Innovative gaseous particle detector development group at the Wigner RCP

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- Team and collaborations
- Laboratory background, funding
- UV photon detection and high resolution diagnostics on Thick GEM structures
- MWPC development and applications
- Low momentum particle detector for CERN NA61

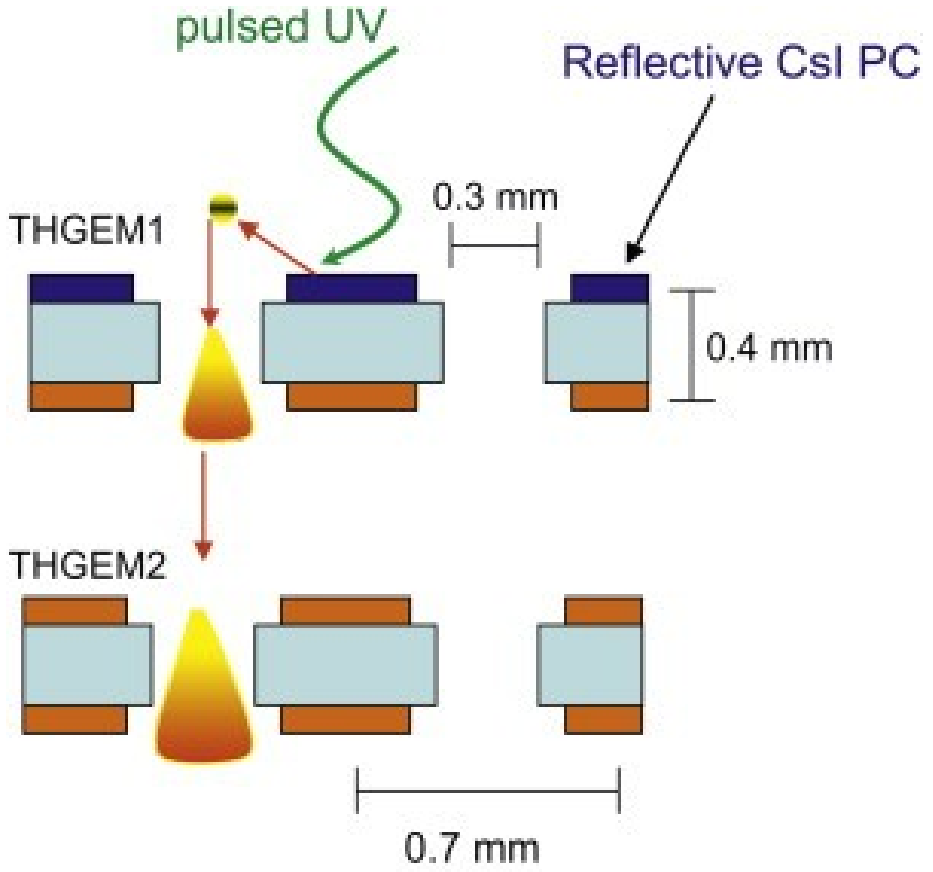
- Project funding: independent team based funding, started from **Aug 2013**
- **Participants (Wigner RCP and Eötvös University, Budapest):**

  György Bencze, Gergely Gábor Barnaföldi, Gergő Hamar, András László, Gábor Kiss, Krisztina Márton, László Oláh (and additional undergraduate students)
- Collaborations: **CERN ALICE, NA61, RD51**
- Wigner RCP is a **founding RD51** member!

Laboratory environment (in development as of Nov. 2013)

- Refurbished lab spaces of various sizes
- **High quality gas supply lines**, control and monitoring
- Standalone DAQ, HV and other electronics
- Reliable and developing local mechanical workshop support

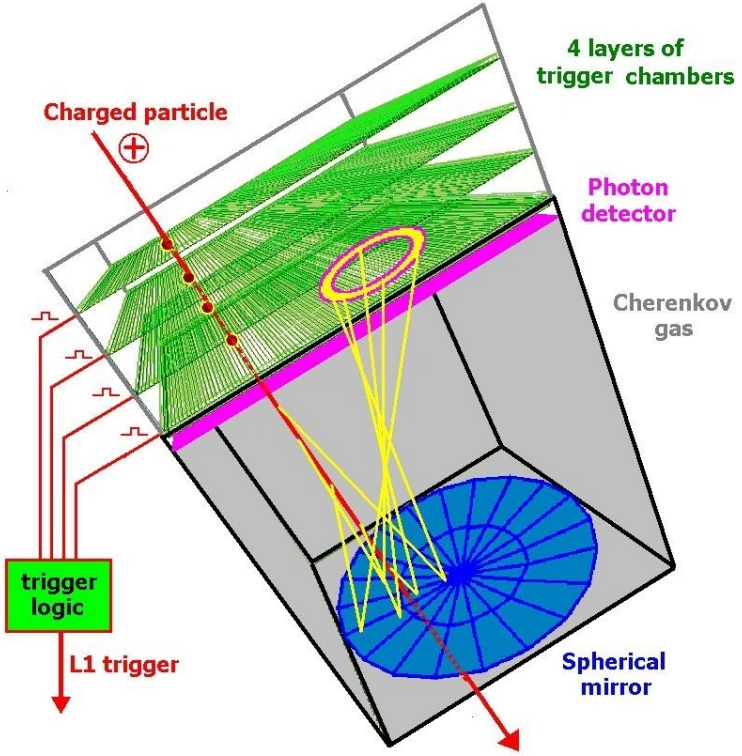
R&D: Thick GEM as UV photon detector

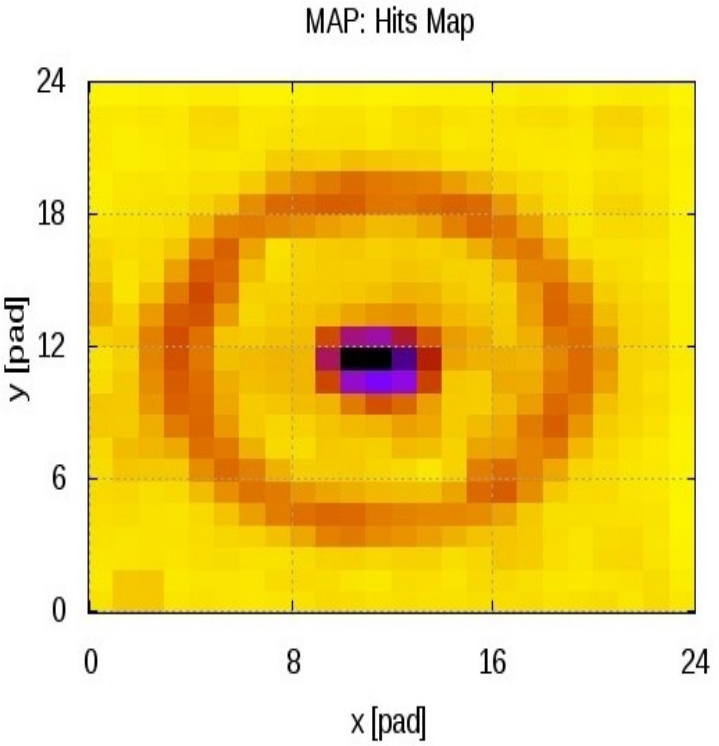


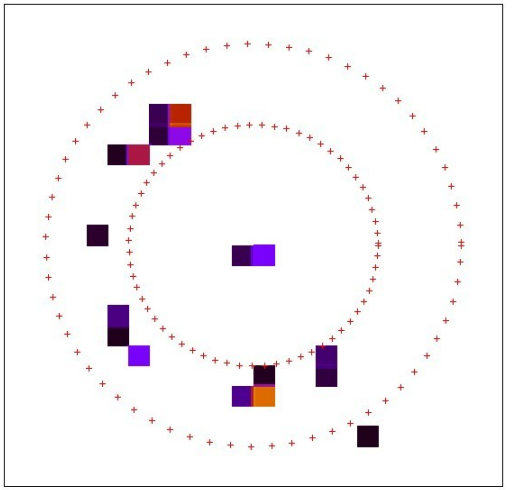
A. Breskin,
R. Chechik

- Photo-effect: electrons emitted are focused into the holes with high efficiency

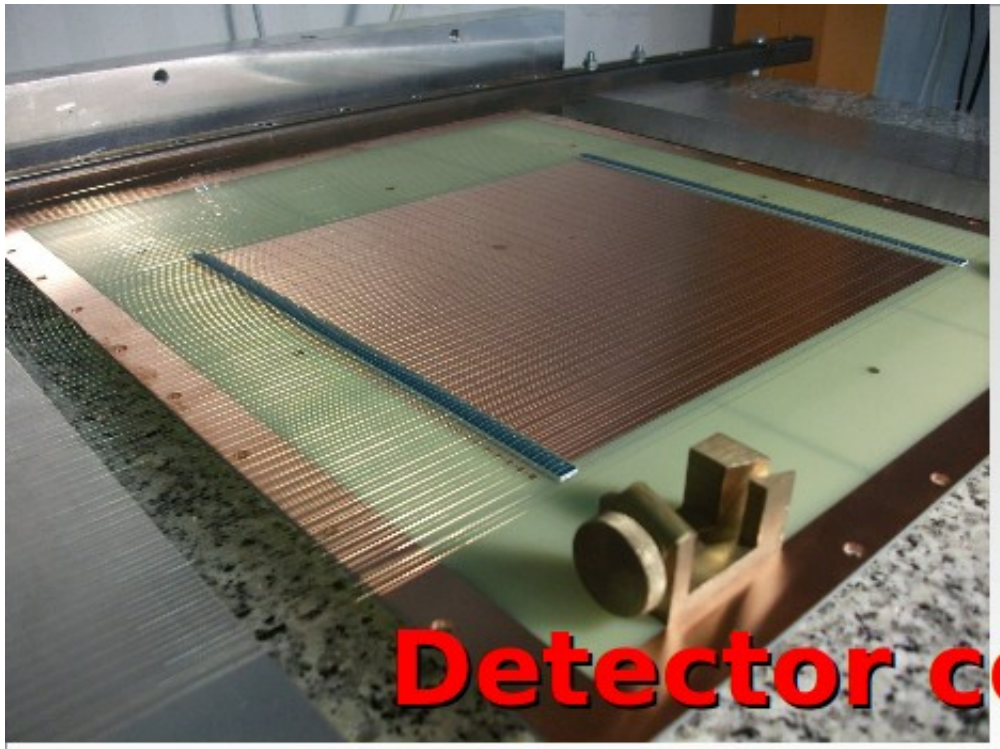
ALICE VHMPID-related R&D

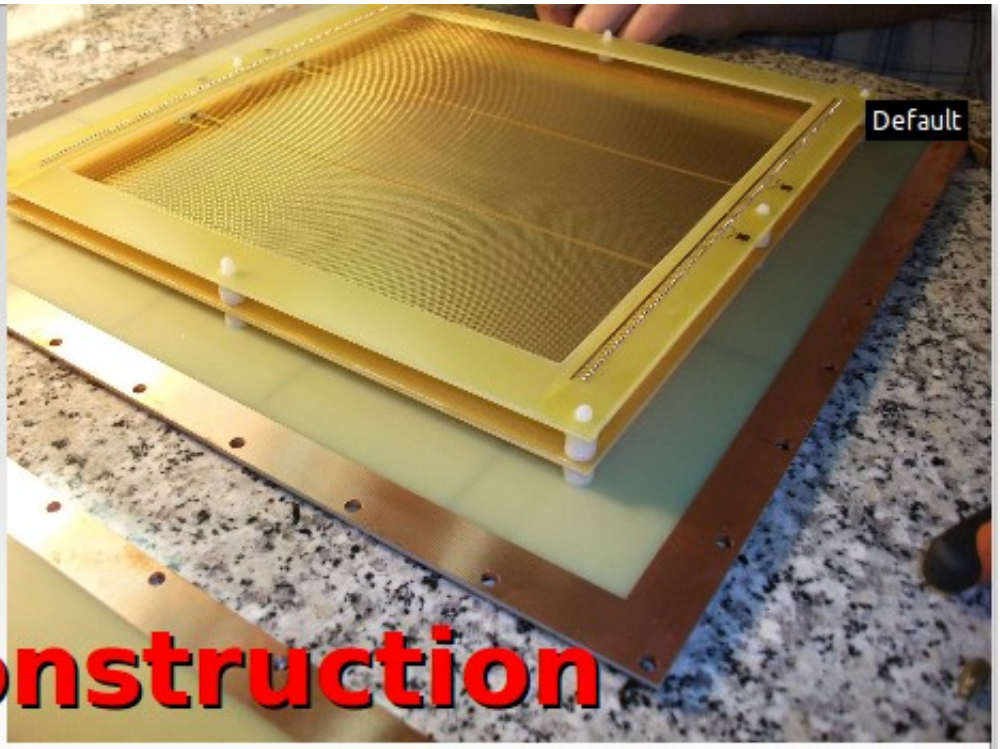




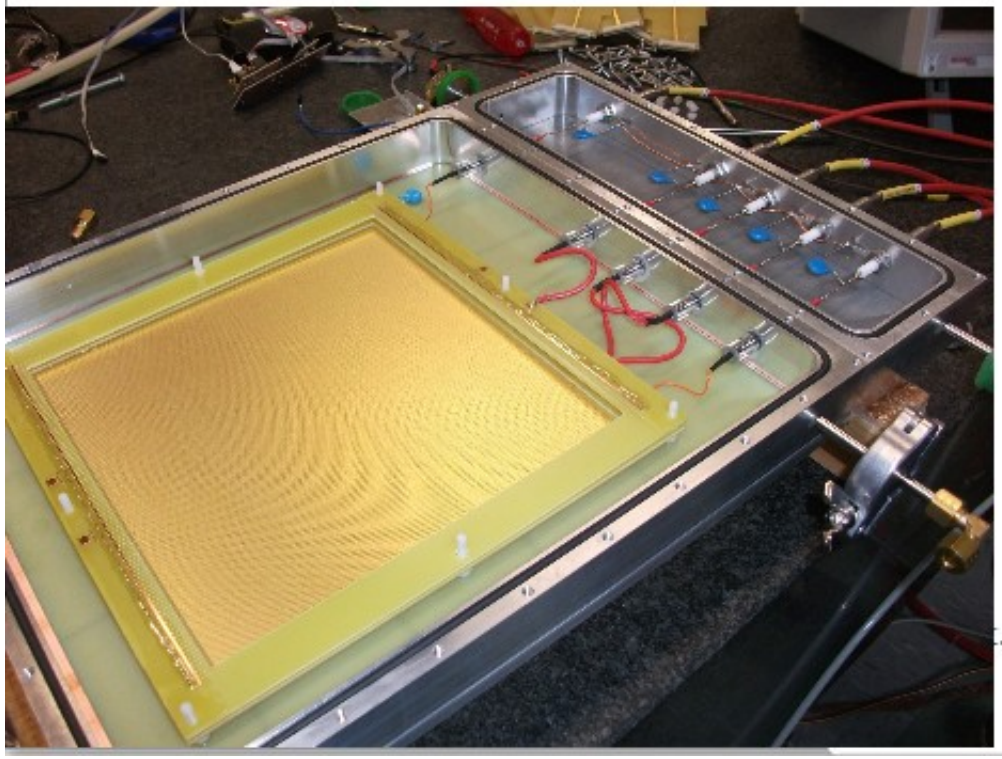


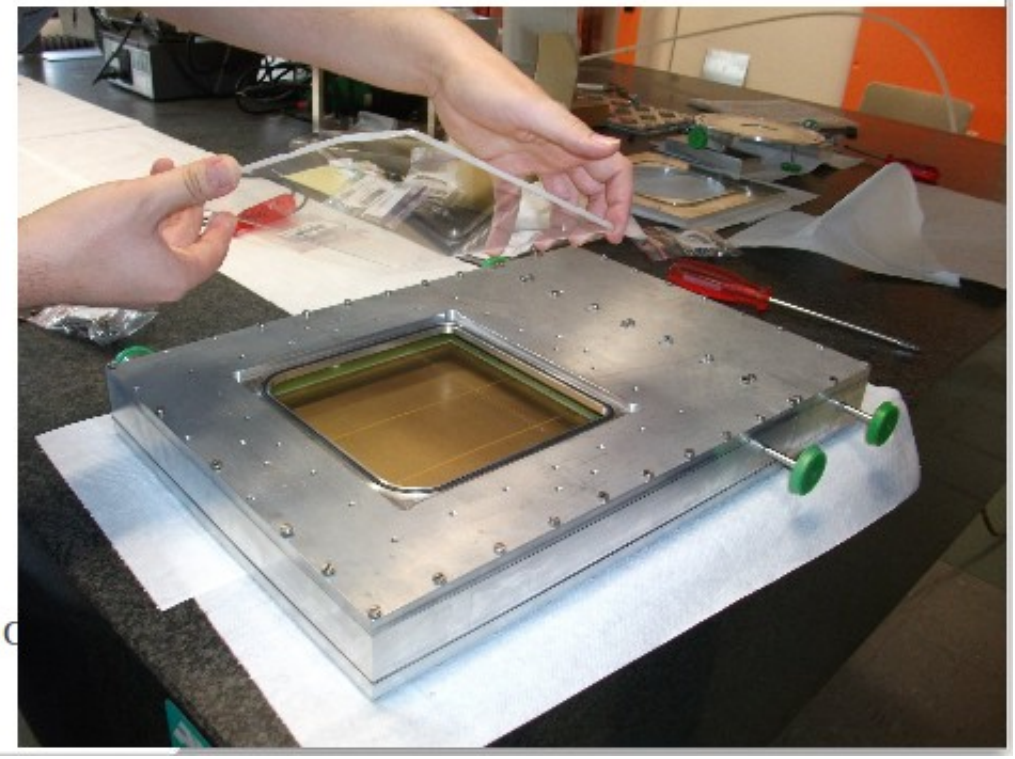
- Ring imaging Cherenkov: few photons (3-15 GeV)
- Hybrid structure, TGEM + MWPC (no sparking...)
- High MIP suppression; 20-30% IBF (not optimized)





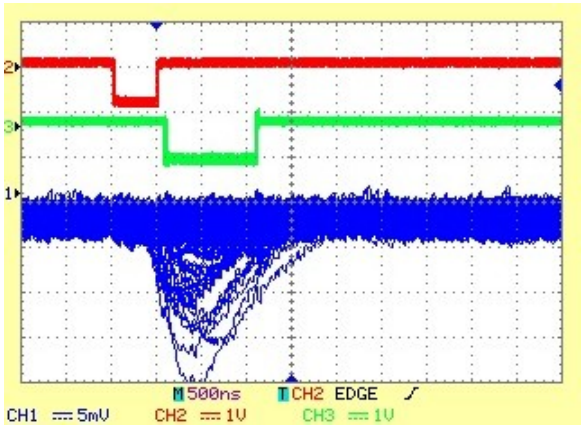
Detector construction

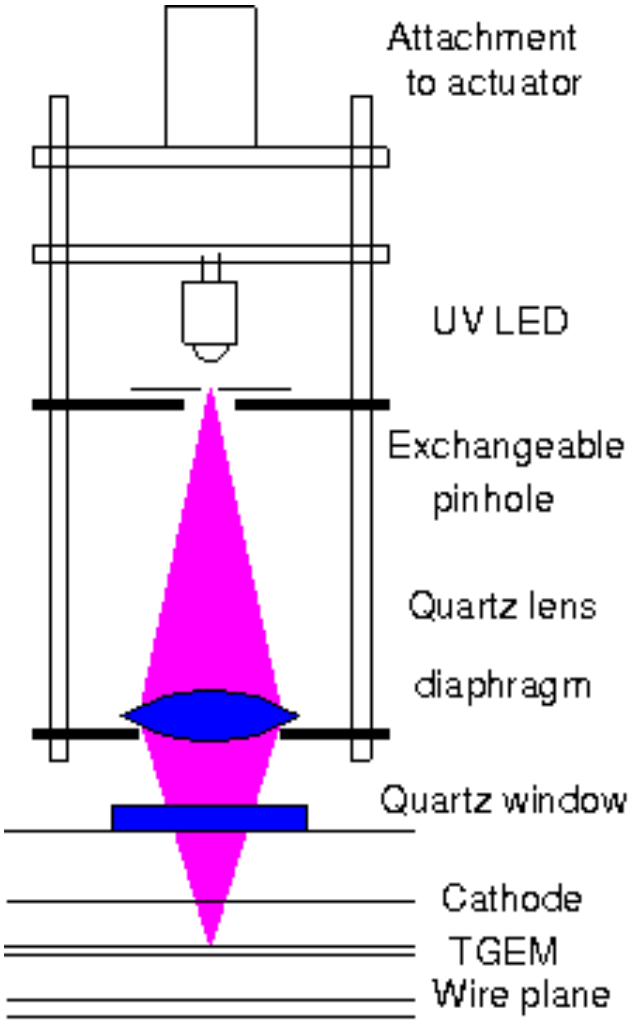




Can one precisely map the efficiency?

- UV LED pulses
- High focusing
- Single photo-electron detection!





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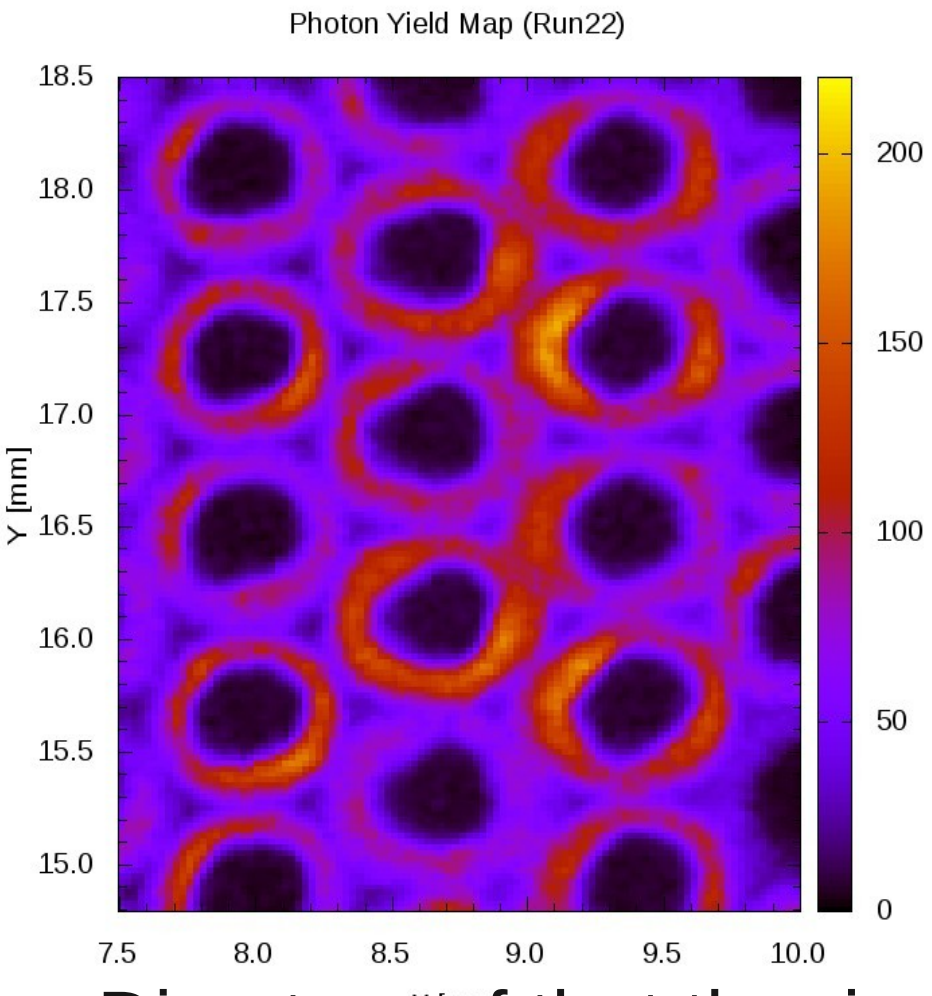
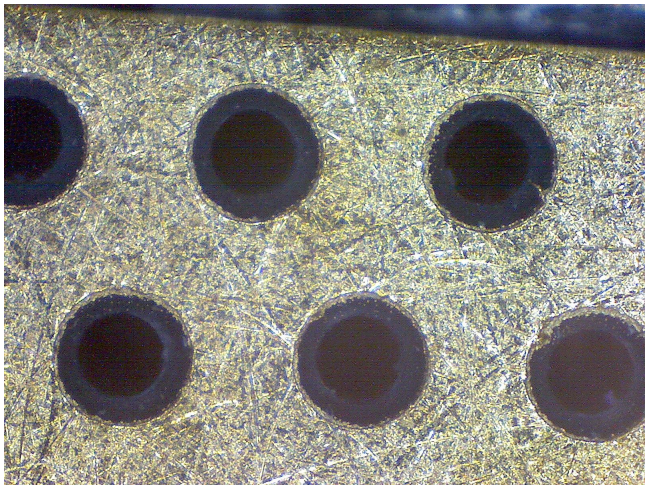
Detailed map of the PE yield

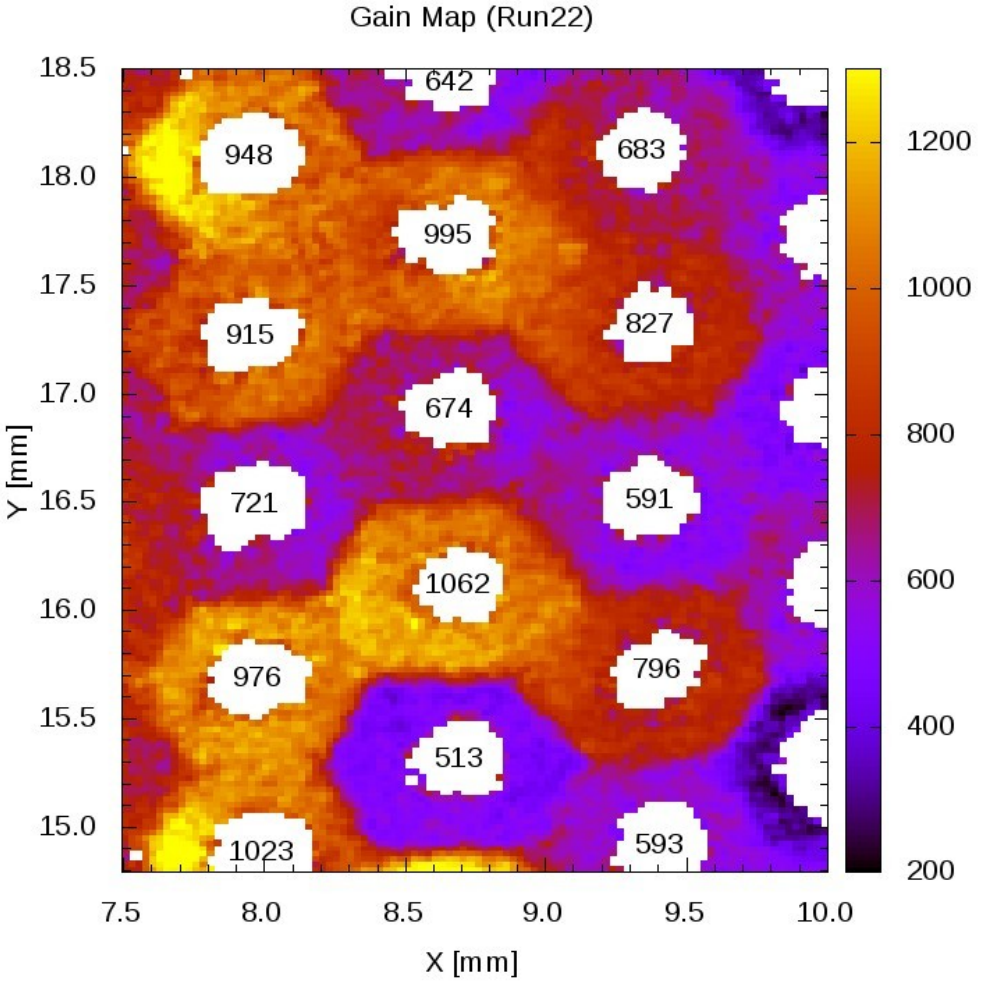




- Direct proof that the rims of the holes are sensitive, unlike the intermediate ”critical points”

Mapping TGEM gas gain (sensitivity)

- Individual gain for individual holes!
- **Now: 70 micron (FWHM) resolution**
- to be improved for other MPGD



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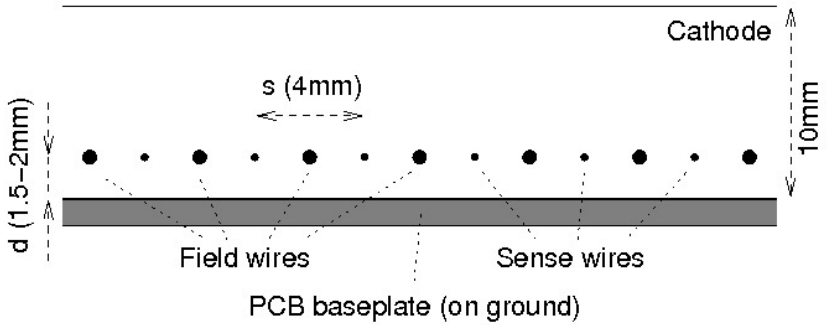
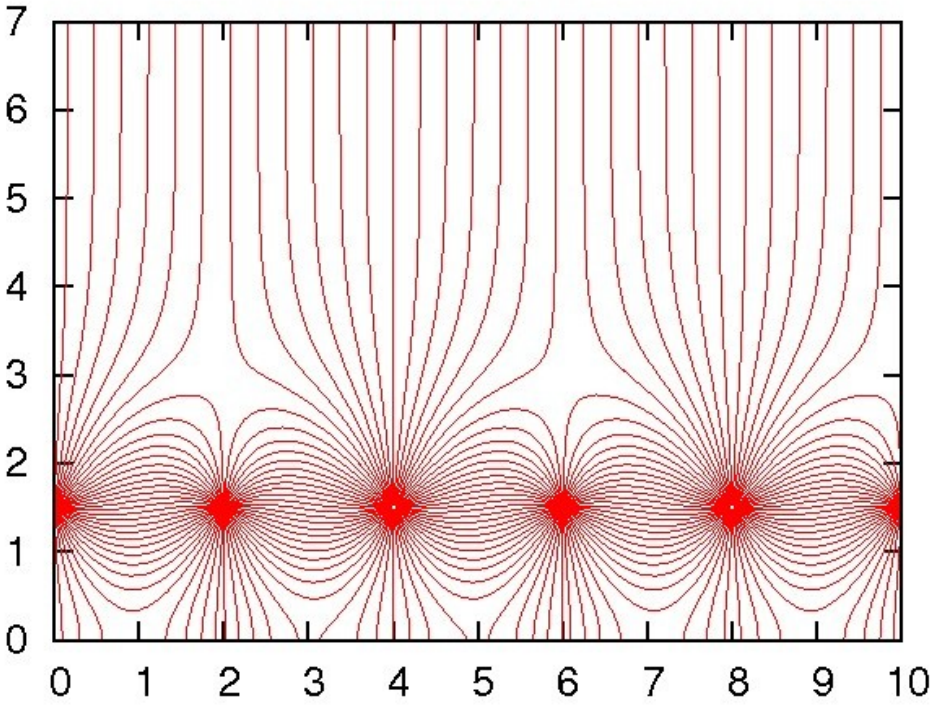
Close Cathode MWPC

- MPGD analogy: most of the field lines constrained between wires





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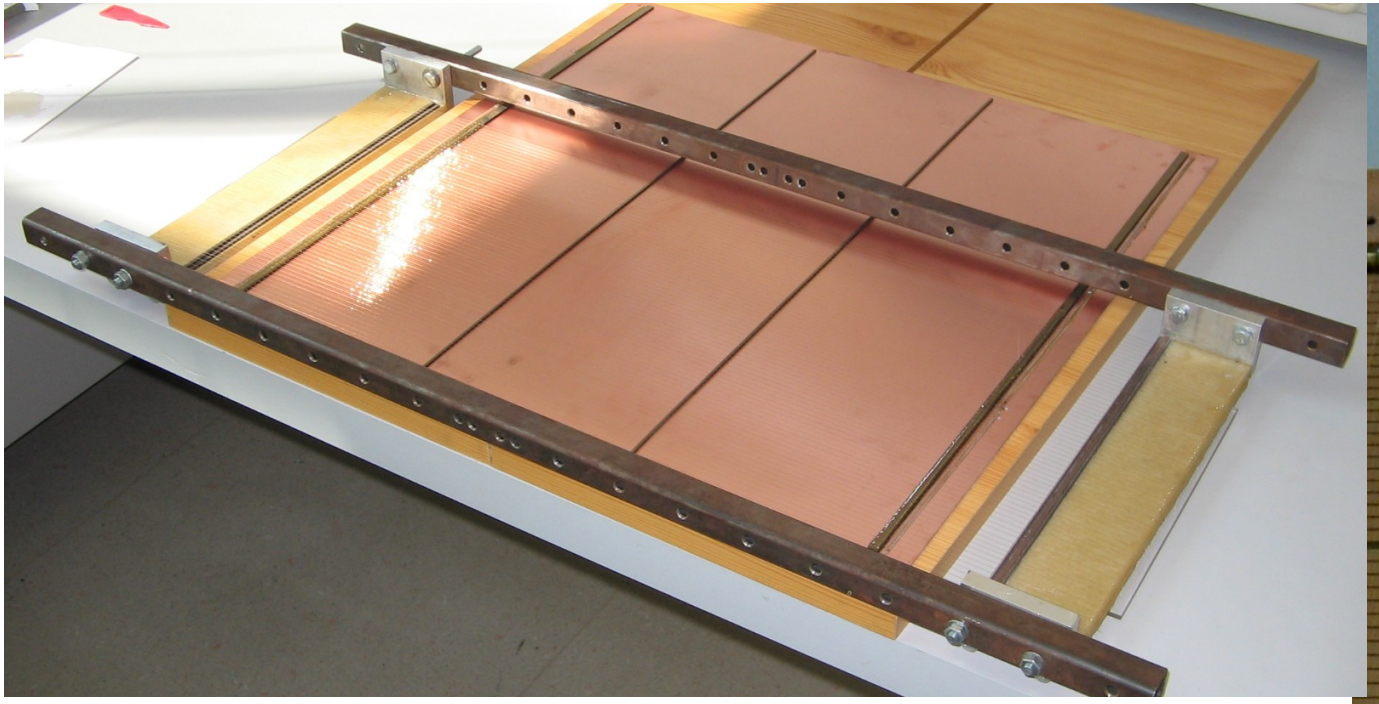
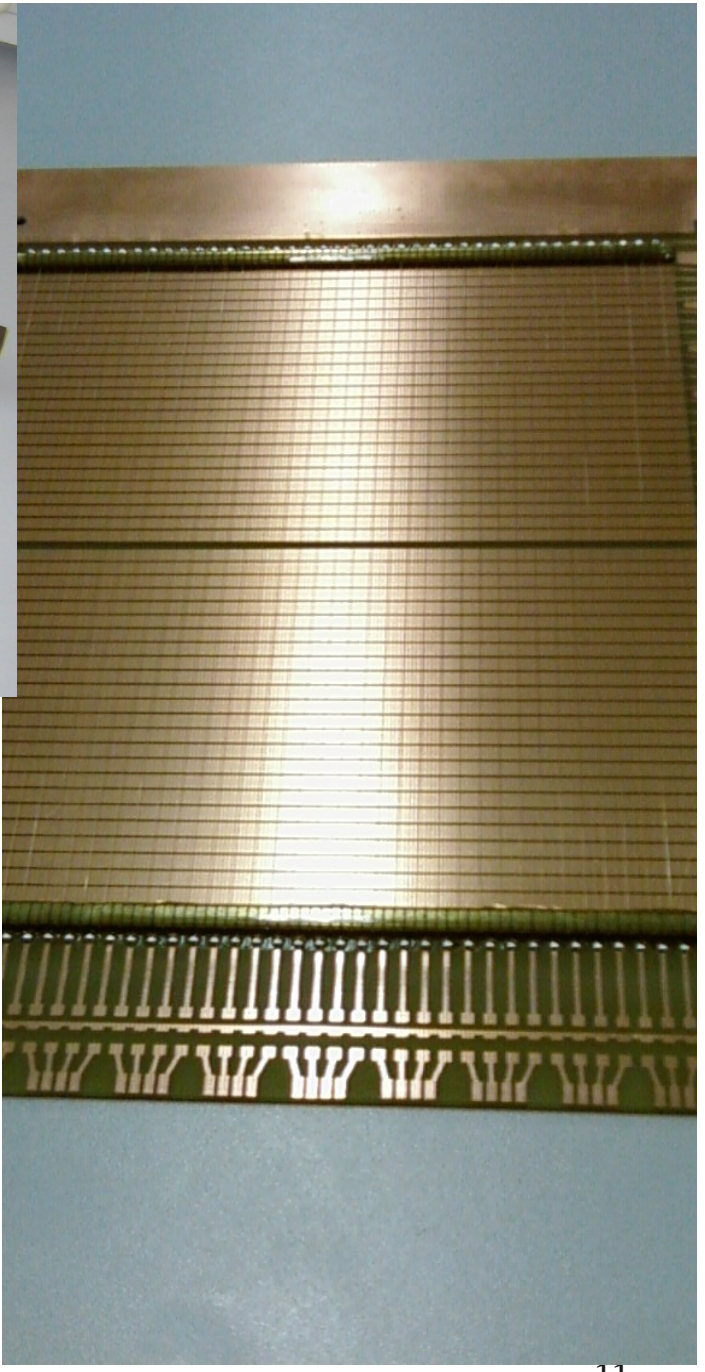
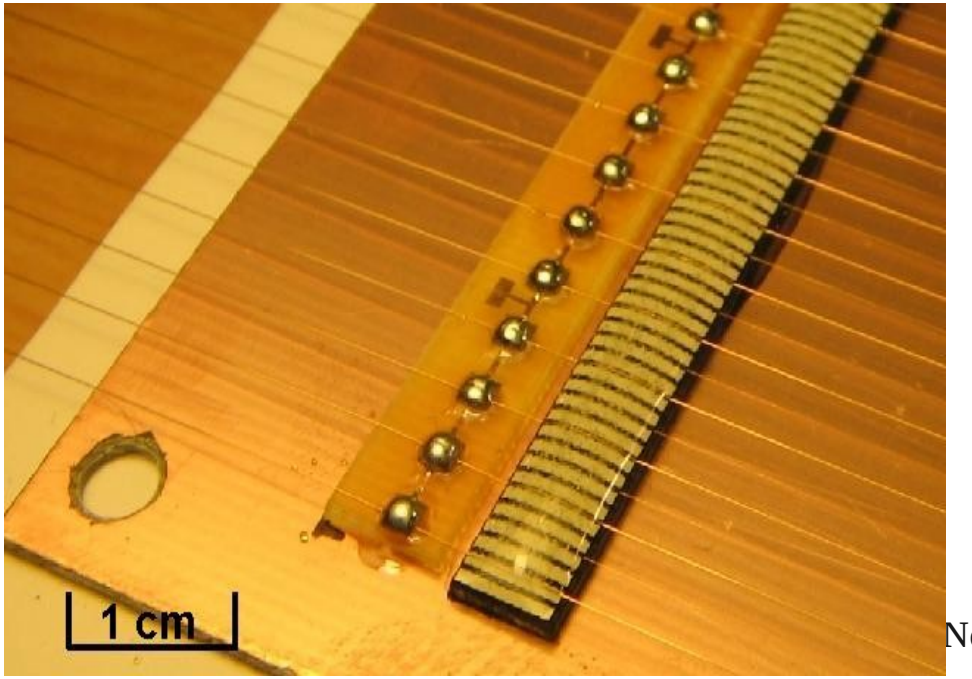
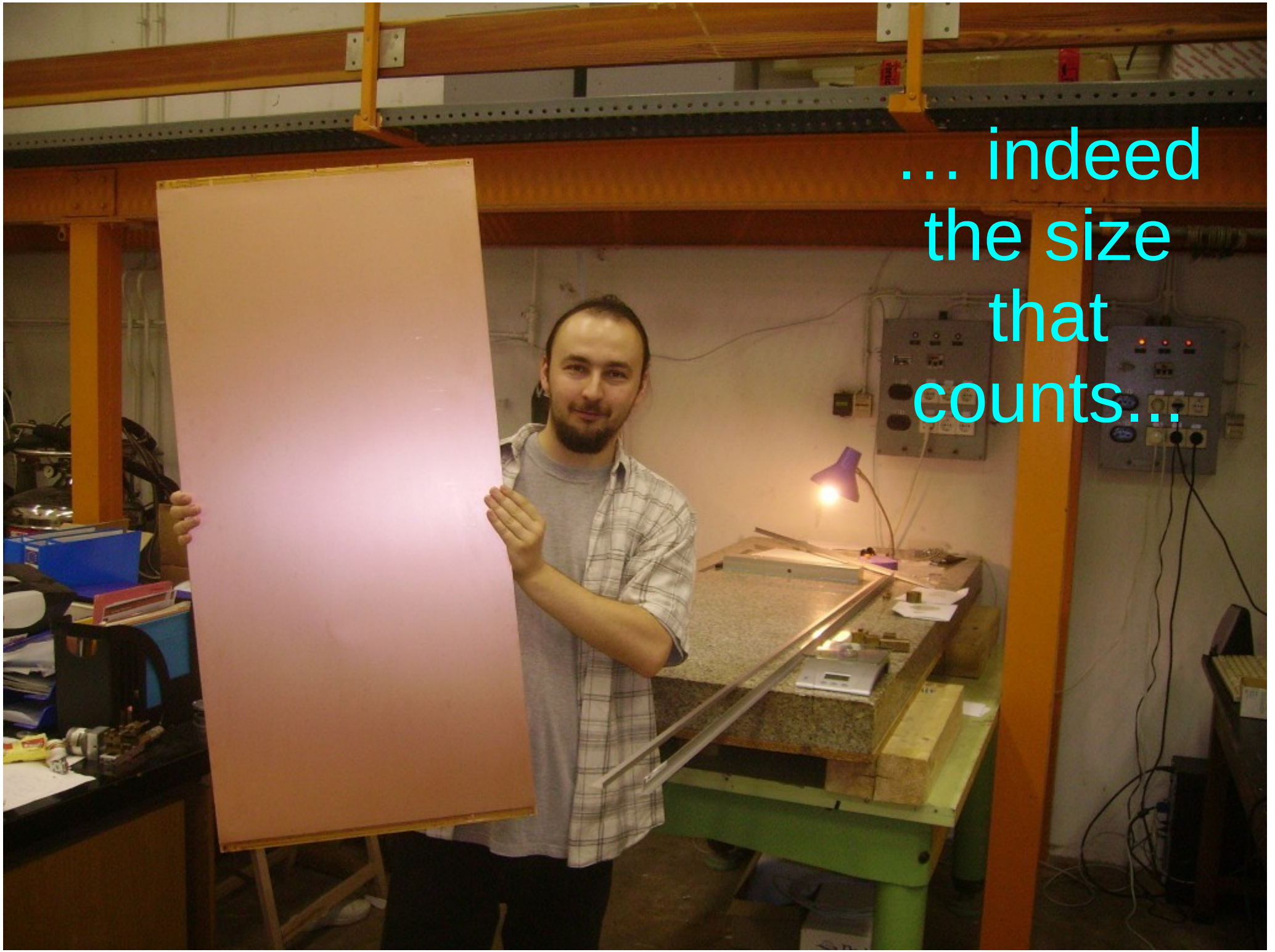


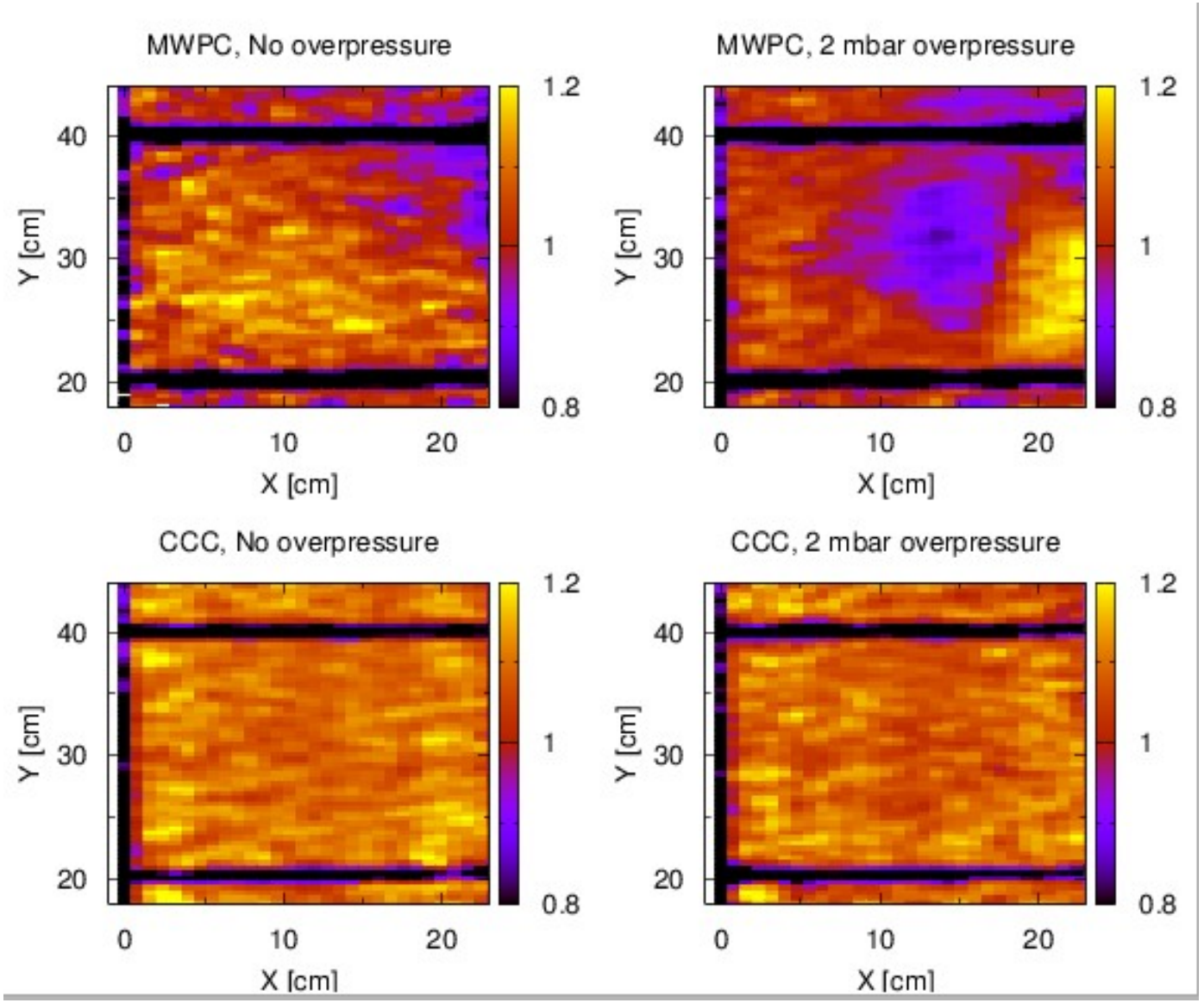



1 cm


… indeed
the size
that
counts…

Beam test (2011, CERN PS)

Direct proof that inner overpressure matters not...



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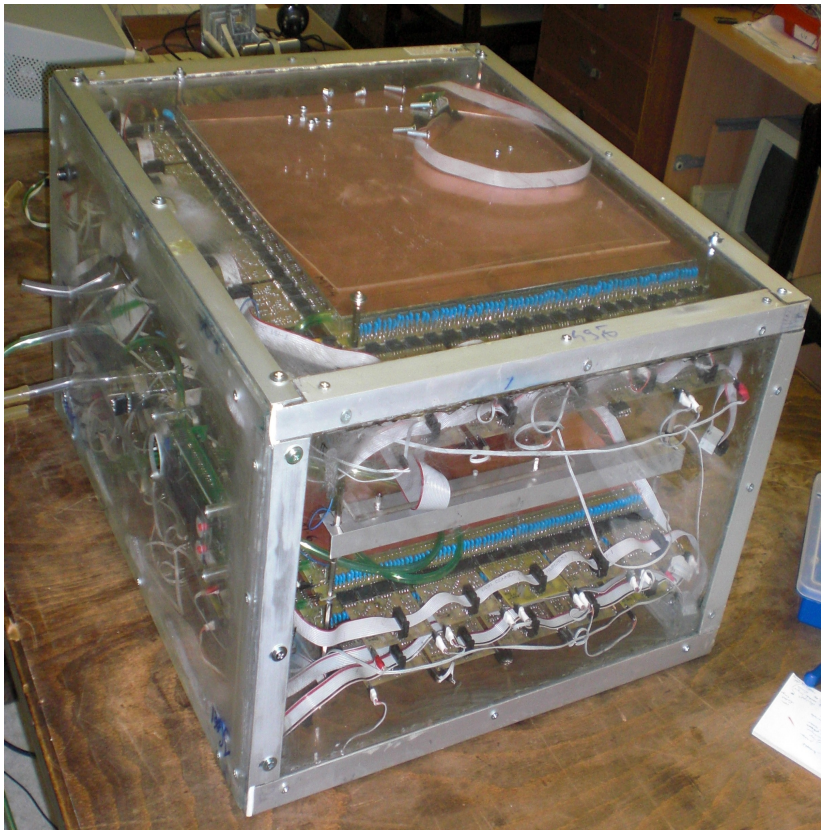
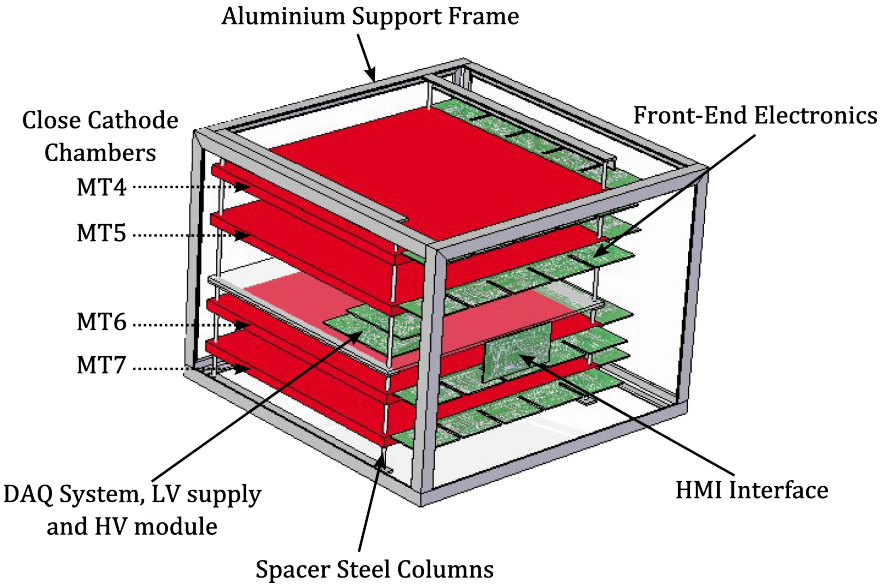
Tomographic measurements with cosmic muons underground





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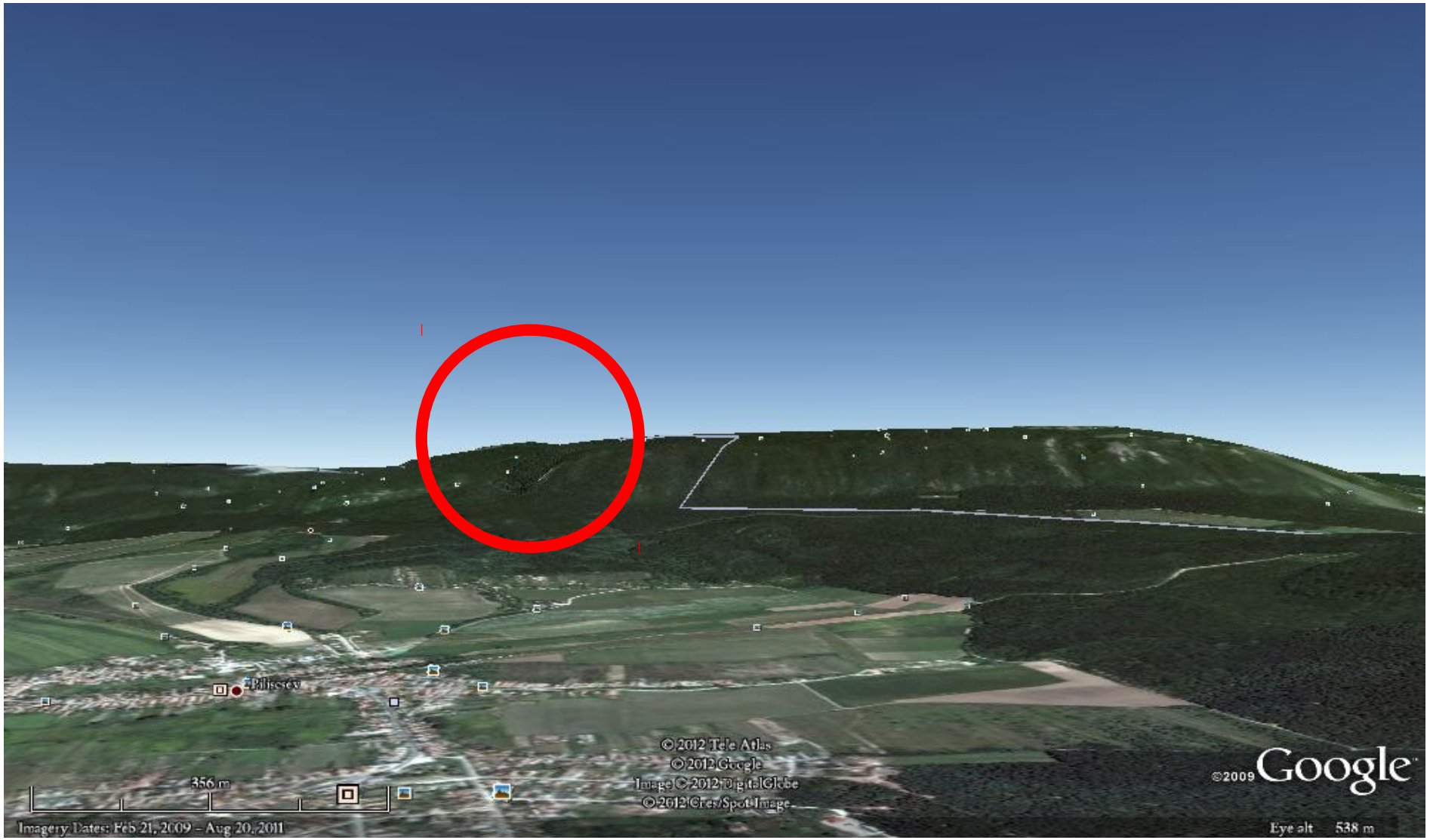
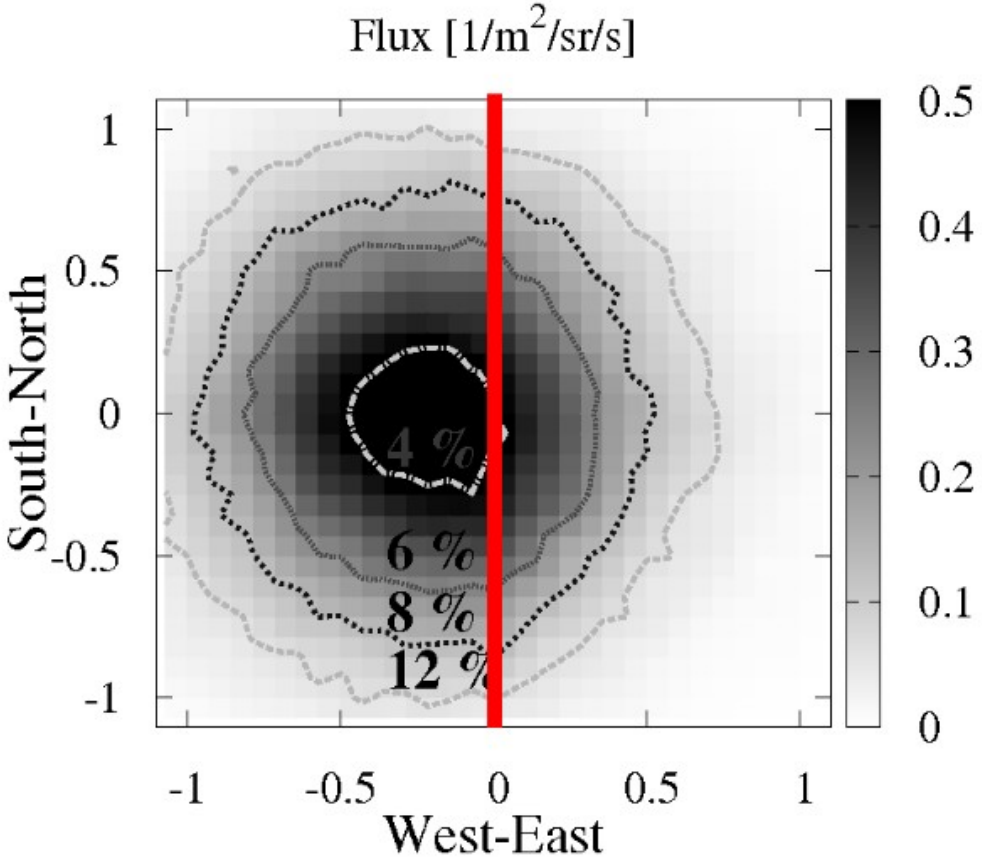
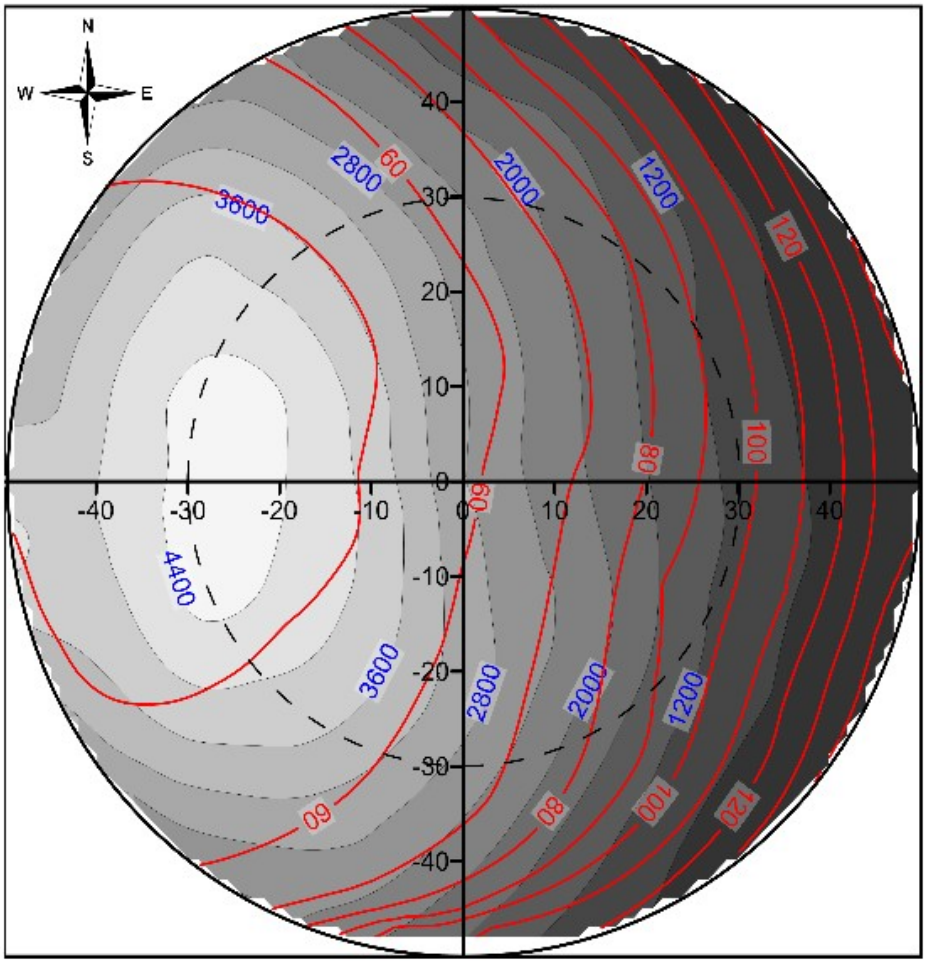
Pilis hegy, Ajándék Cave




mse

Flux demonstrated to be compatible with the surface





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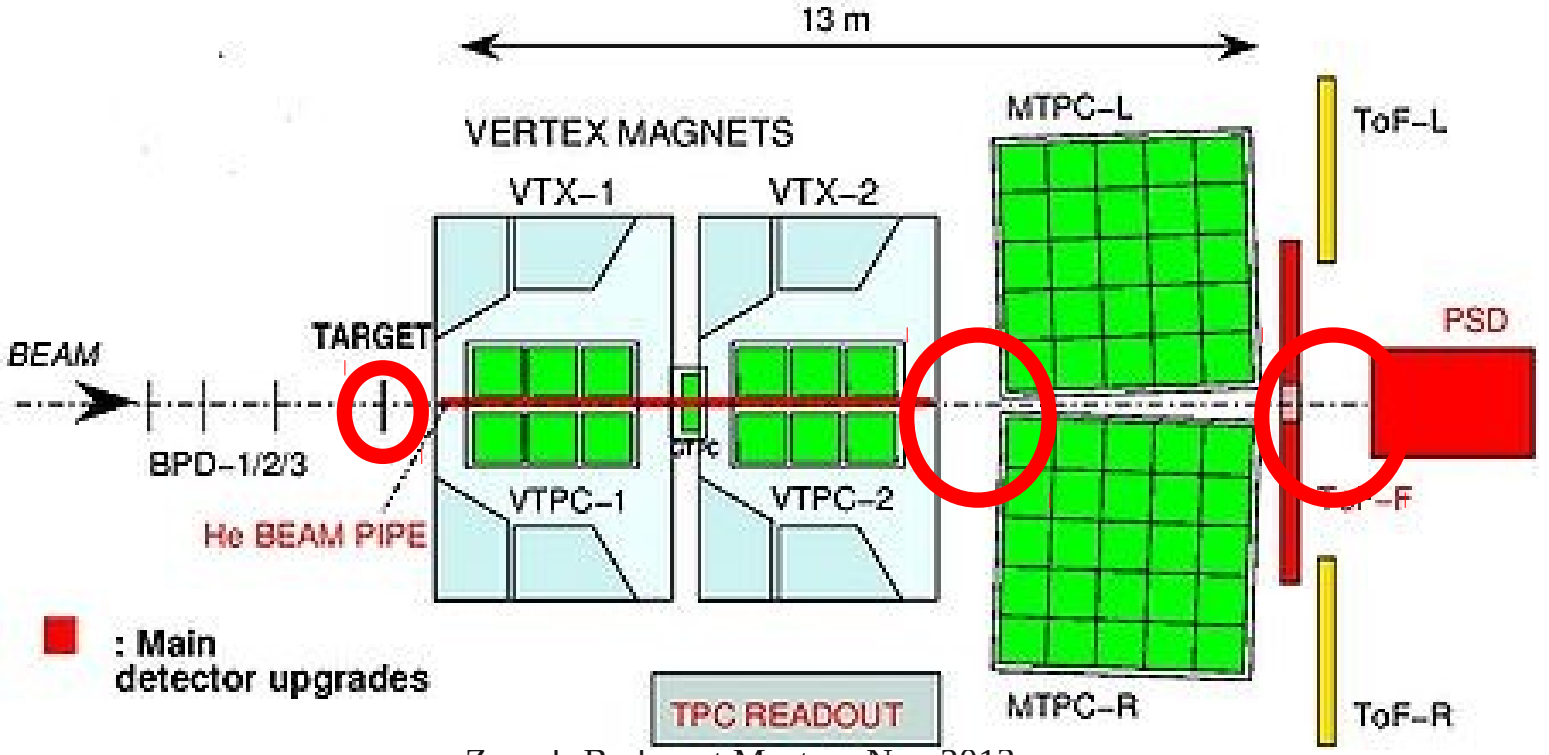
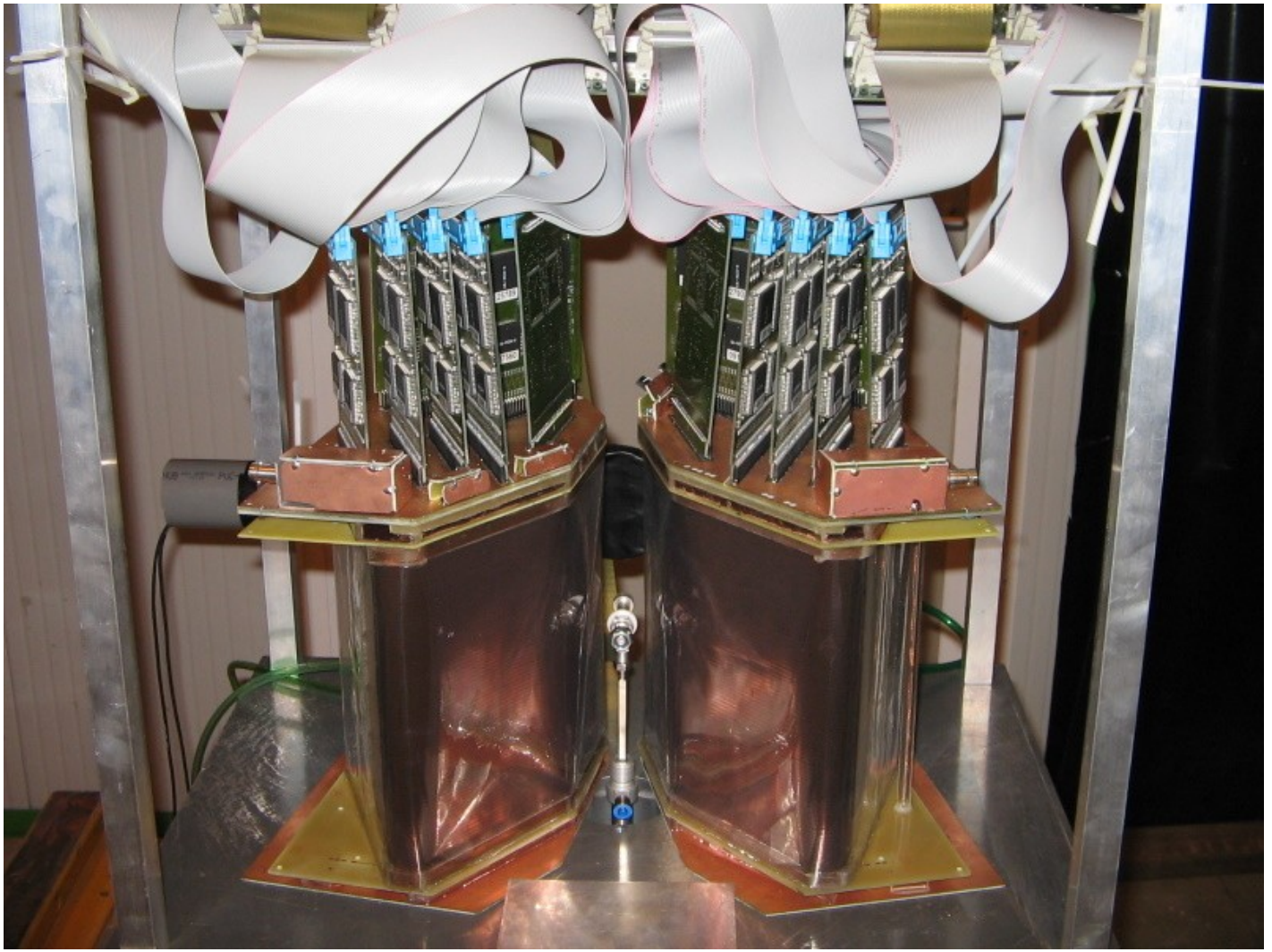
Contribution to the NA61 experiment

- CERN hadron spectrometer, fixed target
- Target recoil detector in operation from 2012
- Forward tracking TPC to be ready by 2014



Technology choice: small size TPC surrounding the NA61 target



Future research program

– Funding secured for the detector development team (modest but flexible budget)

– General R&D in MPGD structures (high resolution scanning, electron transfer, new layouts, IBF, etc)

– Contribution to ALICE TPC

(NA61 low momentum detector backup)