AIDA

Advanced European Infrastructures for Detectors at Accelerators

AIDA WP9

Infrastructure for Gaseous tracking, Si-based vertex detector and tracker R&D, granular calorimetry

1st annual AIDA meeting, DESY, March 2012

Marcel Vos (IFIC, U.Valencia/CSIC)

Vincent Boudry (LLR)

with help from

Klaus Desch, Hanno Perrey, Thomas Bergauer, Roman Poeschl

IFIC

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WP 9.2: Advanced infrastructures for detector R&D Gaseous detector facilities

Subtask 9.2.1 (CEA, CERN, DESY, ULund) :

Upgrade of the Large Prototype at DESY

Superconducting solenoid

Endplate integration and Read-out system

Subtask 9.2.2 (CERN) :

Infrastructure for the production of large MPGDs

Subtask 9.2.3 (CEA, DESY, UBonn, NIKHEF)

Common readout systems for gaseous detectors (pixellated readout)

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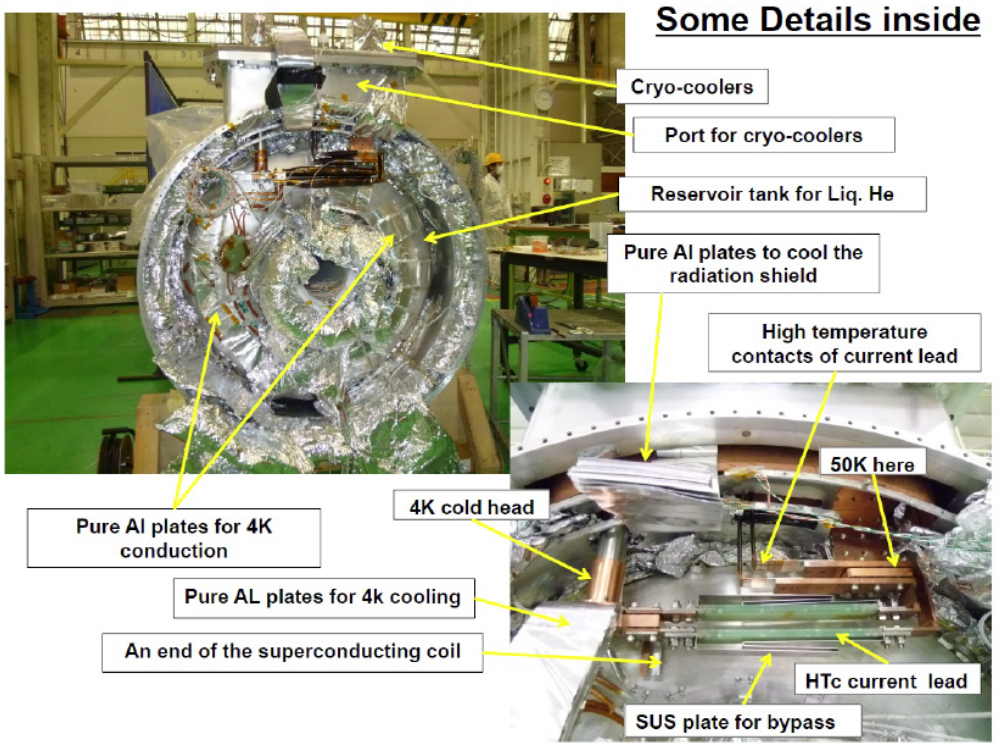
Subtask 9.2.1 Large TPC prototpye upgrade at DESY

PCMAG 1T Solenoid upgrade done in Japan
(waiting for re-installation at DESY)
- selfcontained cryogenics



PCMAG will be available again this summer for tests

Ralf Diener, DESY

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Subtask 9.2.2 CERN MPGD workshop upgrade

9 new machines, delivery almost complete (785 kCHF payed by CERN), commissioning in progress. 2x1m² Micromegas, 2x0.5 m² GEMs.

2 years of fellow on AIDA funds (240 kCHF) for commissioning of the new equipment and redefinition of the production parameters

Lots of ‘clients’ for prototyping (MM Muon chambers for ATLAS upgrade and for muon tomography, GEM Muon chambers for CMS upgrade, GEMs for GSI, plus tens of smaller projects, and more to come…

Rui de Oliveira, CERN

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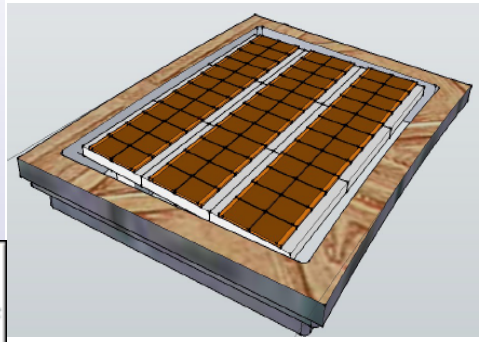
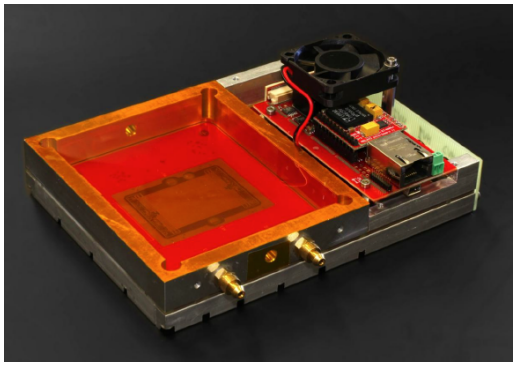
Subtask 9.2.3 Readout pixel-gas detectors

Goals: - „Large Area“ module (~100 chips) with InGrid-Detector for LP TPC with Timepix1- initial readout system for Timepix3 (longer time scale)

Timepix-1 f/o towards Timepix-3

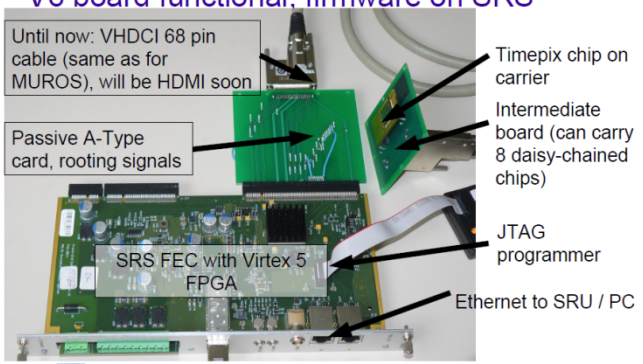


„The goal“



RELAXD readout system

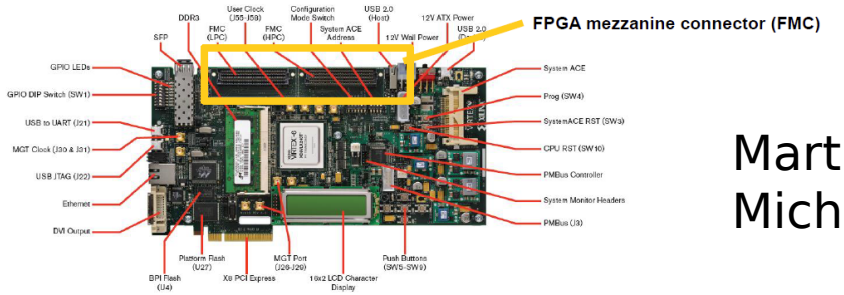
- V6 board functional, firmware on SRS



SRS-based readout system

SPiDR system

- Speedy PIxel Detector Readout
- Readout for Medipix3 and (later) Timepix3
- Initially 1 Gbit/s Ethernet, then migrate to 10 GBE
- Develop firmware on FPGA development boards
  - At a later stage design a compact readout module like Relaxd



Martin van Beuzekom, NIKHEF
Michael Lupberger, Bonn

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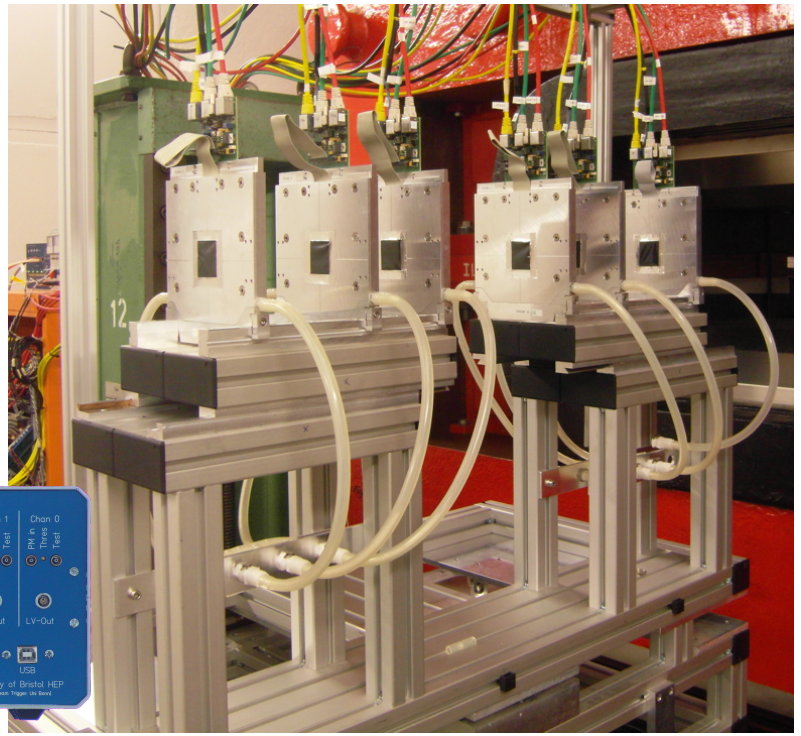
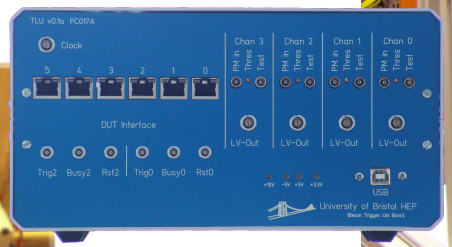
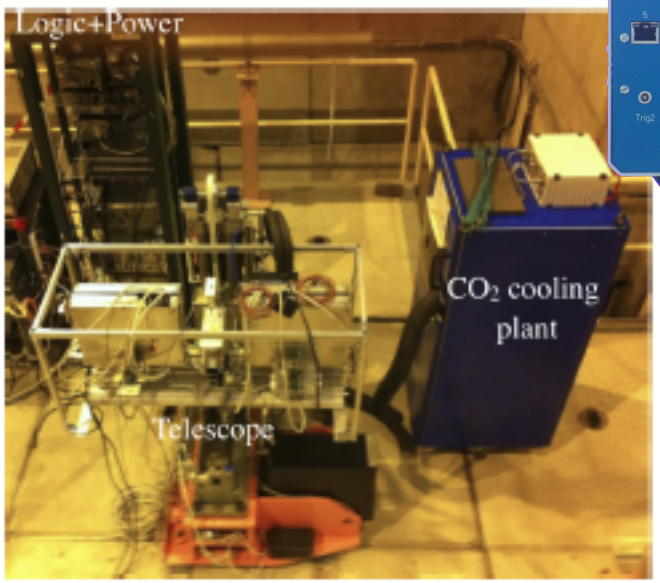
WP9.3: go to a test beam by plane and plug your prototype into a full-fledged infrastructure.

Users don't need to develop/buy and commission scintillators & trigger logic, remote-controlled mechanical support, DAQ, cooling, analysis chain. Support is crucial







Precise Pixel Detectors

Task leader: I. Gregor (also DESY contact)
No meeting this week due to clash with ATLAS upgrade meeting, but a nice overview talk by Hanno Perrey in the plenary on Wednesday
Milestones in M13: design & specification of telescope & thermo-mechanical infrastructure

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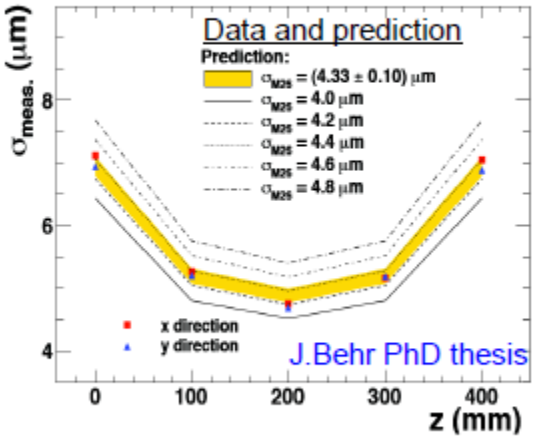
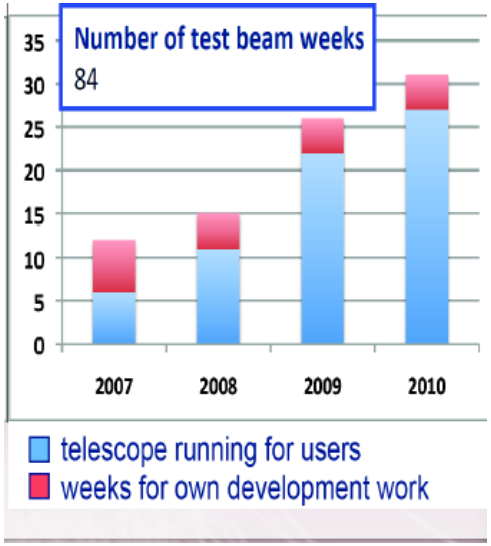
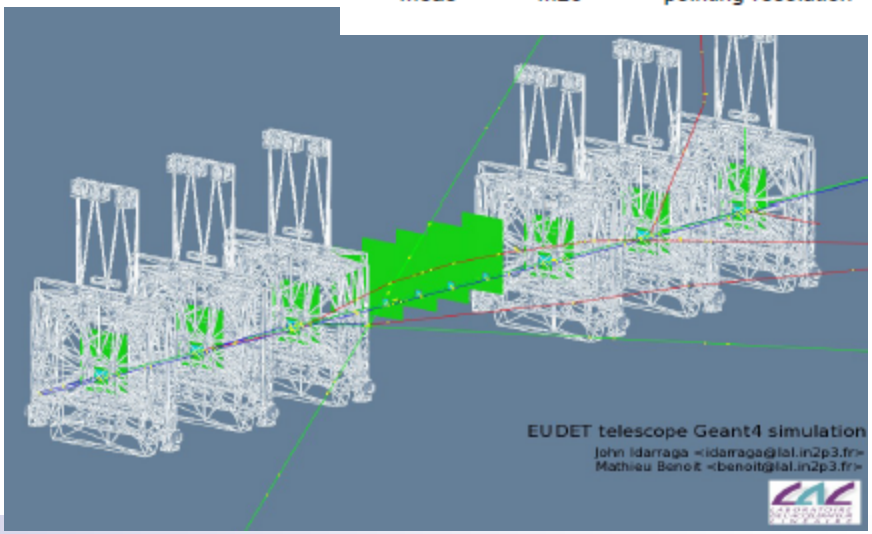
A very complete infrastructure was developed in EUDET
See: Igor Rubinsky (DESY), TIPP2011

Pointing resolution in between the planes



$$\sigma^2_{meas} = \sigma^2_{m26} + \sigma^2_{pointing\text{-}resolution}$$





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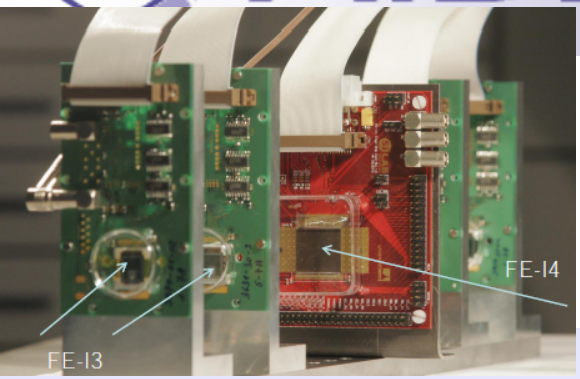

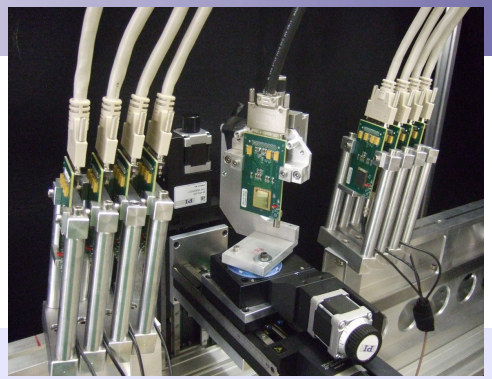

Beam telescope demonstrators:

MIMOSA–28 (next generation)
ATLAS FE-I4 (integrated in EUDET telescope)
TimePix (standalone)

Interfaces & auxiliary infrastructure:

Design and produce a mini-TLU with high speed capabilities
(ongoing, see also common DAQ session in WP8)
Implement FE–I4 in trigger mode
(tested and found to work)
Design cooling plant
(~ existing design)
Providing Timepix infrastructure under the umbrella of AIDA
(plug-compatible with MIMOSA/ATLAS arms?)

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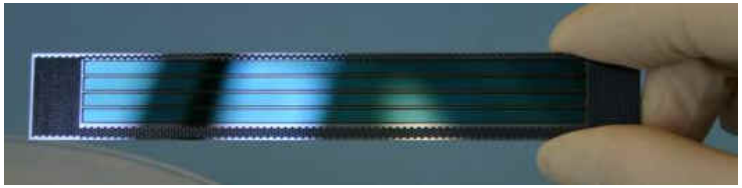
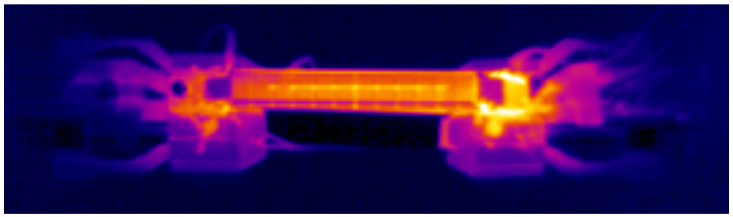
Off-beam infrastructure

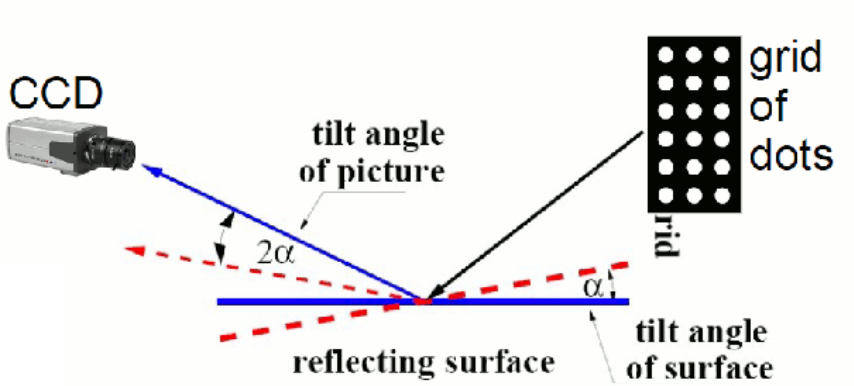
Thermal performance measurements & mechanical characterization

"monitoring minute deformations [...] in an environment that closely mimics that of the experiment.





Allow users to look at their ultra-thin ladders at a different wave-length



Monitor vibrations and deformations using Bragg fibers or

[Participating insitutes] agreed on a list of material required for the optimal design of the system [...] measurements using this infrastructure are planned for 2012" Merge elements from existing "private" infrastructure in Spain and DESY. Similar plans exist elsewhere (at CERN).

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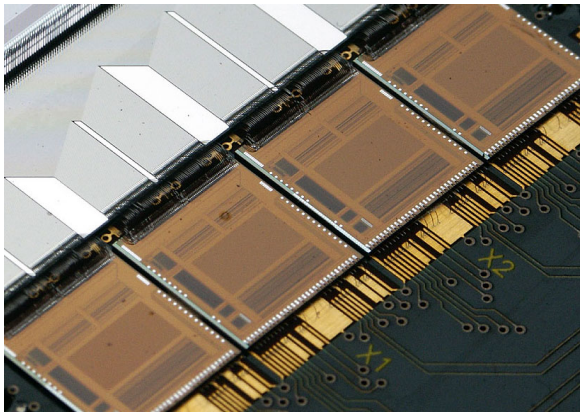
WP9.4 Silicon Tracking

Task leader: Thomas Bergauer (HEPHY Vienna)

Providing multi-layer Si μ-strip coverage for the calorimeter stack of WP9.5



provide a reference for calorimeters of WP9.5

→ use TB data to understand two-particle resolution

re-launching the SiLC collaboration for u-strip R&D

→ to go well beyond for AIDA deliverables

sensors	read-out	support	DAQ integration	offline
	APV	Baseline design	With WP8	

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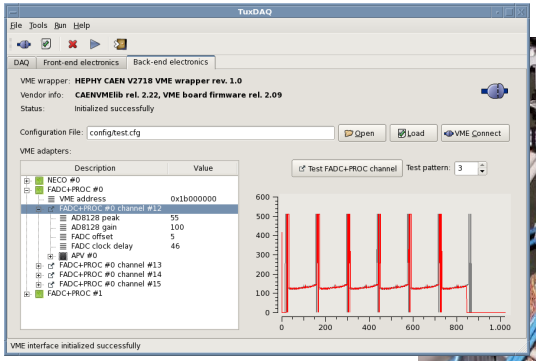

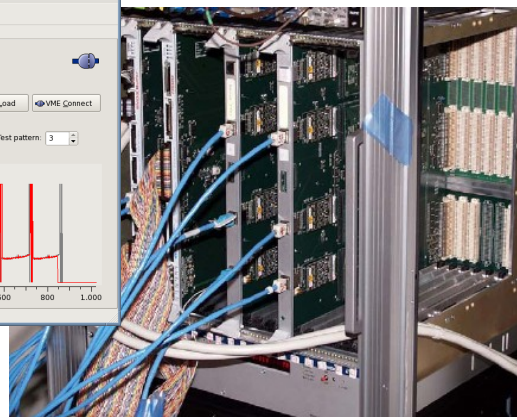

DAQ → APVDAQ (for APV25 chip used in CMS/Belle-II).... Done!!

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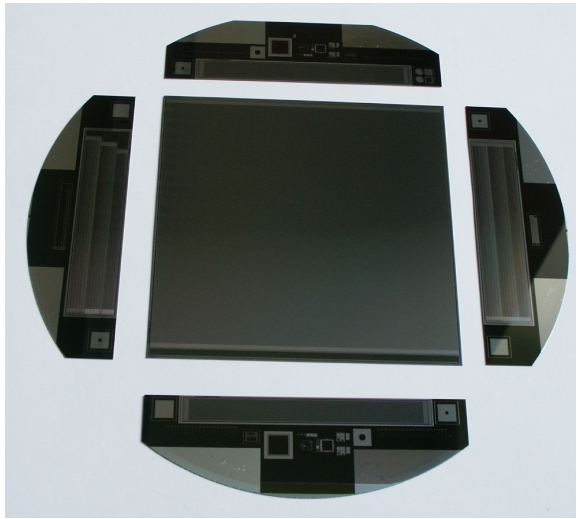
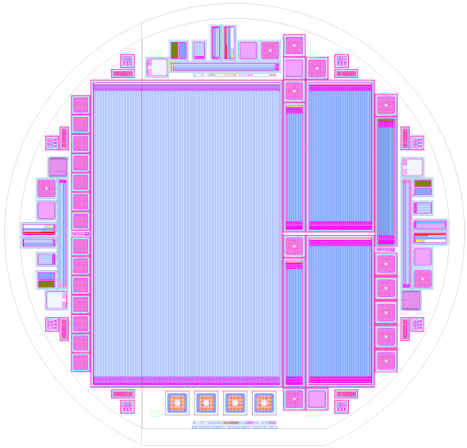
Baseline sensors

- Large area sensor: 95 x 95 mm²
- Very fine pitch: 50 µm

Recovered SILC modules:

careful evaluation of sensor quality needed





Wafer layout made by HEPHY

New sensor design (for submission to ON u-electronics)

Large main sensor 10 x 10 cm²

Small test sensors with design variations

Test structures

Marko Dragicevic (HEPHY Vienna)

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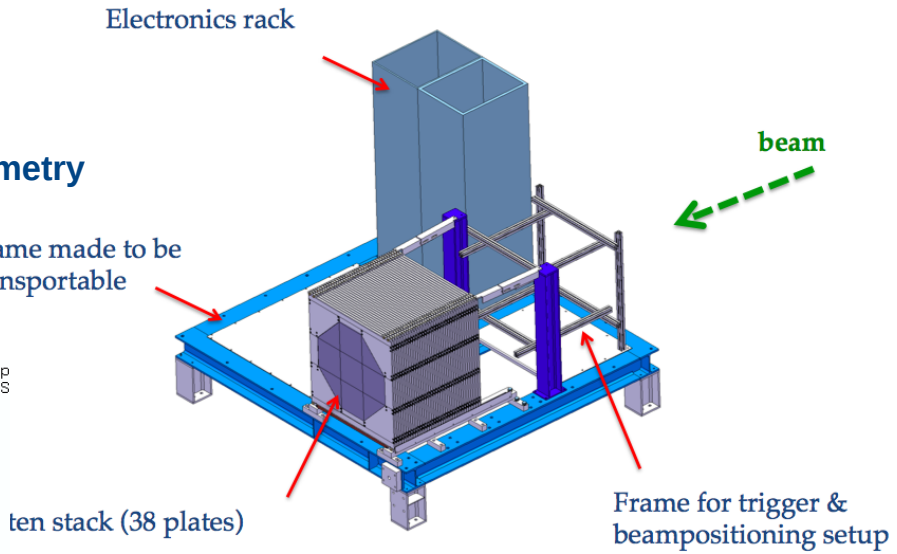
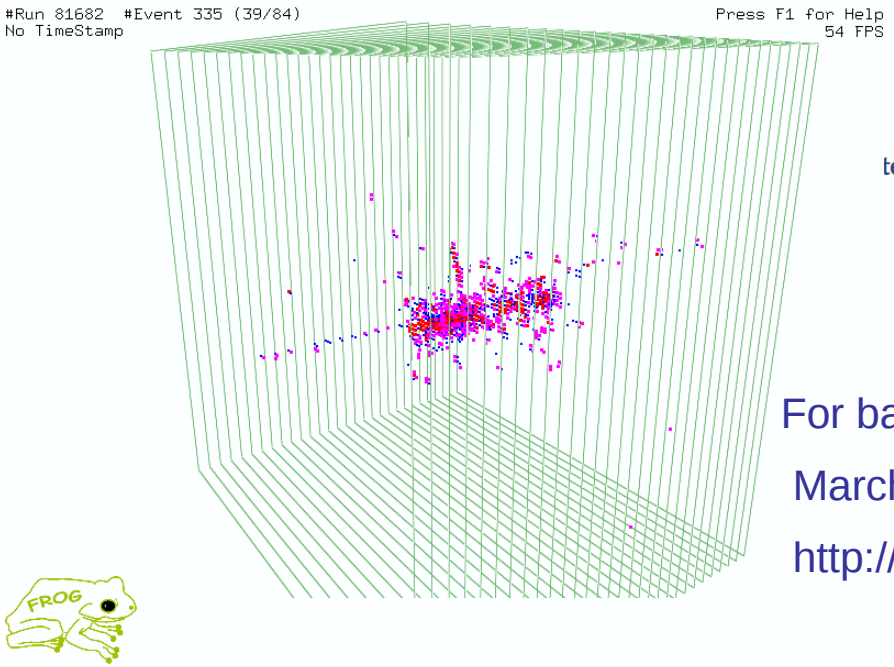
WP9.5 Granular calorimetry

Task leader: Felix Sefkow (DESY)

Infrastructure to develop highly granular "tracking" calorimetry
EM, hadronic, forward





For backgrounds: CALICE reports to the DESY PRC:

March 2010, http://arxiv.org/pdf/1003.1394

http://arxiv.org/pdf/1105.0511

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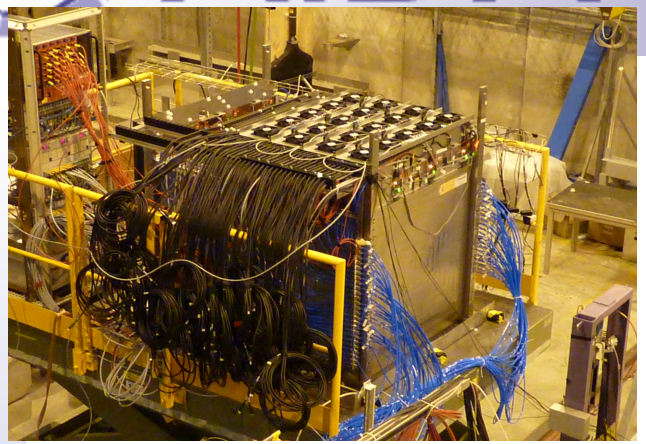
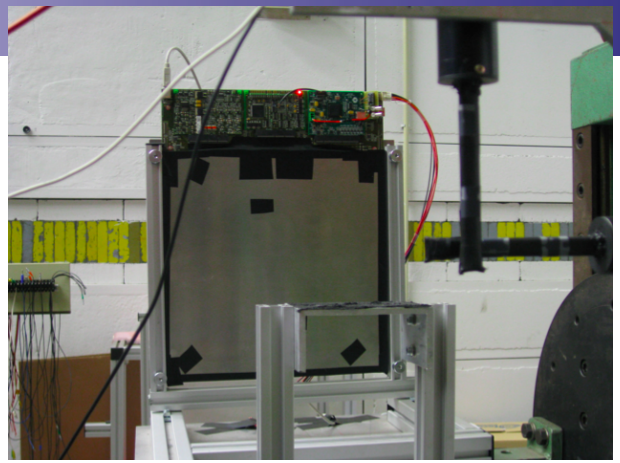
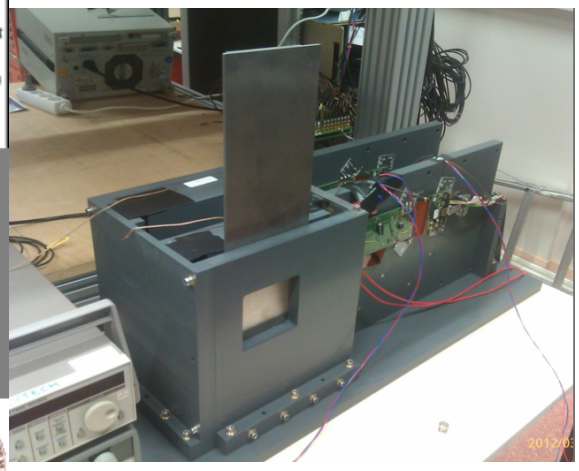


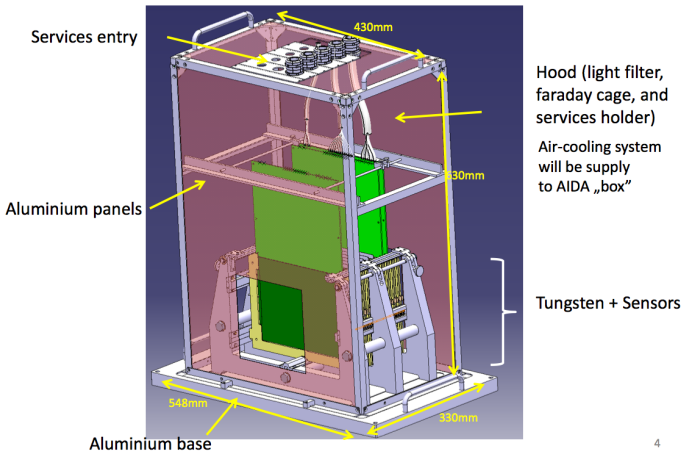
1m3 technological prototype of SDHCAL
(commissioned in 2011, now going for beam)



First layers of technological prototype of analoque Hcal



First layers of technological Prototype of SiW Ecal



Towards AIDA FCAL

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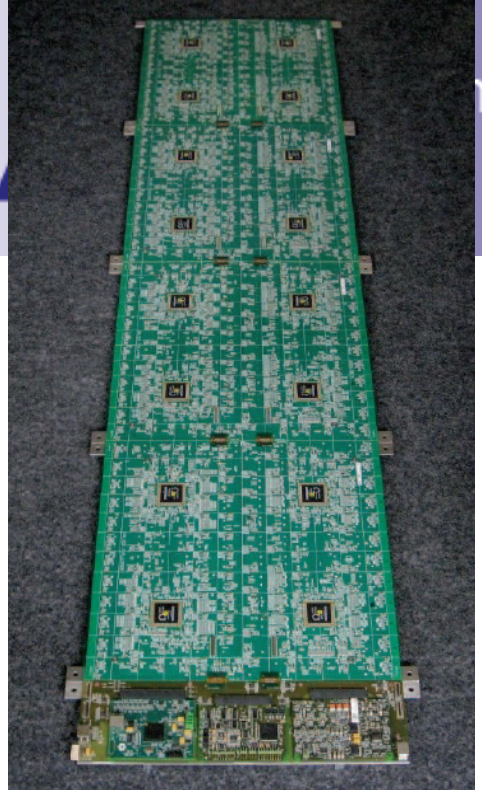
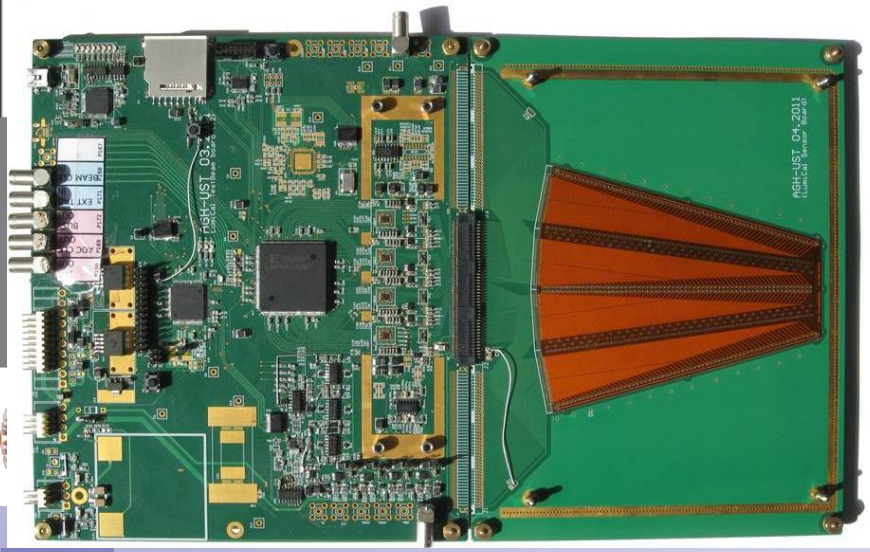
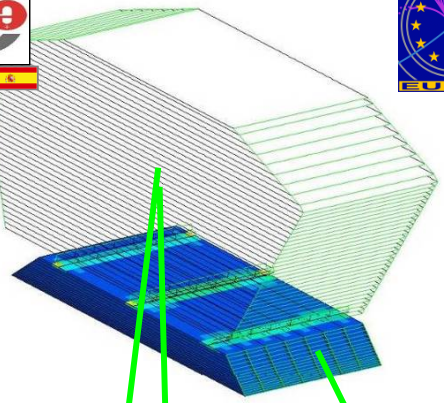
ASIC development & large-scale read-out boards



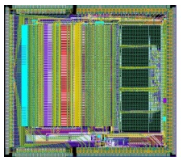
SPIROC

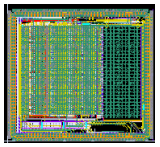
FCAL



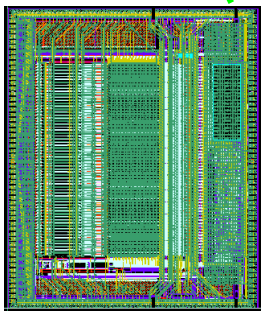


HARDROC2/MICROROC
SDHCAL RPC/µMEGAS
64 ch 20 mm²/

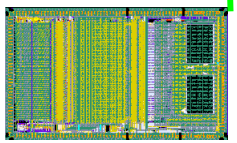




SKIROC2
ECAL Si
64 ch. 65 mm²



SPIROC2
AHCAL SiPM
36 ch 32 mm²



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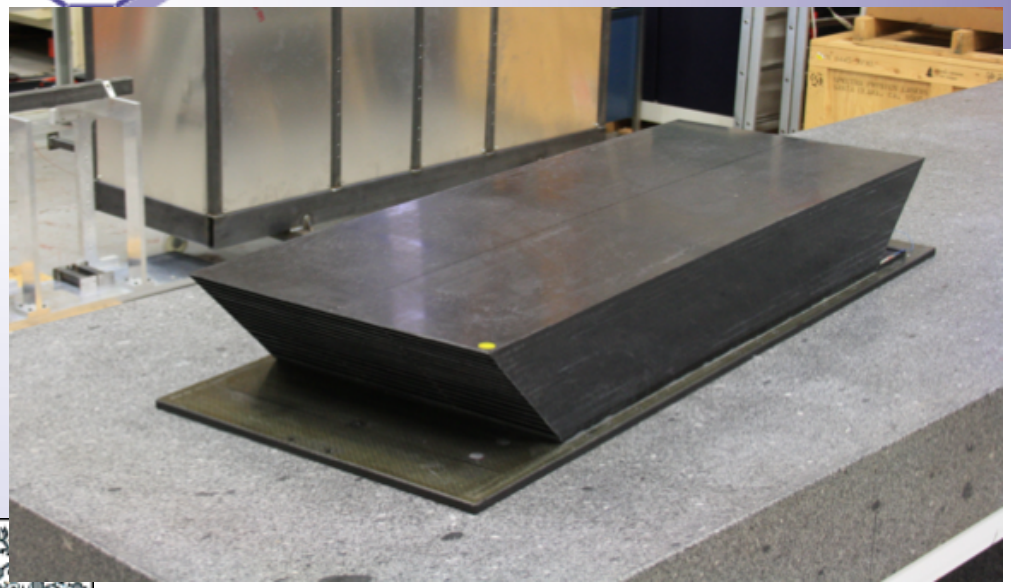
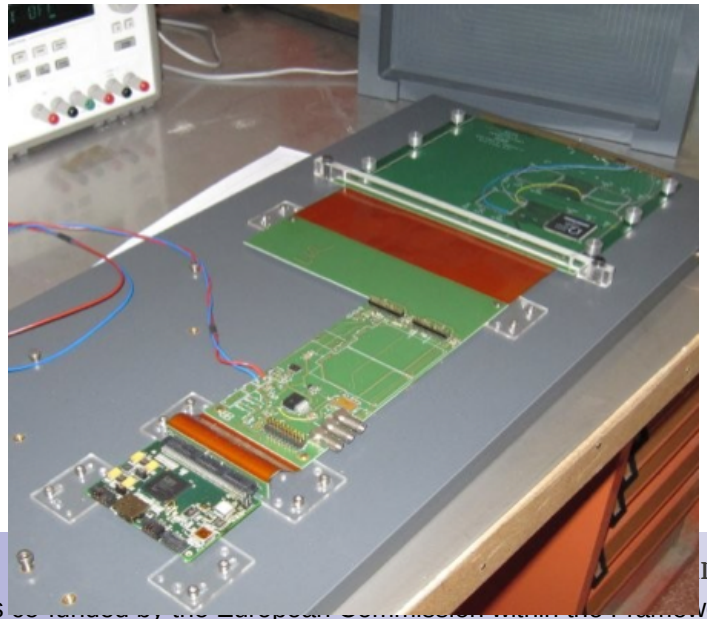


Completed alveolar structure

- Tungsten layers embedded in carbon fibre composite
- Cured in oven to form structure

Similar size as LC detector module

(Infrastructure) which can house other sensitive components (e.g. scintillator layers)



First Ecal slabs in commissioning phase

- Beam test with layer in T24 at DESY ongoing

- Large scale beam test (~ 10 layers) envisaged for July 2012

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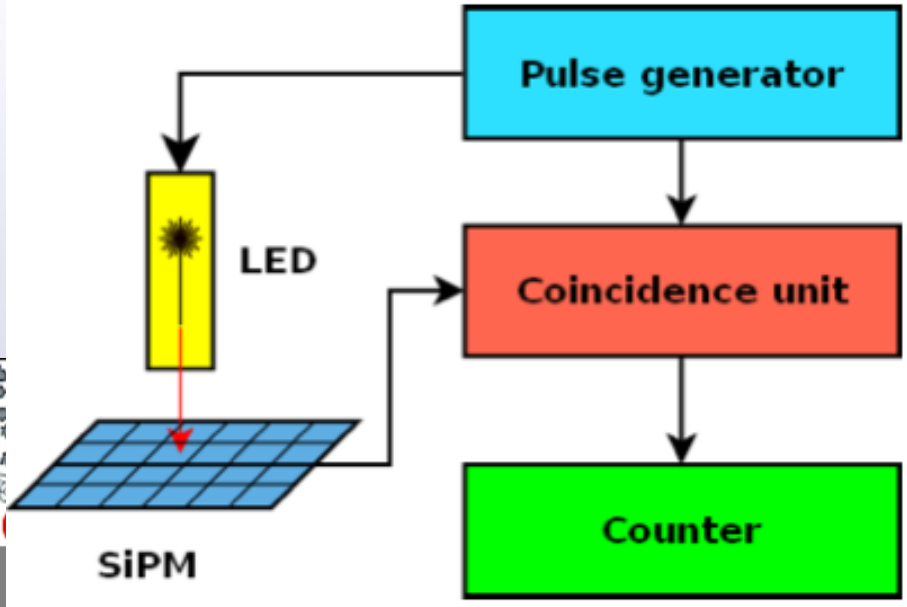
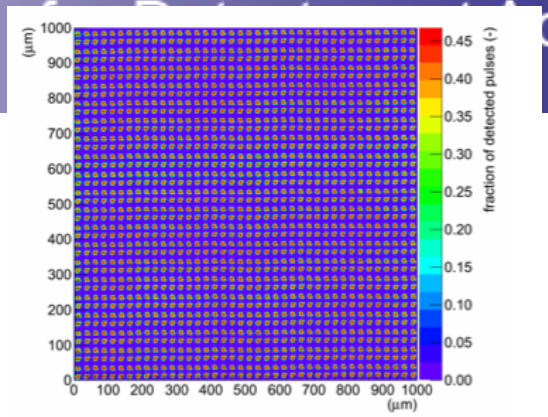
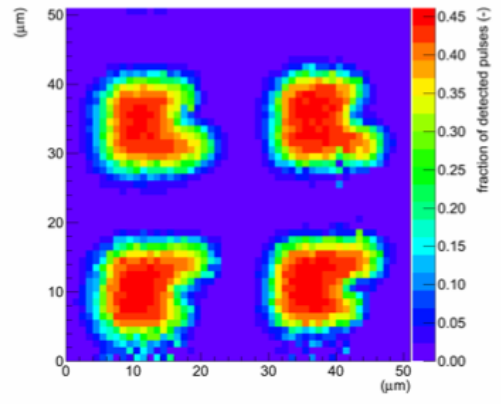


- Focusing LED light to a small point
  Of SiPM (Diameter ~1.5mum)
- Scan with 1mum step size





Getting the details of SiPM response

- Sensitive area reduced By quenching resistor

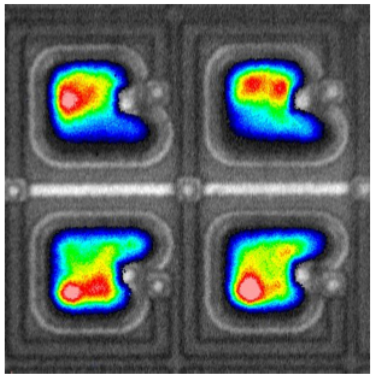


Photo + photoemission image

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Transnational access at DESY and CERN:
See presentations by Ties Behnke and Horst Breuker in WP5,6,7 session on Thursday morning

CERN: 512 person days accepted by selection panel for Testbeams (600 foreseen); 200 in Irradiation facilities. The total budget is 197900 CHF.

Users include the whole spectrum: ATLAS (5x), CALICE (2x), LHC-b, TimePix, CMS, Belle-II, NA63, SPEC, fastRPC

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Special action items for M13 milestones:

Common DAQ & WP9 (organized by David Cussans)

write up a complete “specs” document for the TLU in the next two months, that's agreed upon by TimePix, CALICE, LCTPC, evaluating also a high-rate proposal

µ-strip package assumes minimal DAQ interface is sufficient to run combined tests with CALO-infrastructure

Silicon-CALO interface (organized by WP9.4 and WP9.5)

Specify in detail what is to be measured, how, when and where:

ECAL/HCAL

CERN SPS availability

Overlay/data-only

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Solid activity throughout WP9. Very fruitful task meetings.

Annual report delivered. M13 milestones in preparation.

AIDA continues to provide infrastructure developed under EUDET and is already extending it.

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