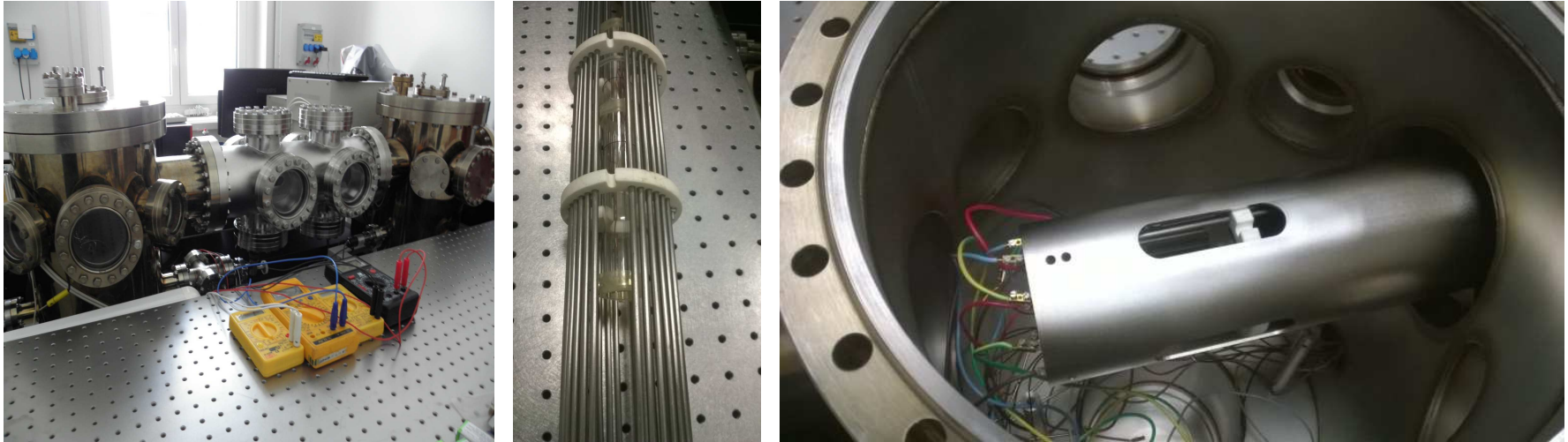
Accelerator research and development (D Barna)

- Participation in FCC (MoU signed in 2015)
 - Leading “Superconducting Shield (SuShi) septum for FCC”
 - Goal: 3-4 T septum magnet for extraction with supercond shield
 - Two prototypes ready, first test this February (SM18)

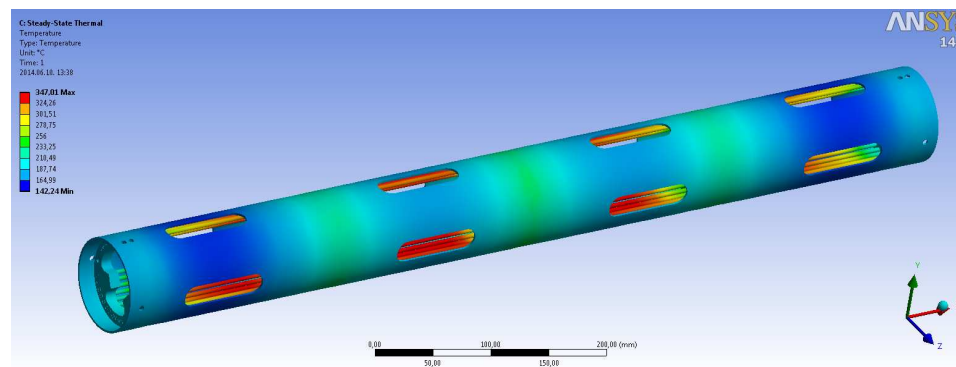


Study effects of HTS coating of beam screen on field quality
Introducing accelerator technology at the university; cyclotron

Plasma wake-field acceleration (D Gagik)

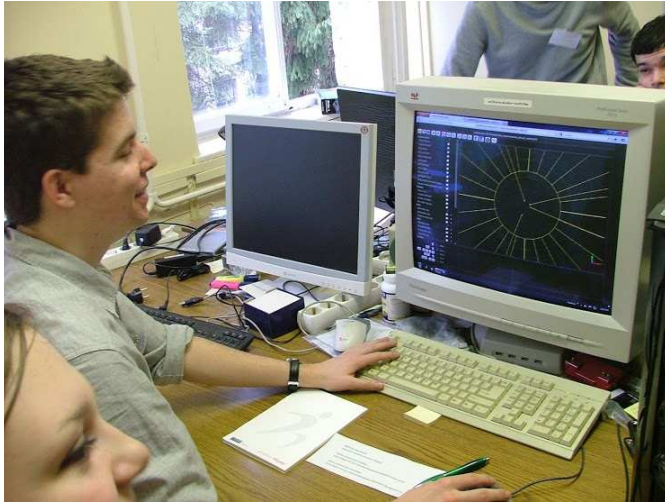


Rb-plasma creation by laser
Experimental test facility at Wigner for AWAKE



Outreach

International Masterclasses at Wigner



Teacher's programme at CERN



Hungarian Teacher Programme

15-21 August 2016
CERN
Europe/Zurich timezone

Overview
Timetable
Videoconference Rooms

Support: Jeff Wiener
jeff.wiener@cern.ch
+41 75 411 9010

The Hungarian Teacher Programme 2016 will take place from visits, exhibitions, and hands-on workshops will introduce its physics. We hope our participants will go back to Hungary as an our next generation of physicists, engineers, IT specialists and as CERN is looking forward to welcome the Hungarian teachers here!

Hungarian Teacher Programme
<https://indico.cern.ch/e/HU>

Teacher Programme Manager
Jeff Wiener: 0041 75 411 9010

In case of emergency:
CERN fire brigade: 0041 22 76

Starts 15 Aug 2016 10:00
Ends 21 Aug 2016 16:05
Europe/Zurich

Location: CERN

Organized by: Dezso Horvath, Jeff Wiener, Noemi Benli

CERN-Wigner Open Days at Wigner



Physics bus in Hungary



Experimental high energy physics – Wigner



- Funding in Hungary

- National Research, Development and Innovation Office
(membership fees, M&O A, limited amounts for basic research)
- Hungarian Academy of Sciences
(salaries; also through “Momentum” and personal grants)