JUSTUS-LIEBIG-
UNIVERSITÄT
GIESSEN

DIRC prototype tests and first results with dSiPMs from Philips

Peter Koch on behalf of AG Düren

PANDA Coll. Meeting XXXV Darmstadt
Nov 29^{th} - Dec 03^{rd} 2010

Activities in our group

`http://www.uni-giessen.de/cms/dueren/arbeiten`

Electronis Optics Sim/Reco Tests/Analysis

Benno Kröck (PhD student)

Kristof Kreutzfeldt (Master student)

Aufbau eines Teststandes für Čerenkov-Detektoren

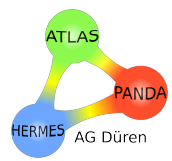
Electronis **Optics** Sim/Reco Tests/Analysis

Marko Zühlsdorf (Diploma student)

Charakterisierung der optischen Eigenschaften des Disc-DIRC für PANDA

Nils Stöckmann (Bachelor student)

Eigenschaften von dichroitischen Spiegeln als Frequenzfilter im Panda DIRC-Detektor



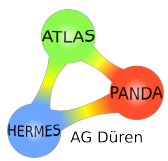
Activities in our group

Electronis | Optics | **Sim/Reco** | Tests/Analysis

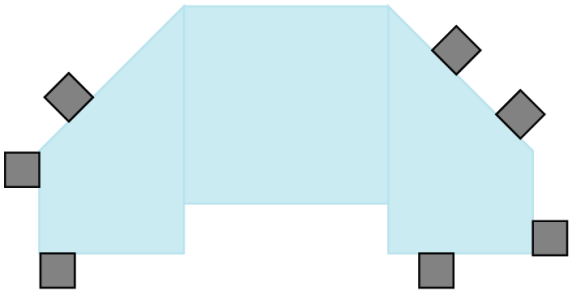
Oliver Merle (PhD student)
Seth Colemans (Bachelor student)

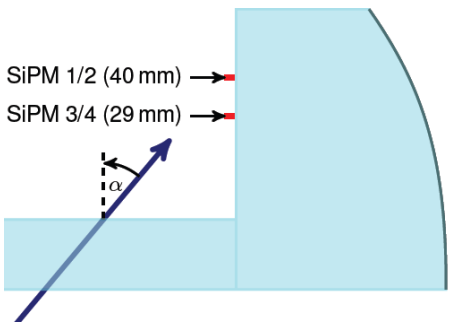
Electronis | Optics | Sim/Reco | **Tests/Analysis**

Peter Koch (PhD student)
Sabrina Darmawi (Master student)
Entwicklung eines Čerenkov-Faserdetektors
für das ATLAS Experiment am Cern
Michael Sporleder (Diploma student)
Messung von Čerenkovwinkeln an DIRC-Prototypen
im Teststrahlexperiment
Ann-Katrin Rink (Bachelor student)
Messung der unterschiedlichen Photonenpfade in
einem DIRC Radiator

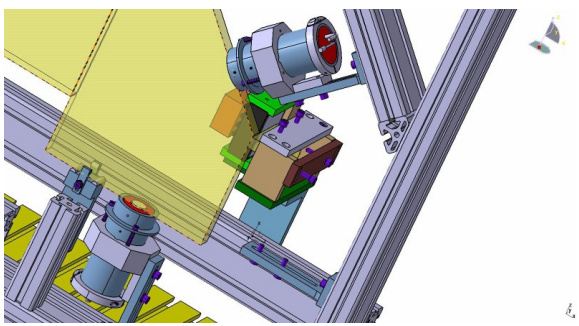


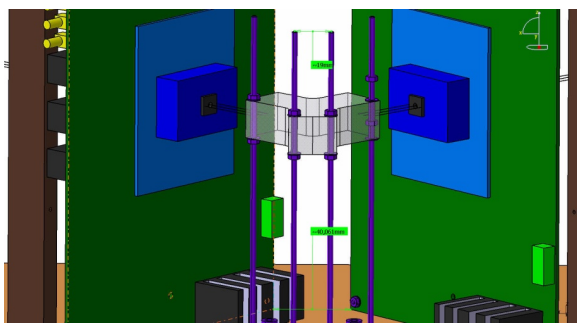
Prototypes we build so far





- 780mm x 390mm borofloat glass coupled with BINP MCPs
- small Plexiglas radiator and FLG coupled with SiPMs
- 780mm x 390mm borofloat glass coupled with BINP MCPs
  additional FLG
  coupled with Photonis MCP
- Y-shaped Plexiglas radiator
  with Philips dSiPM and PCB board





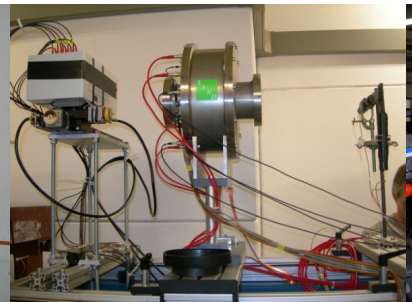
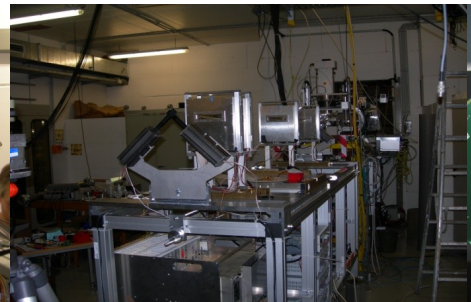
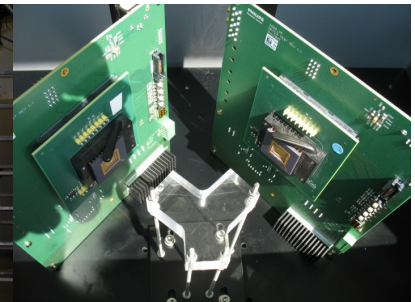
Test beams so far

DESY 2008 disc + BINP MCP
measure Cherenkov light for the first time

JLU $>$ 2009 disc + BINP MCP
cosmisc tests with improved electronics

GSI 2009 FLG + SiPM
measure focusing light guides (less photons than estimated)

FZJ 2010 FLG + SiPM
repeat last test for FLG (still too few photons)

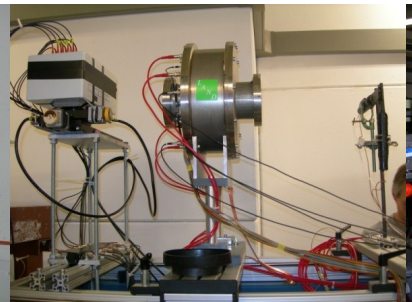
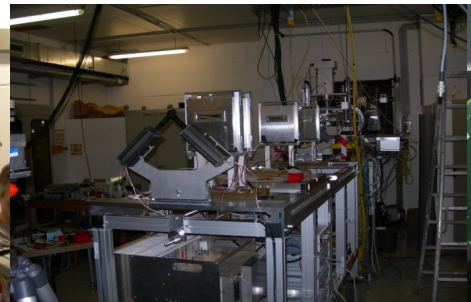
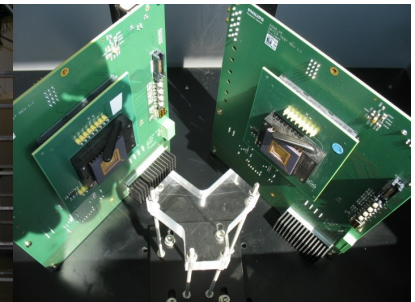





Test beams so far

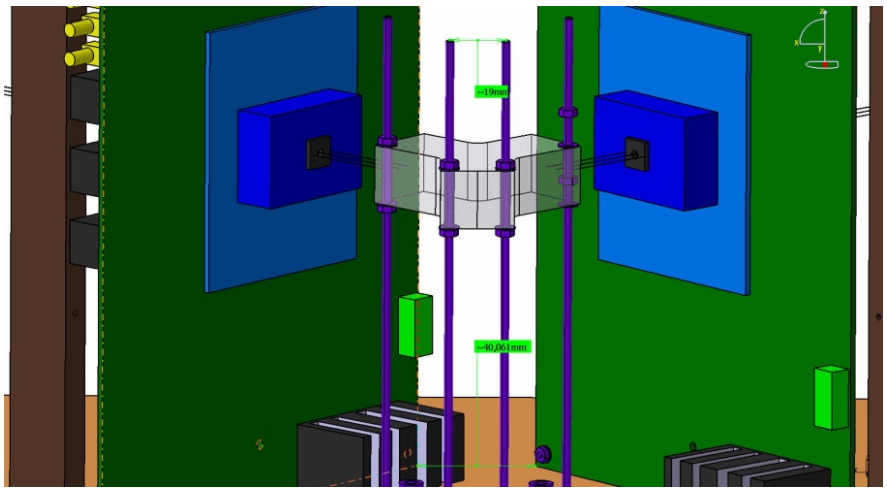
FZJ 2010 disc + BINP MCP + FLG + old Photonis MCP
- measure disc again in beam
- measure FLG with big sensitive area

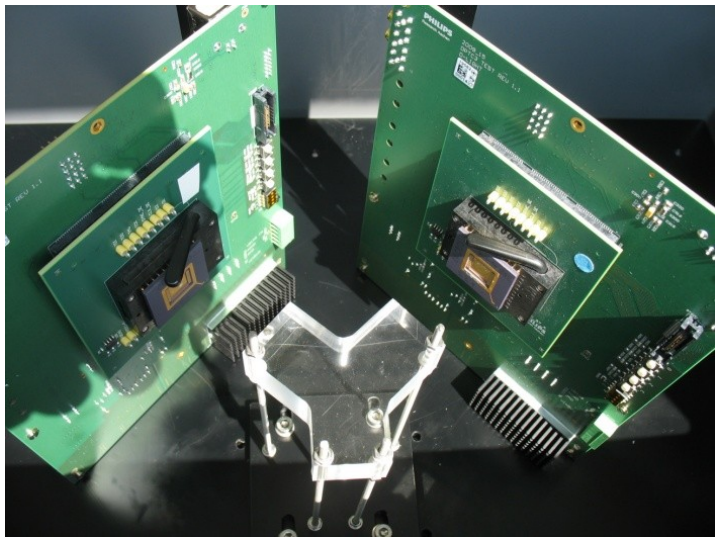
DESY 2010 disc + BINP MCP + FLG + PMT
- measure disc again in beam (more statistics)
- measure FLG with standard PMTs (they didnt work in DESY)

CERN 2010 Y-Prototype + dSiPM; AFP + new Photonis MCP
- test Phlips dSiPM

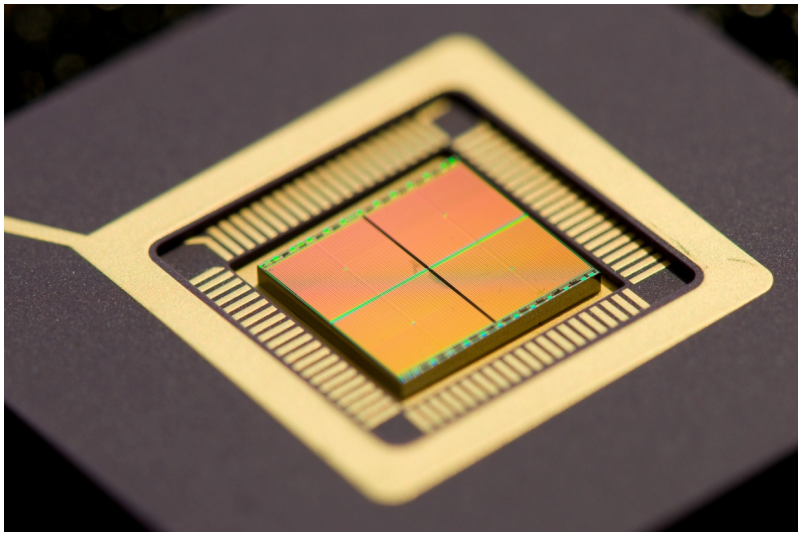
The Philips dSiPM Prototype

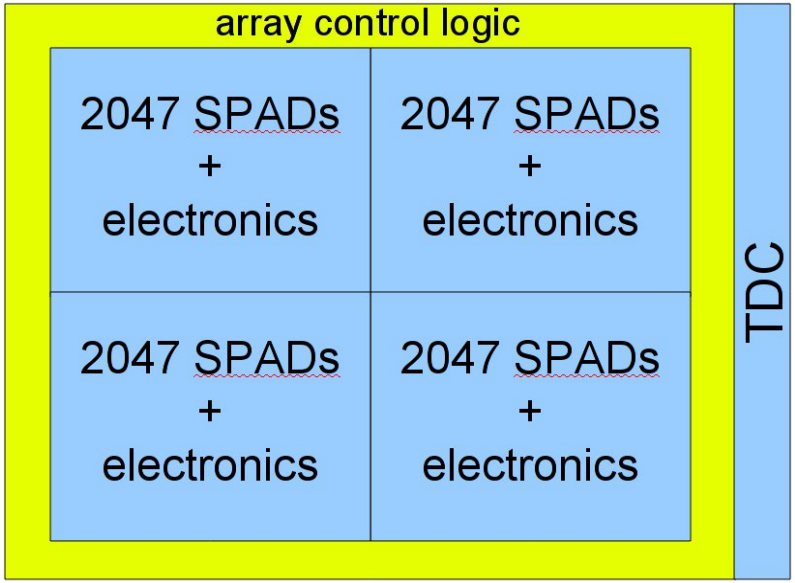




- Plexiglas radiator, refractive index ~ 1.5
- Cherenkov light at 48.2 degree defines geometry
- Build and tested in cooperation between Philips and JLU Giessen

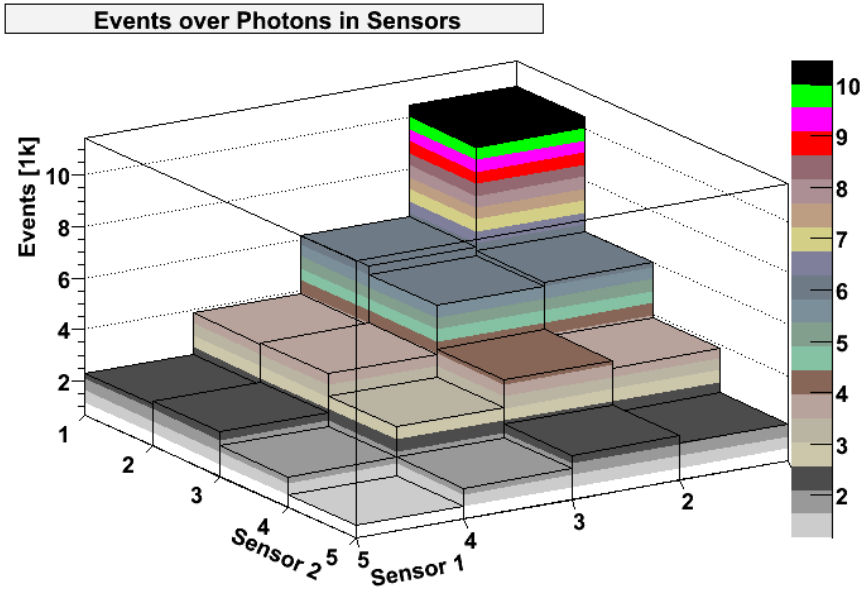
The Philips dSiPM

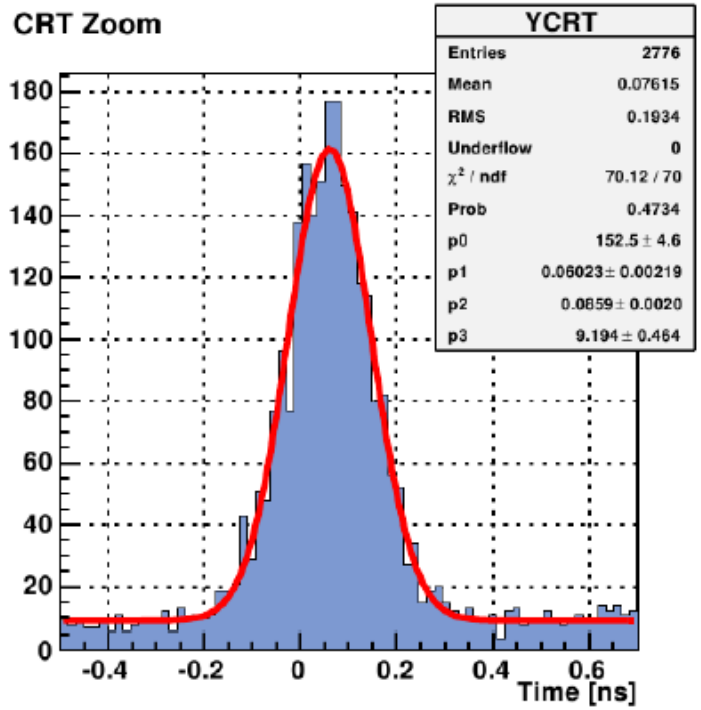




- each arm has array of 4 pixel with 2047 SiPM each
- SiPM has 30x52μm; array has $\sim$ 54% fill factor
- individual SiPMs can be inhibited (noise reduction!)
- integrated TDC has 8ps sigma resolution
- variable trigger (1-4 photons) and thresholds (1-64 photons)
- DAQ controller is in FPGA

CERN Results

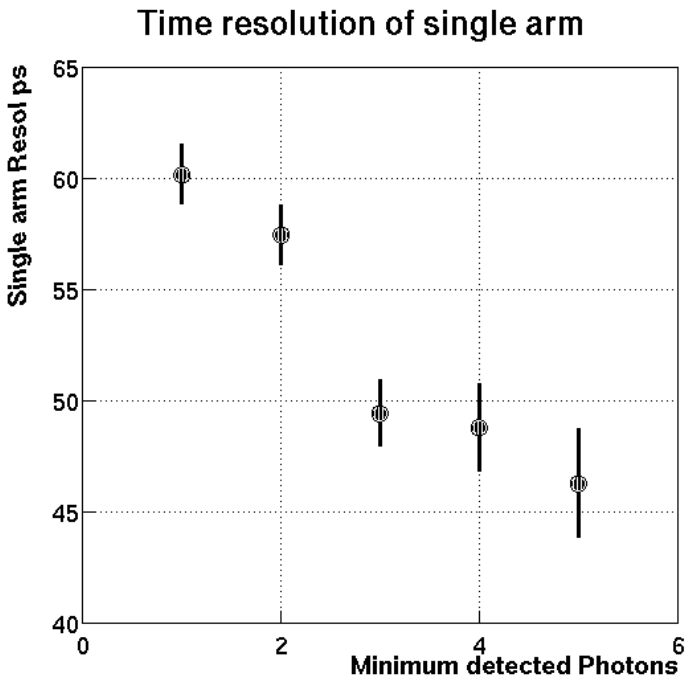


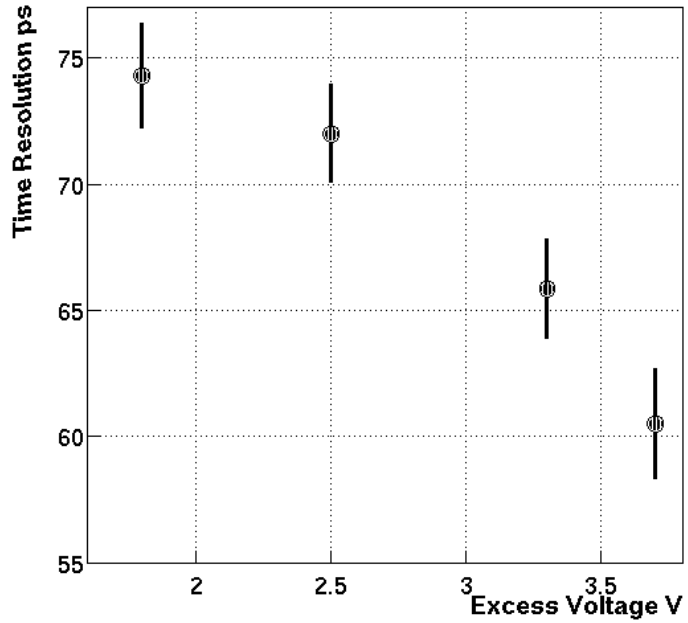


- 98% diodes active
- 3.7V excess voltage
- T=2°C
- DCR = 477/553 kHz

- first photon trigger
- no energy threshold
- CRT σ = 85.9ps
- resolution = 60.7ps

Time resolutions

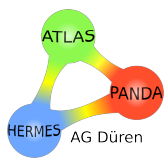




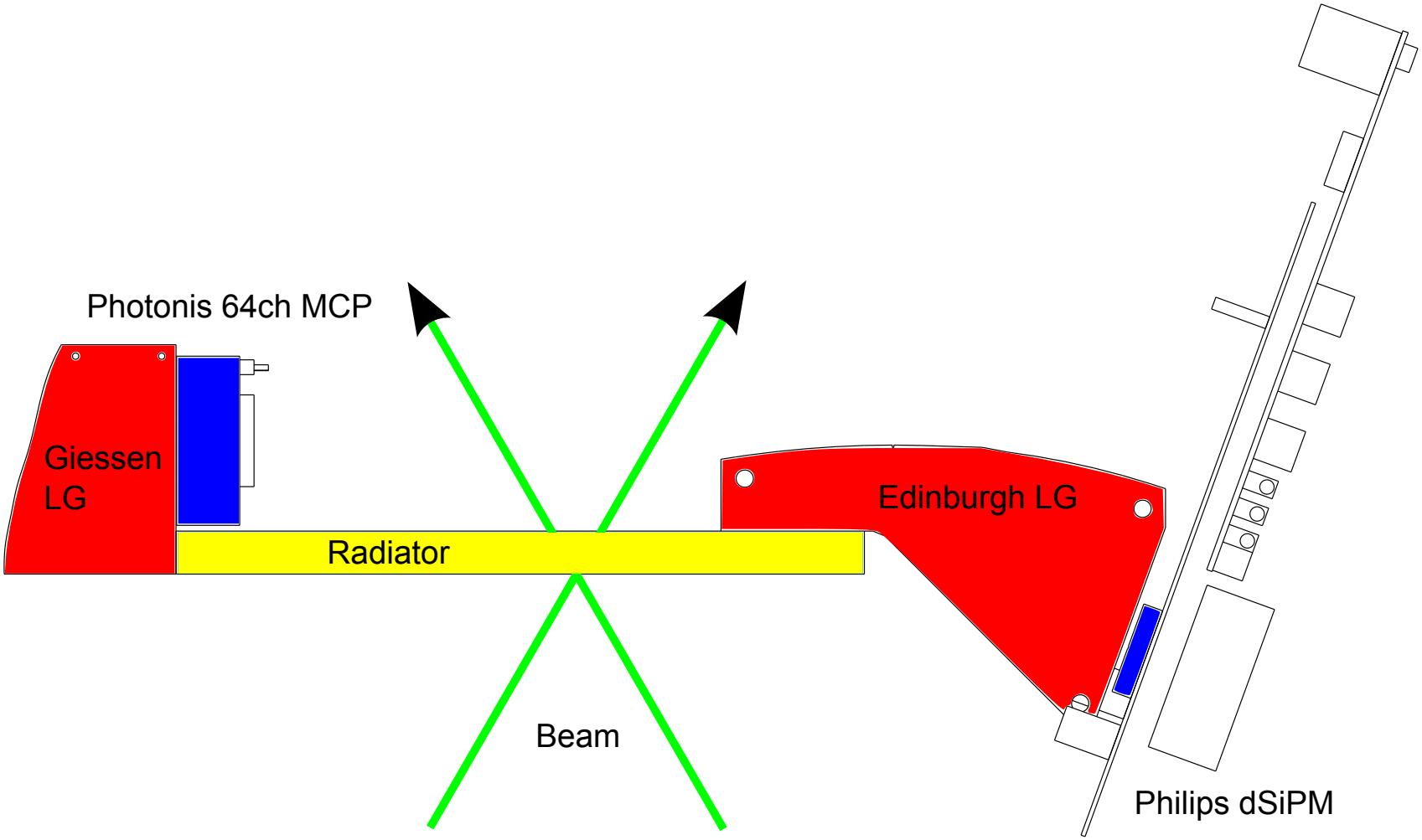
- search for optimal working conditions:
  - excess voltage
  - temperature
  - N of disabled channels

Philips dSiPM Testing

- Phlips dSiPM was tested to detect Cherenkov photons
- promising results in terms of time resolution
- cooling is a MUST for detecting single photons
- new version will improve the fill factor and the trigger network
- next test beam (DESY December 2010) with more time for systematic studies



Testbeam DESY December 2010



DESY Hamburg, December, 4th - 13th 2010


DIRC 2011
International Workshop on Fast Cherenkov Detectors
Photon detection, DIRC design and DAQ
April 4-6, 2011
Justus-Liebig-Universität Gießen
DIRC design
Novel developments and progress in the detection of internally reflected Cherenkov photons.
ps timing
Readout electronics with time resolution in the 10 - 100 ps regime.
fast DAQ
Data acquisition for Cherenkov detectors with interaction rates in the 10 MHz region.
single photon detection
Fast photodetectors for the detection of single photons. Influence of strong magnetic fields and lifetime issues.
For more information and registration, visit:
www.uni-giessen.de/cms/dirc11
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