Testbeam 2010
Technical Issues

Aim

- Prove frontend electronics operation together with sensor and automated triggered readout in a particle beam.
- Collect experiences for preparation of a BeamCal/LumiCal prototype subset – plane or sector
  (‘deliverable’ within MC-PAD).

Outline

- Test beam facility
- Sensors
- Frontend electronics
- Contacting the sensor
- Readout
- Mechanics
- DAQ & software
- Summary

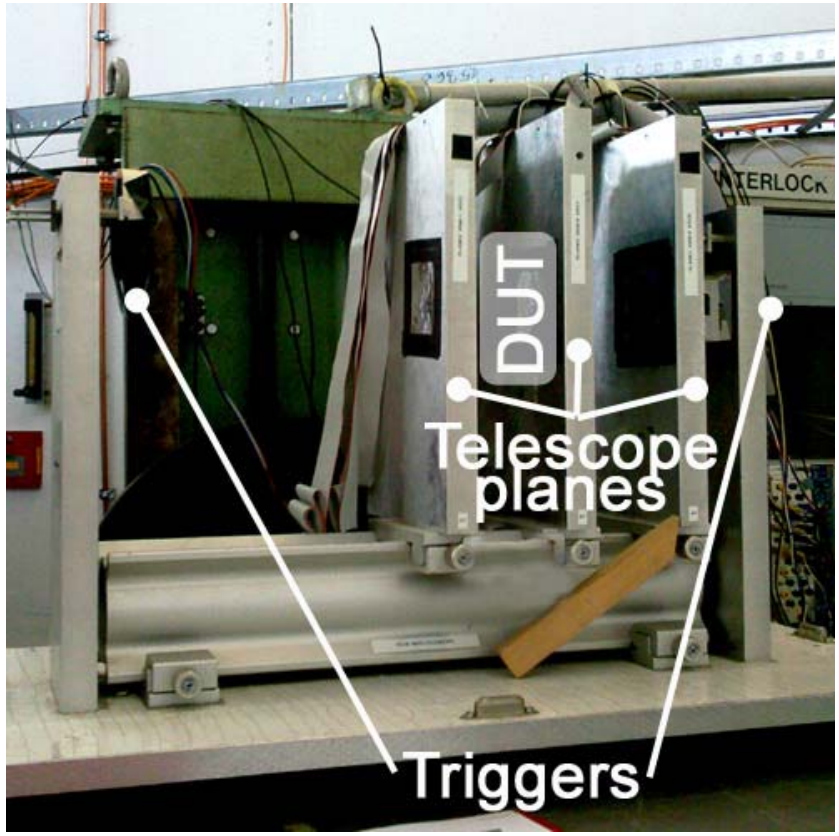
Testbeam facility

DESY Hamburg

- Beam line #22
  1...6 GeV, 10^{10} particles per bunch,
  1...5kHz

- Silicon Telescope
  3x2 layers, perpendicularly oriented
  each one 32x32mm^2, 28µm resolution
- 2...4 scint. finger counters as triggers

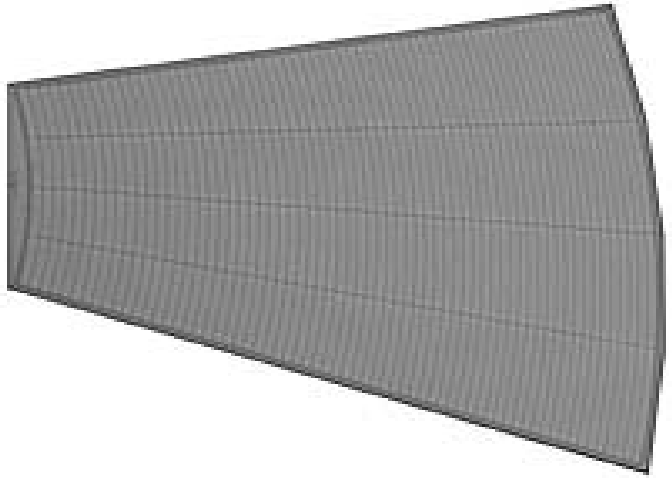
- standalone readout system



Sensors

LumiCal

- Hamamatsu Silicon sensor
- 4x64 pads



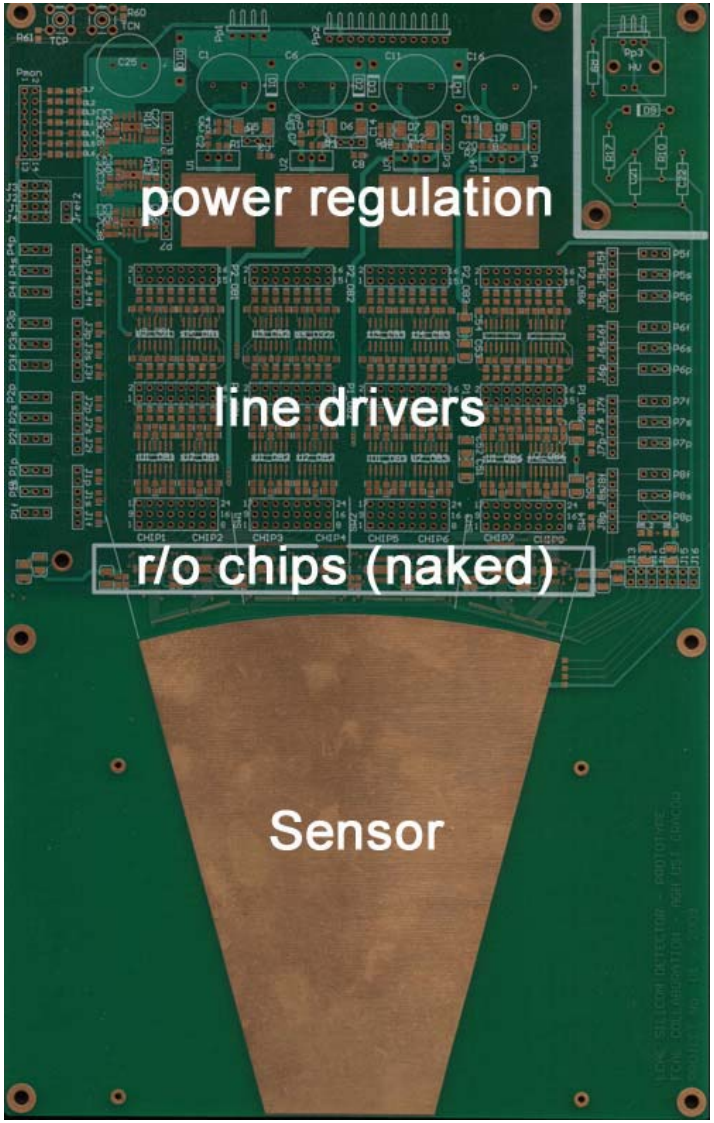
BeamCal

- JINR/Tomsk GaAs sensor
- 87 pads in 12 rings

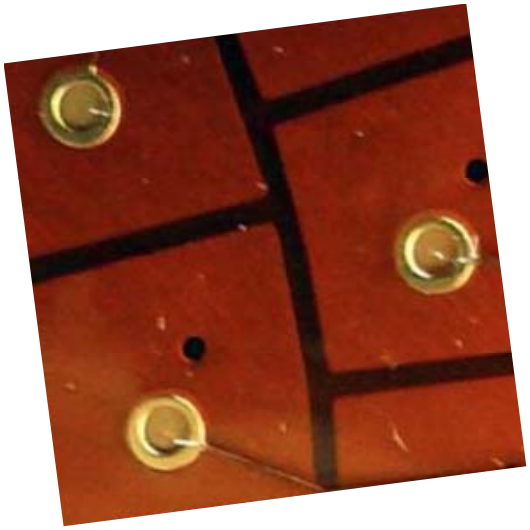
Frontend Electronics

Integrated printed circuit board
(courtesy Sz. Kulis)

- max. 64 channels, 32 equipped
- positive output into 50Ω
  (optional negative)
- 2 testpulse inputs
- power supplies &
  sensor HV filter included
- typically 8 channels r/o at a time
- Krakow √
  Zeuthen o



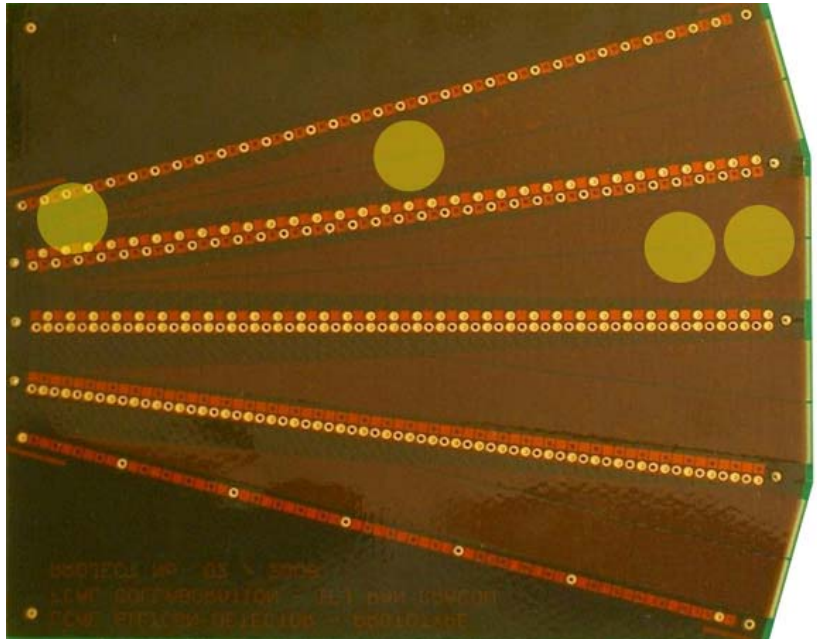
Contacting the sensor



‘fanout’ foil/pcb

- single sided copper traces
- through hole bonding
- provide different schemes for check of
  - crosstalk
  - capacitive load

- Krakow:
  capton, two different versions √
- Zeuthen:
  thin but stiff pcb o

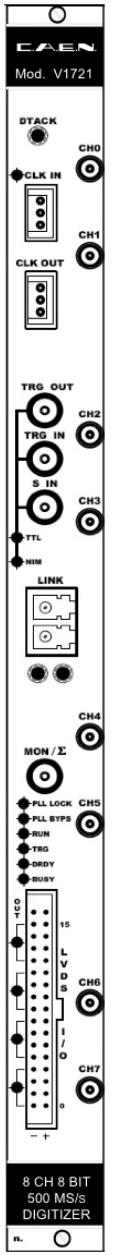


Readout (Proposal)

- 500MS/s 8bit sampling ADC (CAEN V1721) - VME standard
- single ended input 1Vpp ○
- 8 channels √

- programmable input offset adjust
- threshold selftrigger capability
- deadtime-free buffering up to 2MSamples/channel
- optical readout chain provided
- readout software suite exists (CMS) √

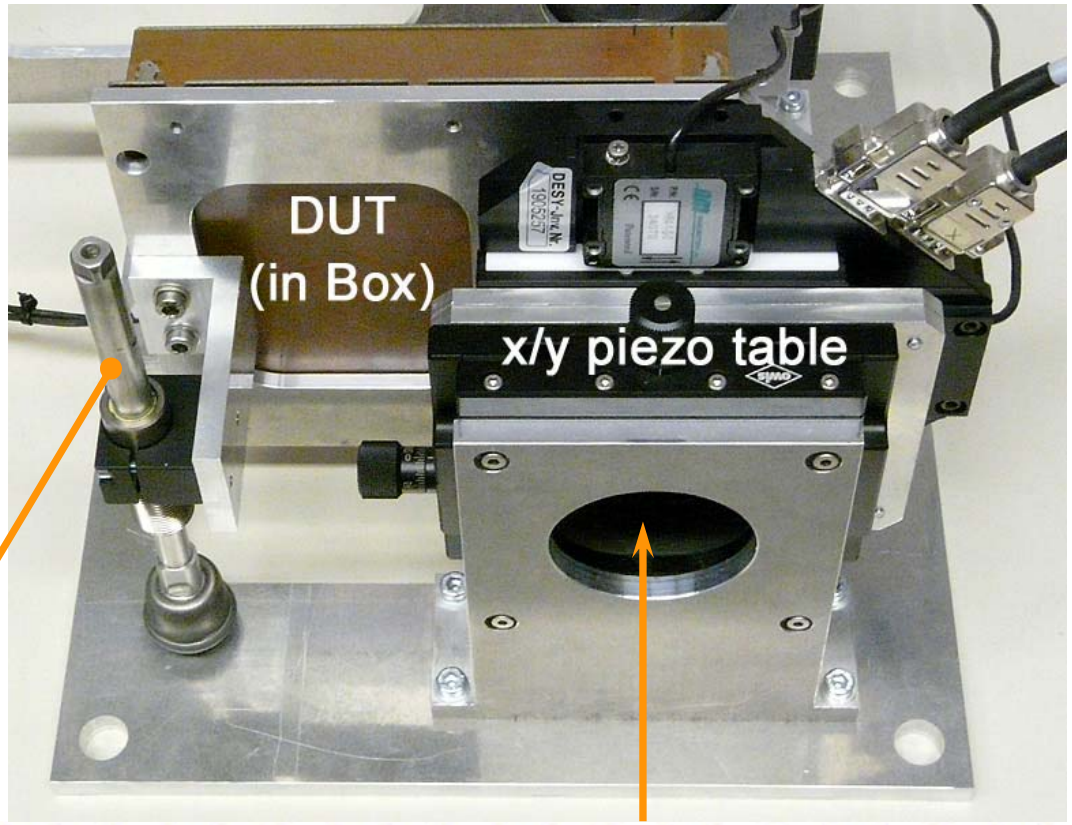
- 1 piece @ CMS (another one *ordered yet*) √



Mechanics (1)

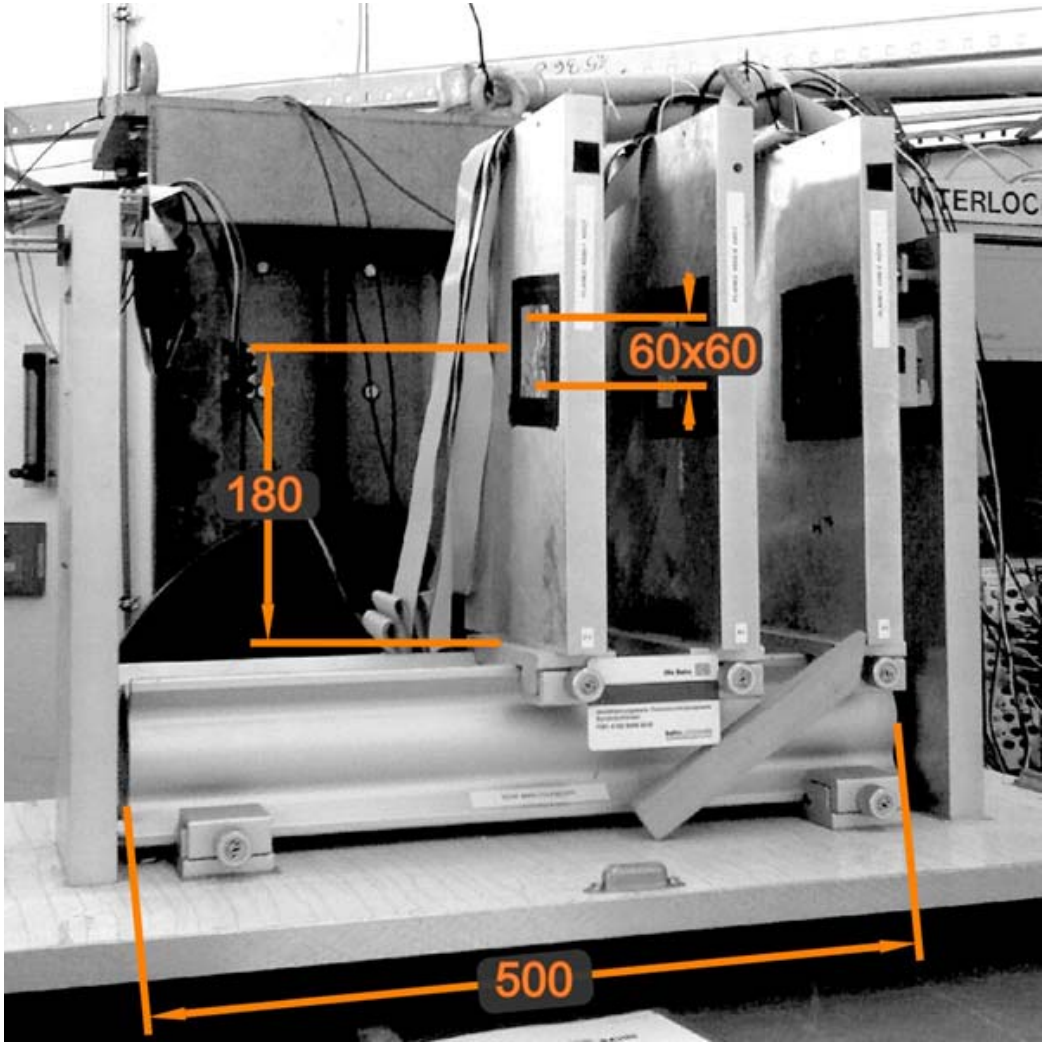
- **x/y table**, remote controlled √

- **shielding box** for integrated sensor/readout-board o
- beam windows in both pcb & box o



Mechanics (2)

- construction:
  weight compensation
- mountings:
  DUT box onto table
  x/y table onto optical bench



DAQ and software

- C++ ADC readout suite (CMS BCM group) incl. optical readout √
- extension to two modules (16 channels) and/or use of ADC with higher resolution ?
- LabView control for x/y table √
- derive trigger signal for ADC ?
- understand & operate telescope software o
- combine track data & ADC readout (tagging? time stamp?) oo

Summary

electronics

- well advanced in Krakow (sensor, fanout, pcb - tested) √
- a lot to do in Zeuthen (design, production, assembly, test) oo

mechanics

- some adaptations needed, no major issue o

software

- small adaptations to r/o program o
- table control probably useable (√)
- major issue: merging data with telescope software o

Thank you!

Links

Testbeam Facility

- http://adweb.desy.de/~testbeam/
- http://www.desy.de/~gregor/MVD_Telescope/short_intro.html

Electronics (Krakow r/o board; restricted access)

- http://lumifun.ftj.agh.edu.pl/doku.php?id=lumiwiki:front1sen:pcbdoc
- http://lumifun.ftj.agh.edu.pl/doku.php?id=lumiwiki:front1sen:usermanual

DAQ/Software (Zeuthen CMS setup; restricted access)

- https://znwiki3.ifh.de/CMS/ZeuthenSetup