The PANDA Barrel DIRC Frontend electronics & DAQ

Carsten Schwarz, GSI

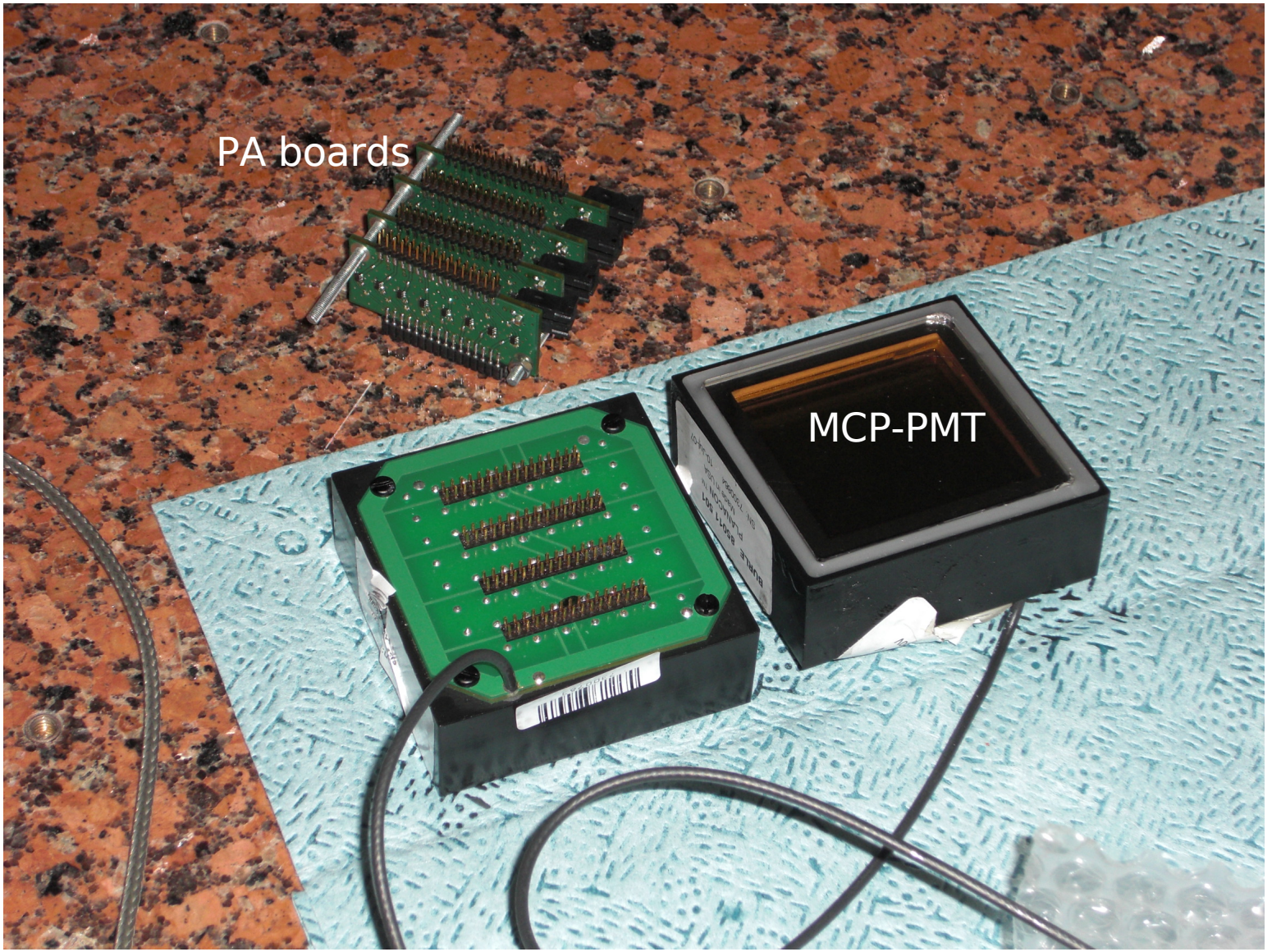
- Motivation
- Photon detector
- Preamplifier
- Discriminator
- TDC (TRB)
- Geometric setup

Motivation

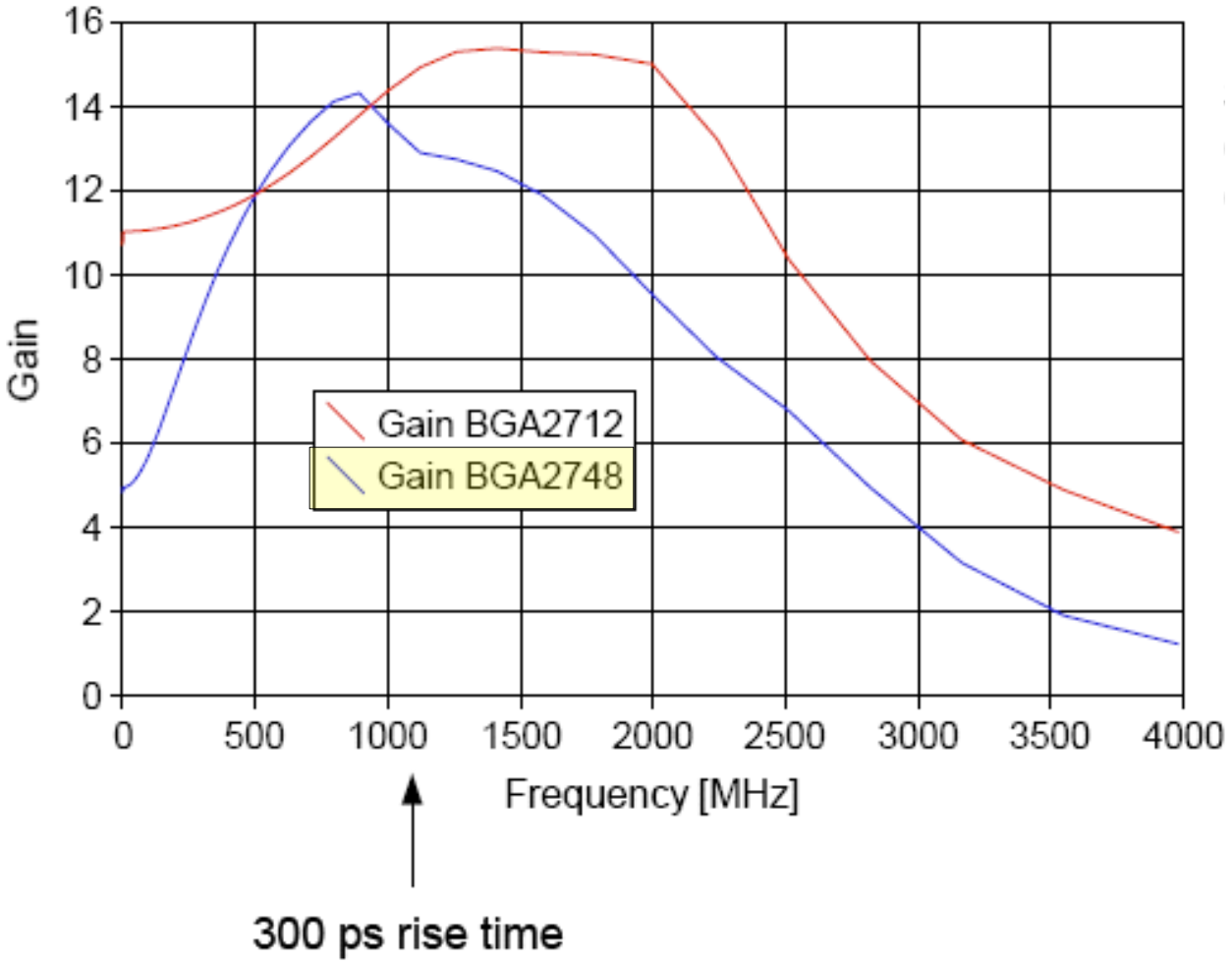
- There is not yet “the” PANDA readout chain for the barrel DIRC
- Test experiments for radiators and photon detector need now electronics for many channels, 128, 256...
- usage of existing read out chain
  - HADES TRB (HPTDC)
  - HADES discriminator boards / NINO boards

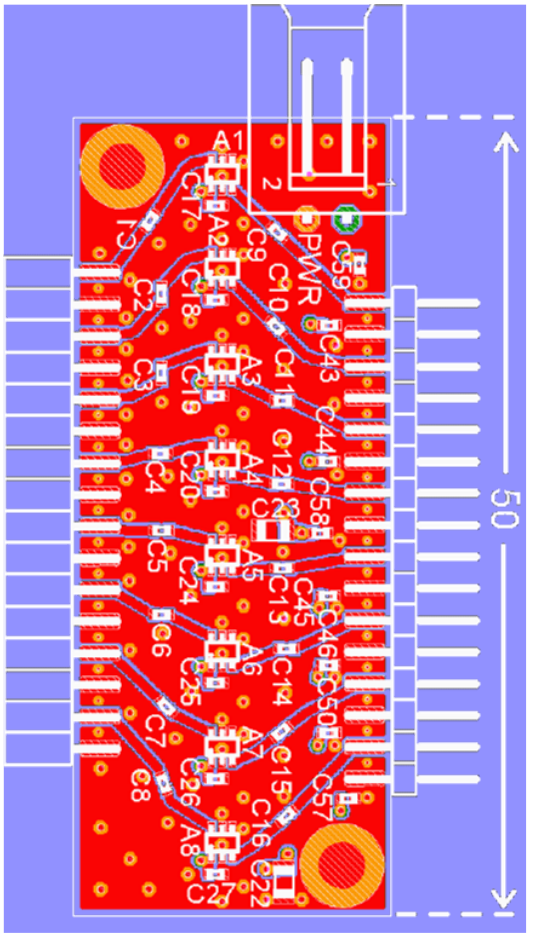
Photon detector

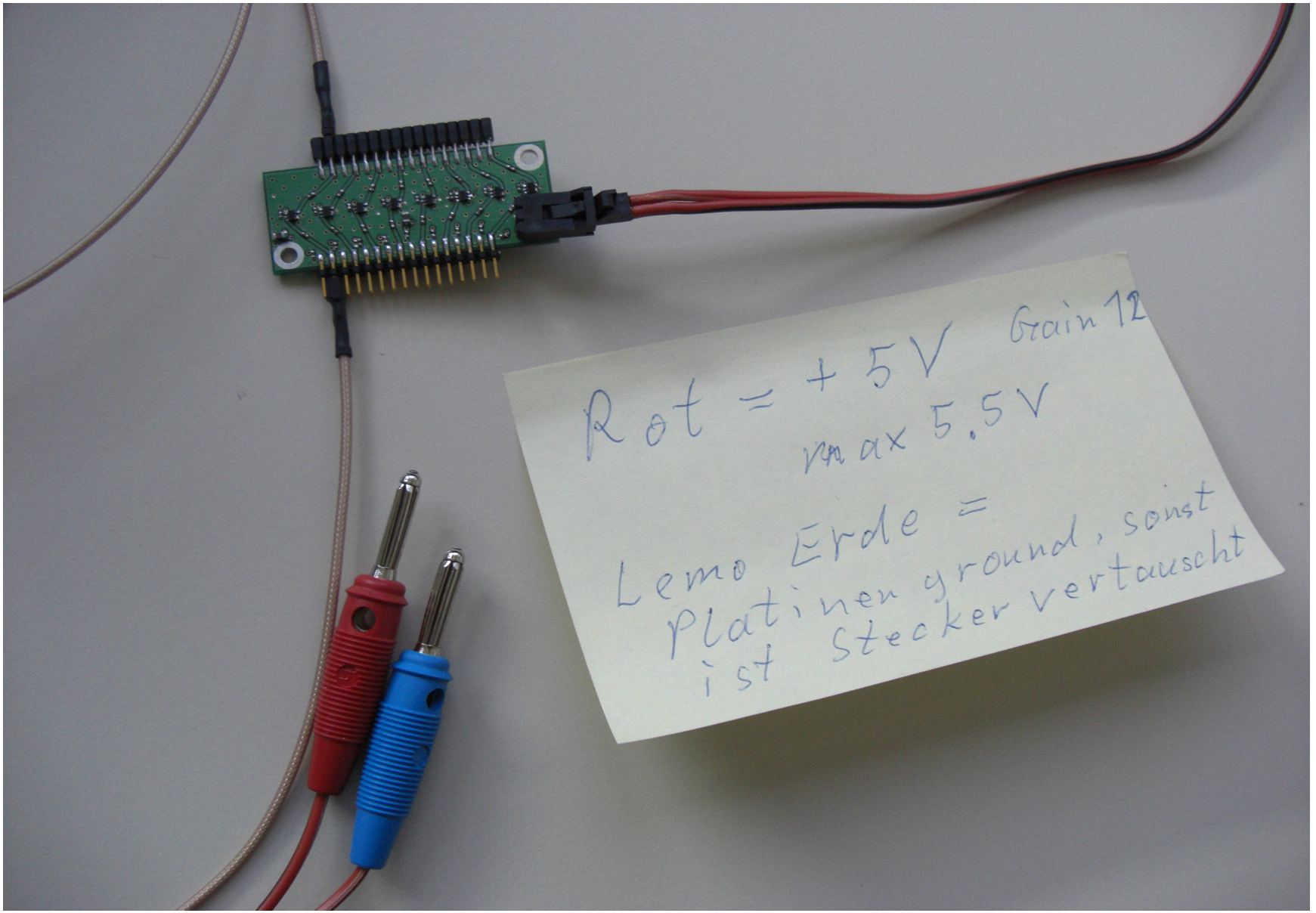
Burle-MCP-PMT
64 anodes
25um channels
work in high
magnetic field



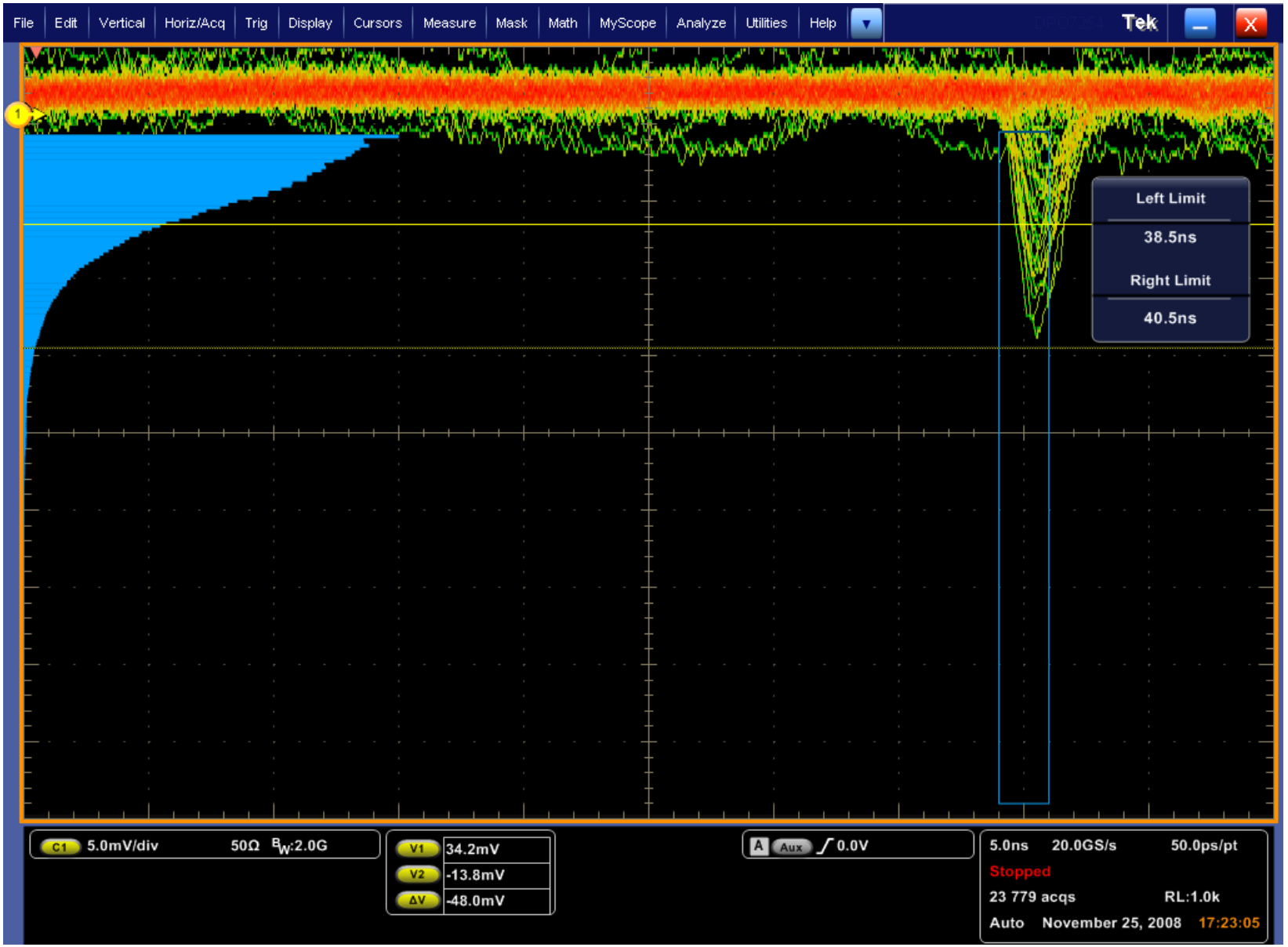
Preamplifier



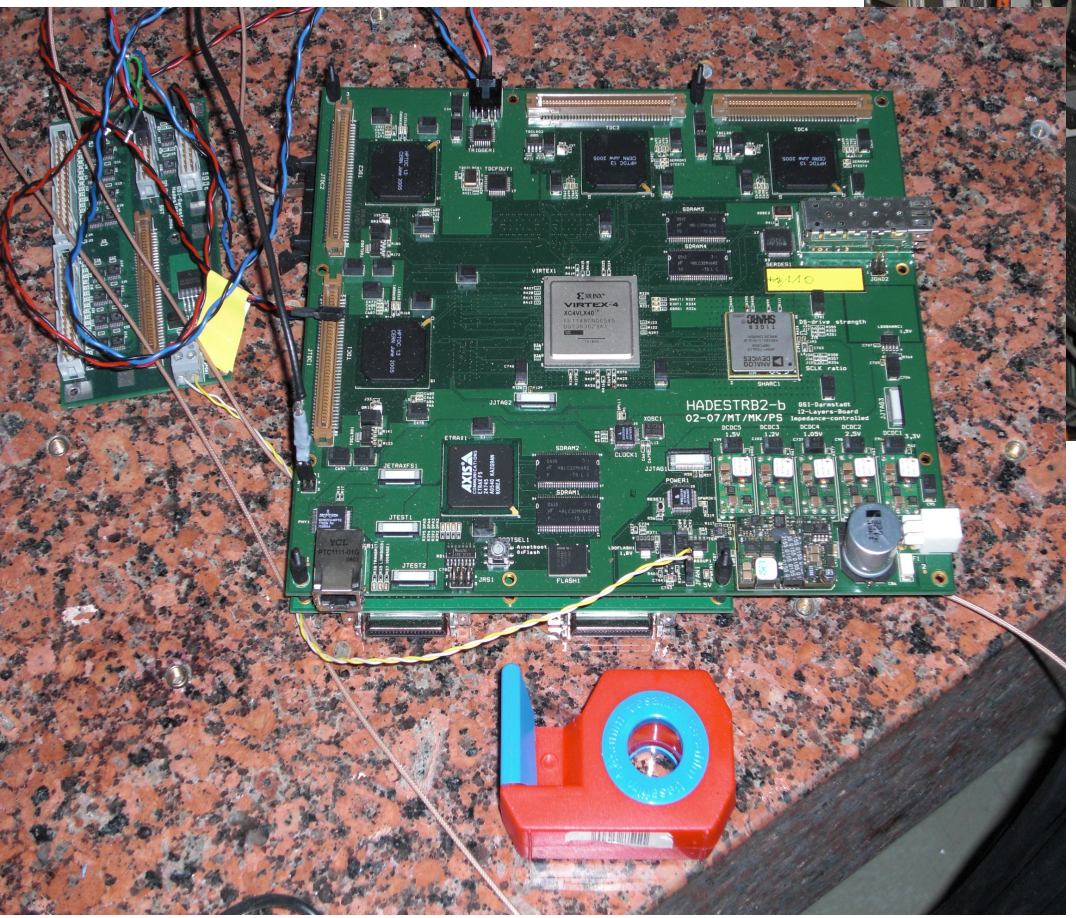



Rot = + 5V Grain 12
max 5,5V
Lemo Erde =
Platinen ground, sonst
ist Stecker vertauscht

MCP-PMT amplified --> 15mV Signals

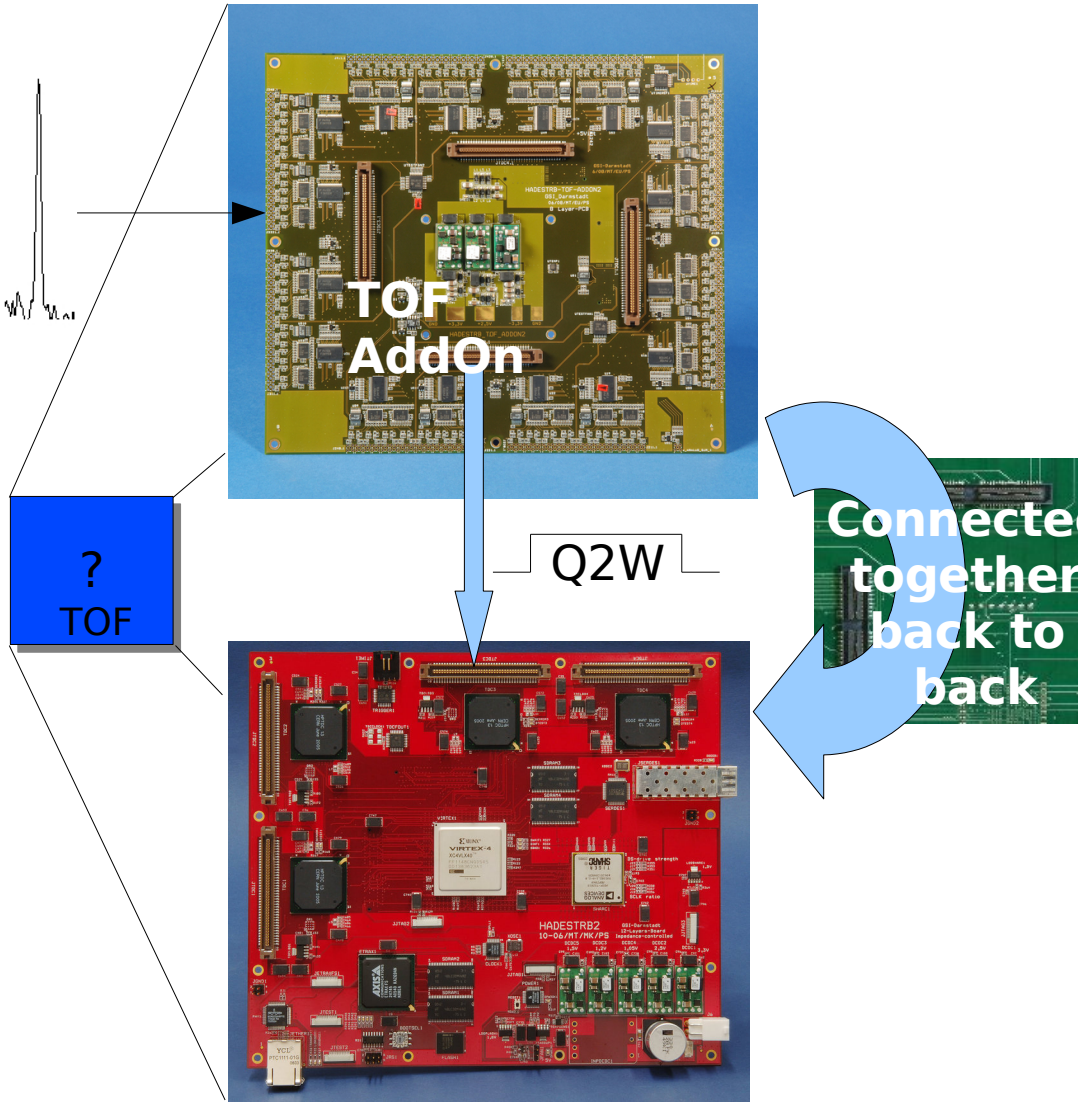


Hades TRB



TRB
+ discriminator board
(HADES)

TRB + NINO



The TRB gives a power supply and a slow control

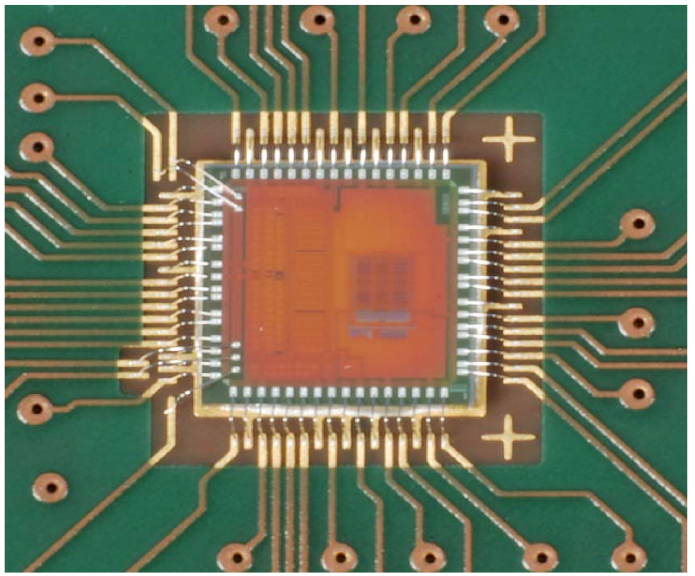
128 Q2W channels

Marek Palka IEEE Dresden

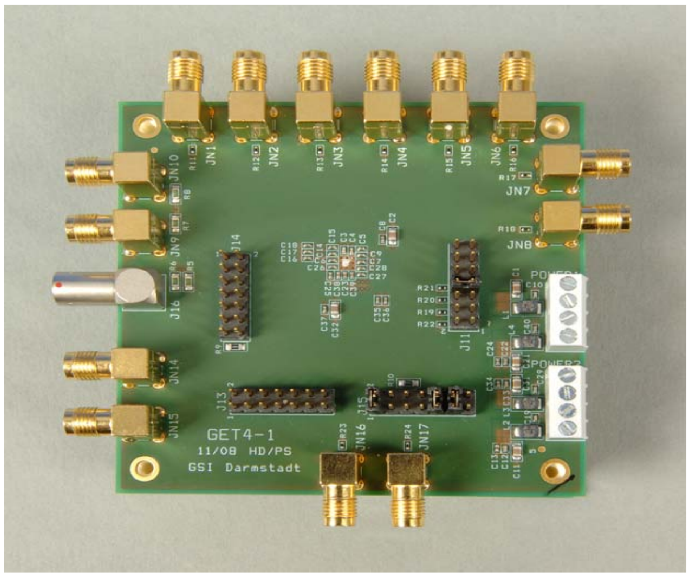
Optional TDC: GET4

GET4 Prototype PCB

Bottom side view



Top side view



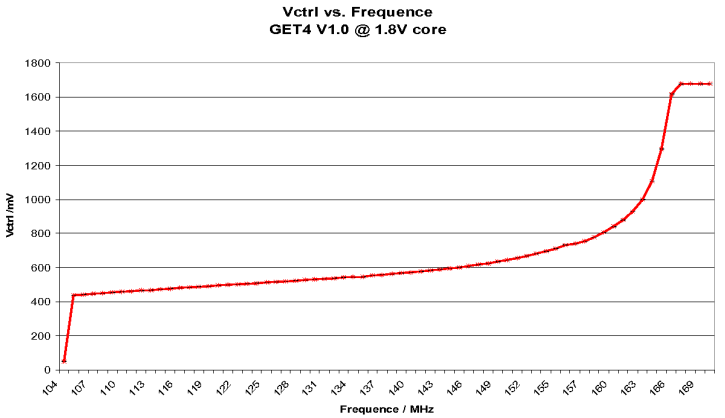
Harald Deppe
Holger Flemming

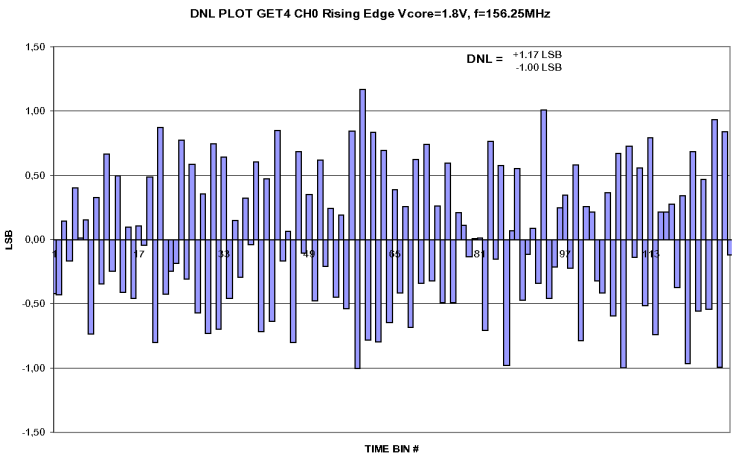
EE- ASIC

Bodenmais FE-DAQ meeting 2009

Measurements and Results GET4

- Clock 156.25MHz
- Lock Range 110MHz – 165MHz
- Linearity:
  - DNL > +/- 1.2 LSB
  - INL > +/- 1.5 LSB
- Resolution: $\sigma_{uc} \approx$ 23ps ± 1ps
- Power consumption:
  - 27mW/Chan @ 150kHz event rate





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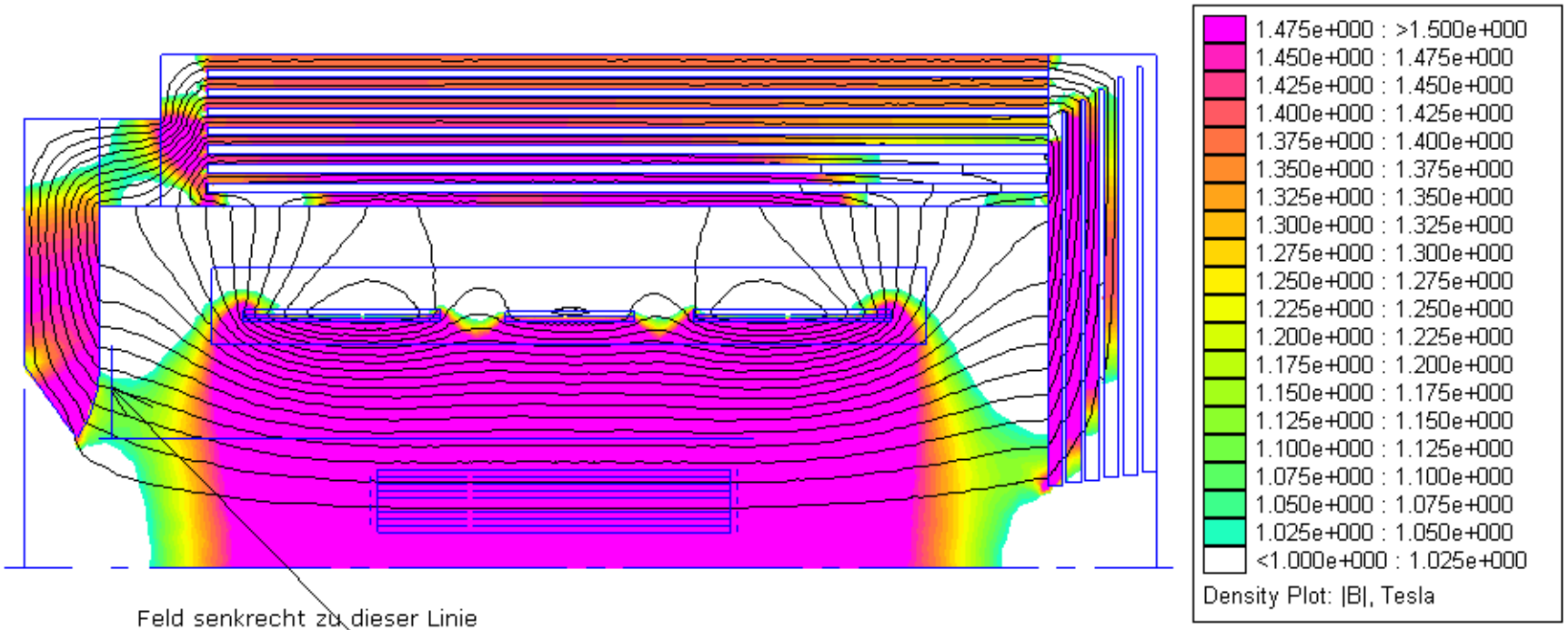
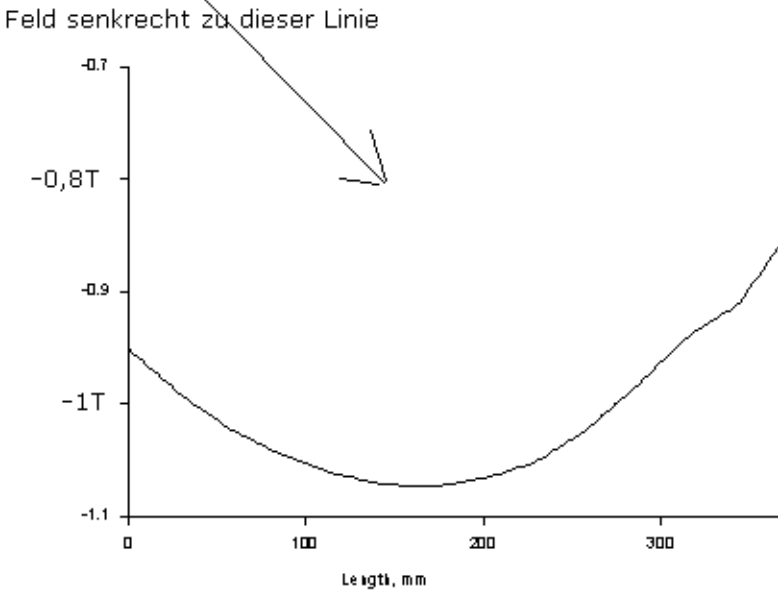
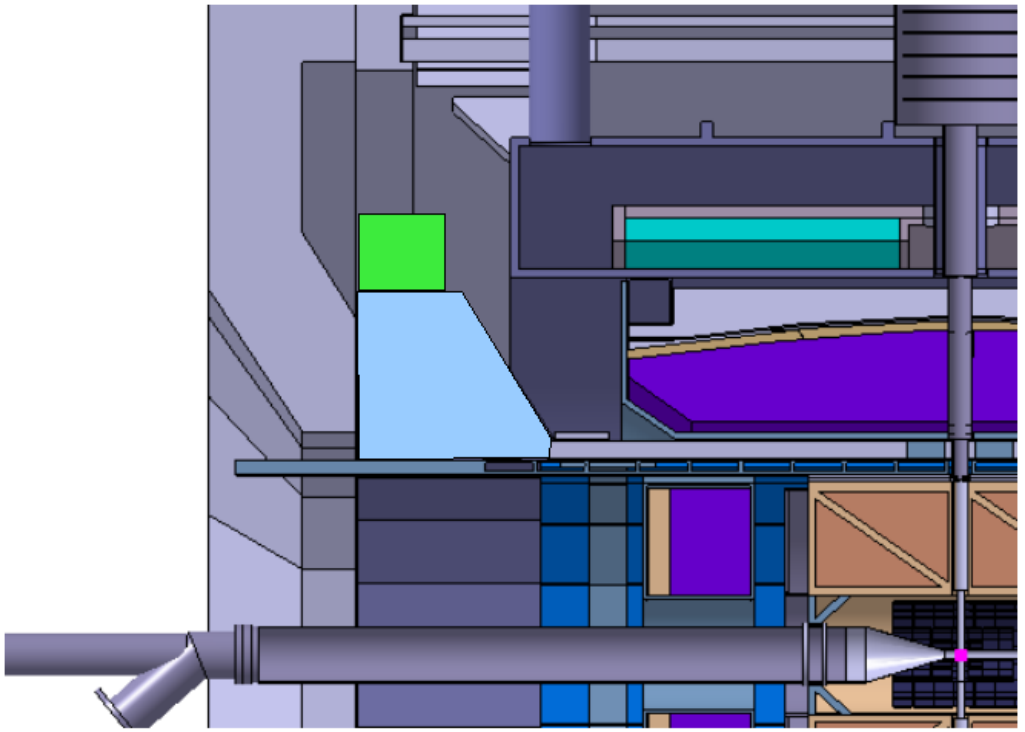
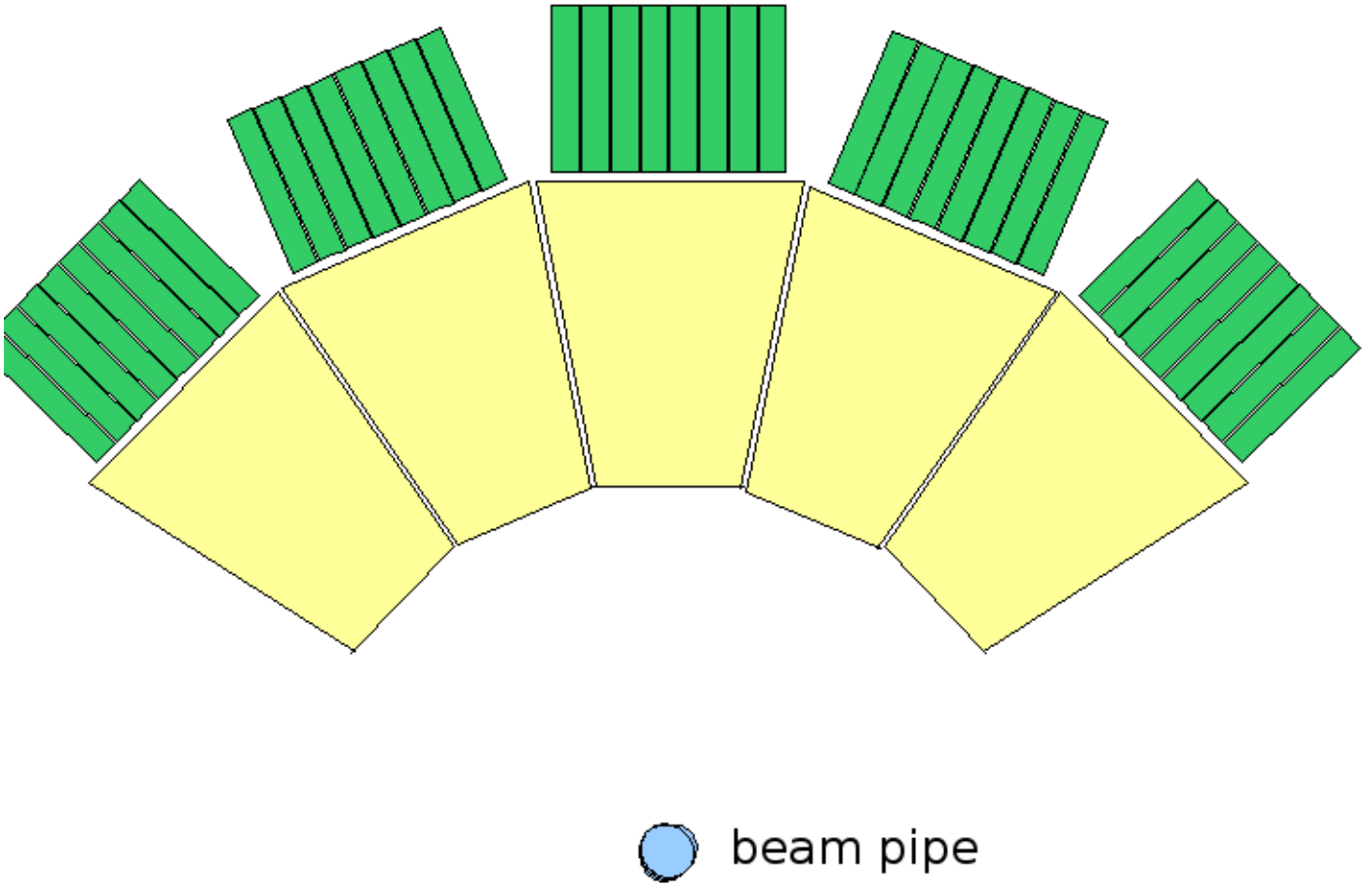
Magnetic field







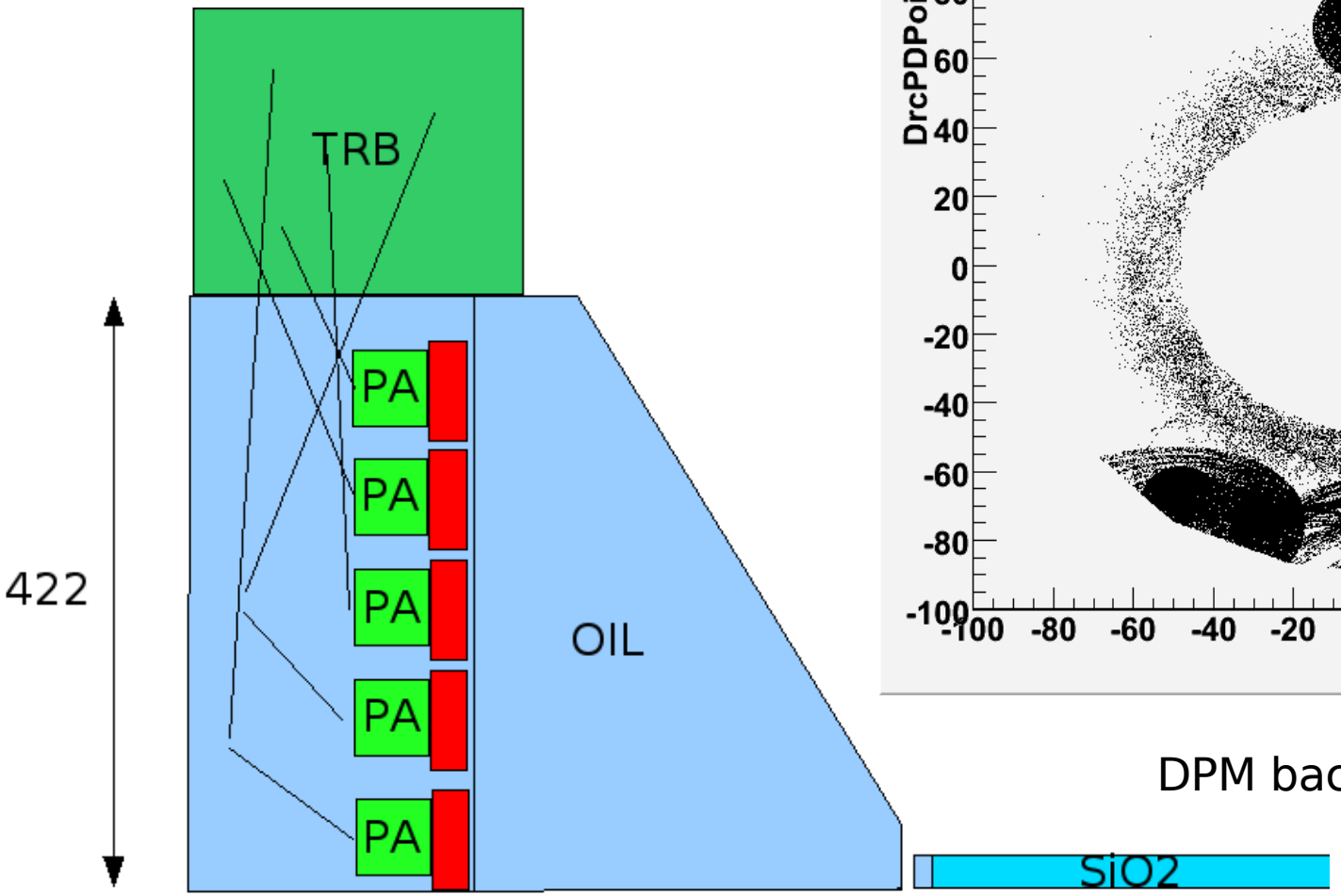
Photon detector and electronics have to work in magnetic field
B ~ 0.5-1 Tesla

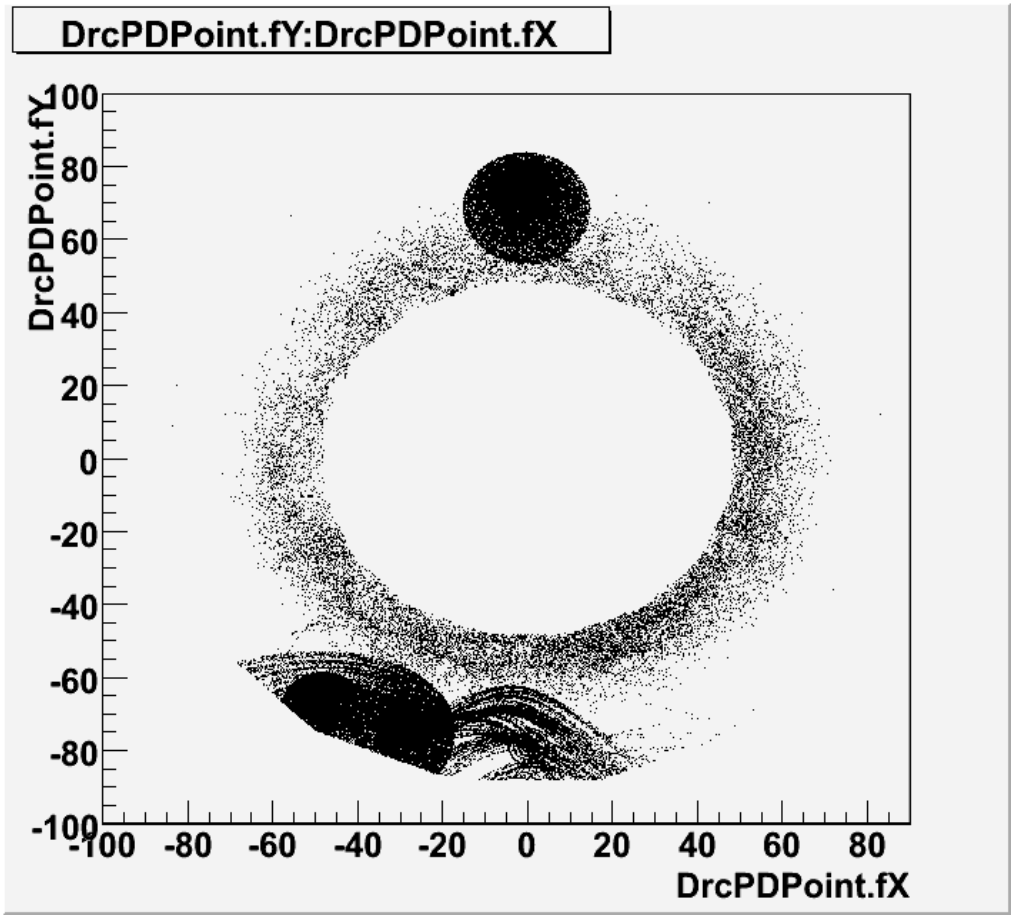

beam pipe

20 MHz interaction rate
barrel multiplicity 2
20 photons per ring
~ 5000 channels (inside region)

Rate: 160kHz (inside region)

Data rate





DPM background generator

Summary

- Barrel DIRC needs sub nano second timing information
  - Time over threshold information is preferred (walk)
- Idea of FEDAQ is existing
  - based on existing boards (Hades,GSI)
  - is being explored in test experiments
- DIRC in trigger needs a fast Hough transformation.