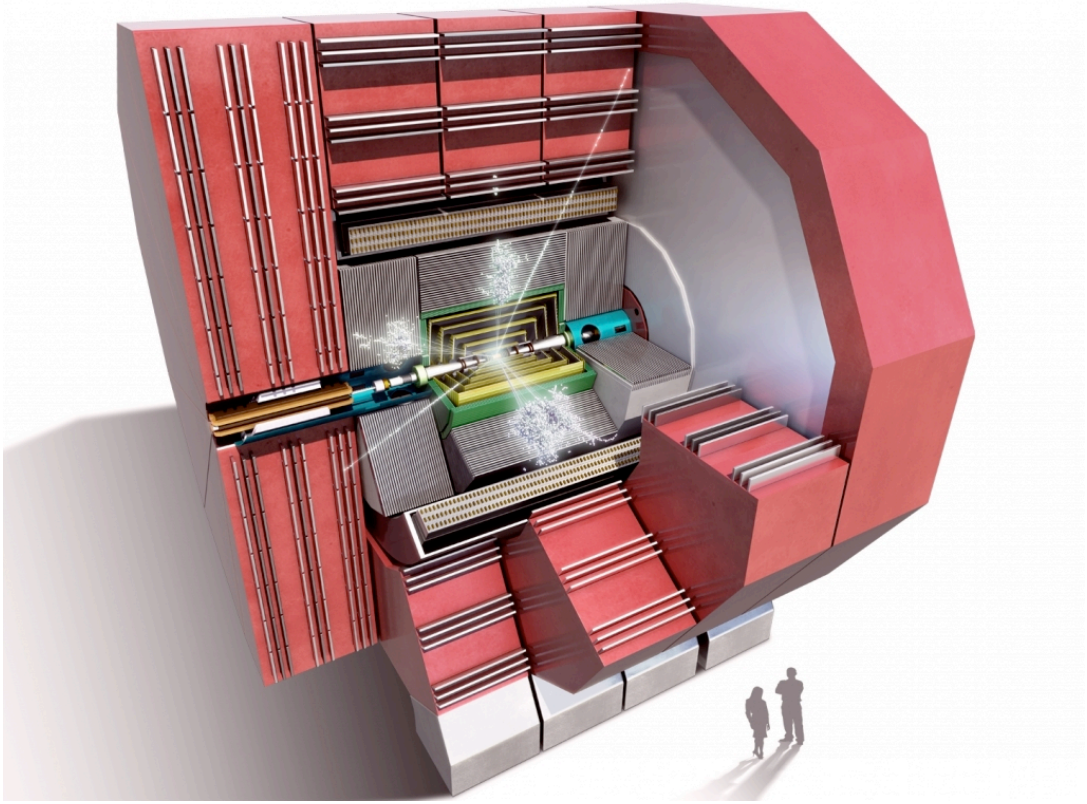
Status of FCAL-related activities at CERN



Lucie Linssen, Szymon Kulis, Francois-Xavier Nuiry, André Sailer
CERN

Outline

- CERN PS test beam schedule
- Software news and status of clustering
- Detector integration and future refinements
- FCAL electronics status: for FCAL and for ECAL with SiPM readout

Test beam schedule, CERN PS

PS: October 2014

schedule issue date: 06-May-2014 Version: 1.0

	Mon 29 Sep	Tue 30 Sep	Wed 1 Oct	Thu 2 Oct	Fri 3 Oct	Sat 4 Oct	Sun 5 Oct	Mon 6 Oct	Tue 7 Oct	Wed 8 Oct	Thu 9 Oct	Fri 10 Oct	Sat 11 Oct	Sun 12 Oct	Mon 13 Oct	Tue 14 Oct	Wed 15 Oct	Thu 16 Oct	Fri 17 Oct	Sat 18 Oct	Sun 19 Oct	Mon 20 Oct	Tue 21 Oct	Wed 22 Oct	Thu 23 Oct	Fri 24 Oct	Sat 25 Oct	Sun 26 Oct	Mon 27 Oct	Tue 28 Oct	Wed 29 Oct	Thu 30 Oct	Fri 31 Oct	Sat 1 Nov	Sun 2 Nov
Week	40							41							42							43							44						
Machine																																		
East Area T8 - Irrad	M. Glaser																																EA-Irrad	
East Area T9	ALICE FOCAL	D. Dannheim	Clic pix					F. Sefkow							Calice (ahcal)							L. Linsen			FCAL								RE29 (DAMPE)	
East Area T10	ALICE PHOS	P. Iengo	ATLAS NSW					W. Trzaska	ALICE FIT						G. Mallot	NA58 (ECAL)						P. Martinengo	ALICE ITS										ALICE TOF-MRPC-HMPID	
East Area T11 Cloud	J. Kirkby cloudy																																CLOUD	
TT2A	E. Chiaveri																																nTOF	

UA9 MD 7h–8h, TS 7h–16h

For further information contact the PS/SPS-Coordinator. Email: Sps.Coordinator@cern.ch, Tel: +41 76 487 3845.

The latest version of the schedule are available here: http://sps-schedule.web.cern.ch/sps-schedule/
The Beam Line for Schools competition (BL4S) exact dates are not yet settled.
Users scheduled in T9 in August-September should expect schedule changes.
No beam during Technical Stops (TS), limited beam availability during Machine Developments (MD)

October 22nd at ~17 hrs to October 28th at ~7 am

Software news and status of clustering

Andre Sailer

Subversion repository

Subversion Repository FCAL at DESY is up and running

- So far used for TB paper and FCal Clustering Processors
- Add other software (BeCaS, LuCaS, TestBeam Simulation or Analyses) and papers or reports to the repository?
- Please note the different URLs for access via web browser and SVN client `https://svnsrv.desy.de/access.html`

Very short how-to for the command line client:

```
svn co --username="user@email.com" https://svnsrv.desy.de/basic/FCAL/Documents/paperTB2011
#Edit the text or code, add files
svn add someFile

#Get update from the server
svn update
#check what was changed
svn status
#see in detail what was changed
svn diff [filename]
svn commit [filename]  -m"I added something great and will be more descriptive than this"
```

"[fileName]" means optional

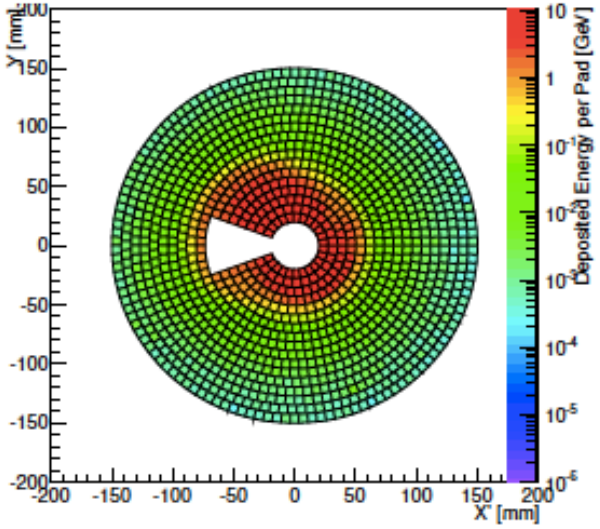
Tape Backup for test beam data

- Andreas Gellrich (DESY-HH IT) provided tape storage for FCal TestBeam Data
- I (AS) strongly encourage putting the TestBeam data there and also replicating it to the CERN storage element as well

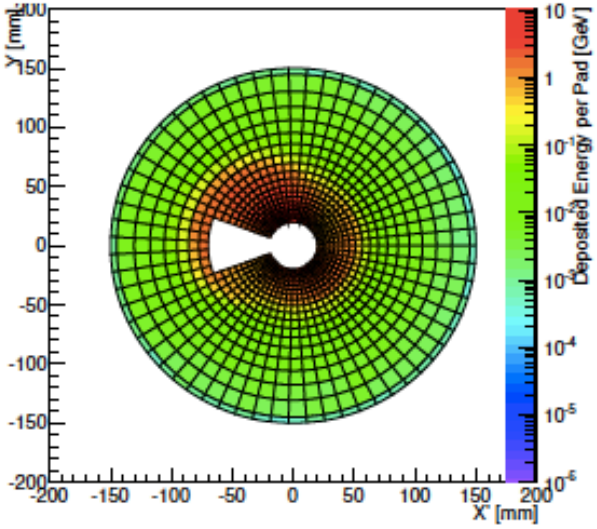
Beamcal clustering

- Wrote a wrapper to cluster the output from BeCaS in a small standalone program
  - Needs a small XML file to describe the geometry
- Single implementation able to reconstruct (almost) any BeamCal simulation
- Please contact me (AS) if you want to try it out or improve it

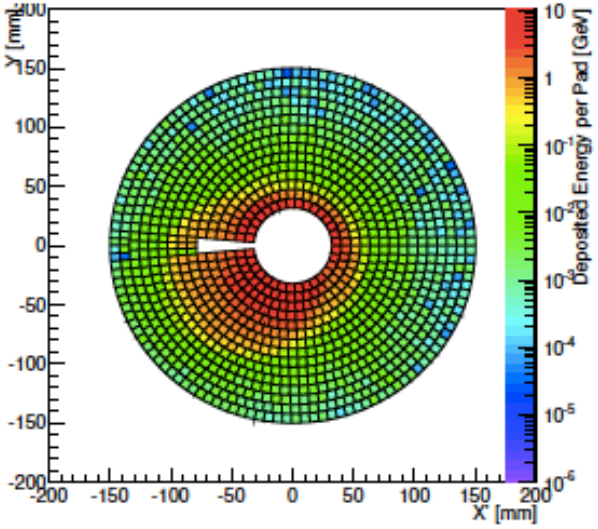
ILC: Uniform segmentation



ILC: Proportional segmentation

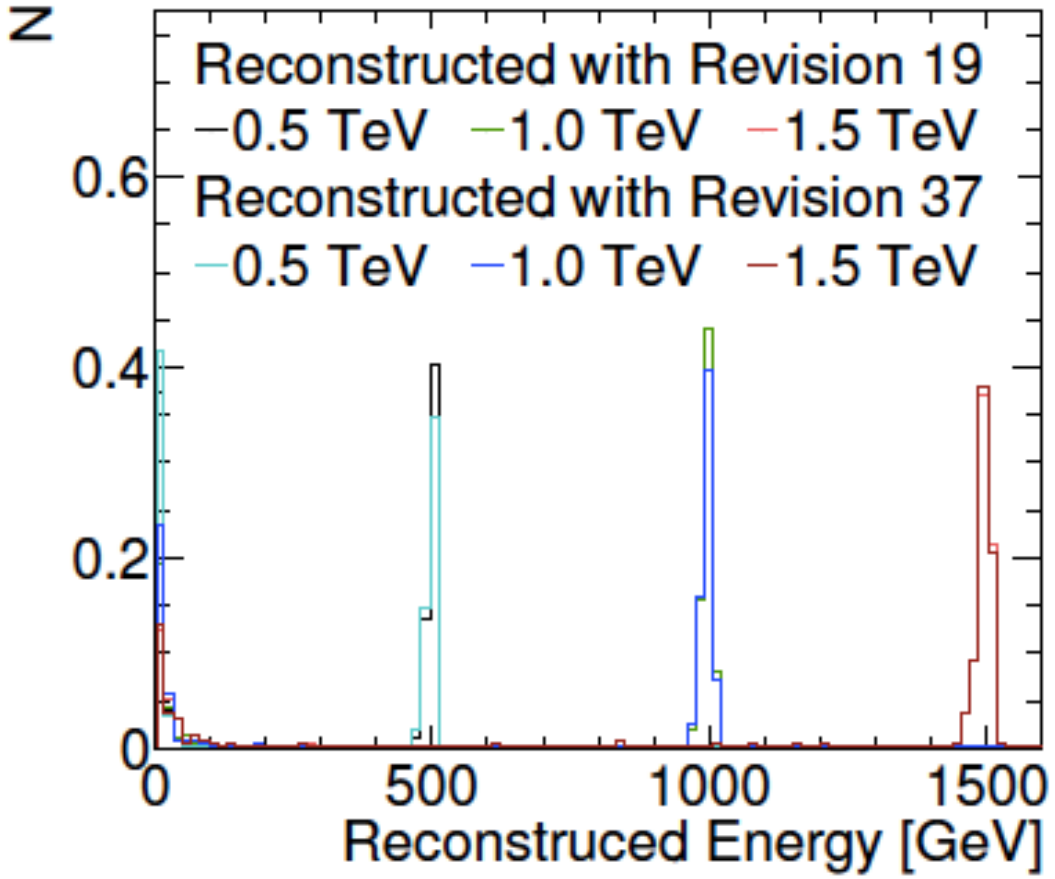


CLIC: Uniform Segmentation



Lumical Clustering

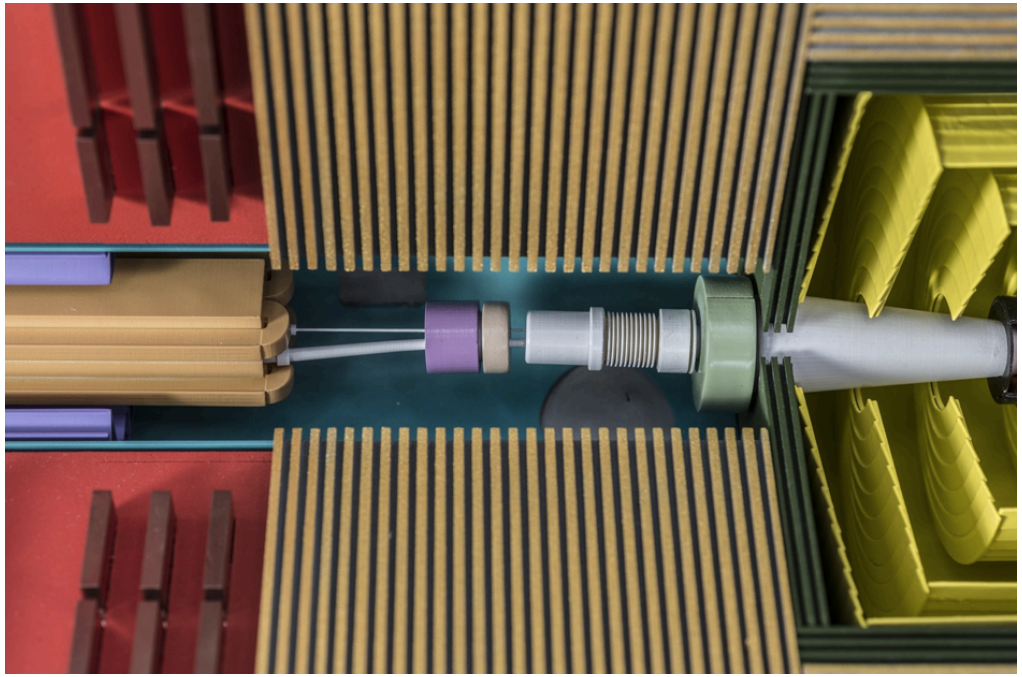
- Clustering is working on the current Lumical in Mokka, though still “work in progress”
- Subtle bugs causing small differences; some clusters merge while others split
- Need better testing environment (event display, control plots)



Single electrons

Detector integration and future refinements

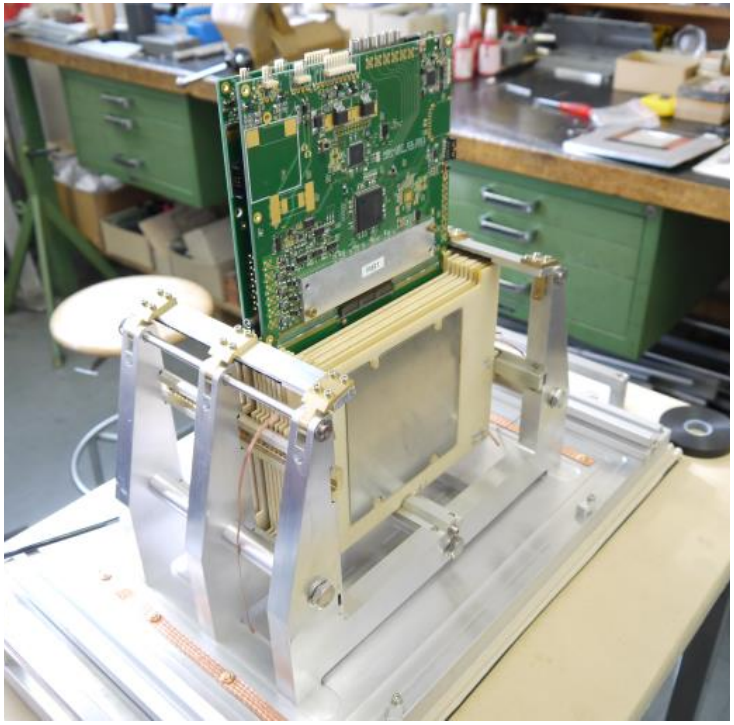
François-Xavier Nuiry



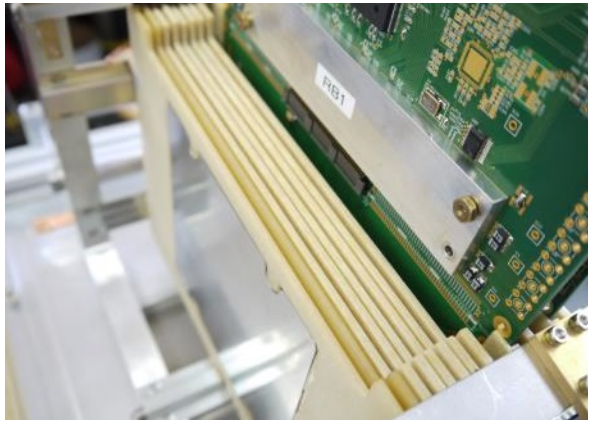
Compactness of test beam set-up

Possible *future* upgrade of the existing mechanical infrastructure

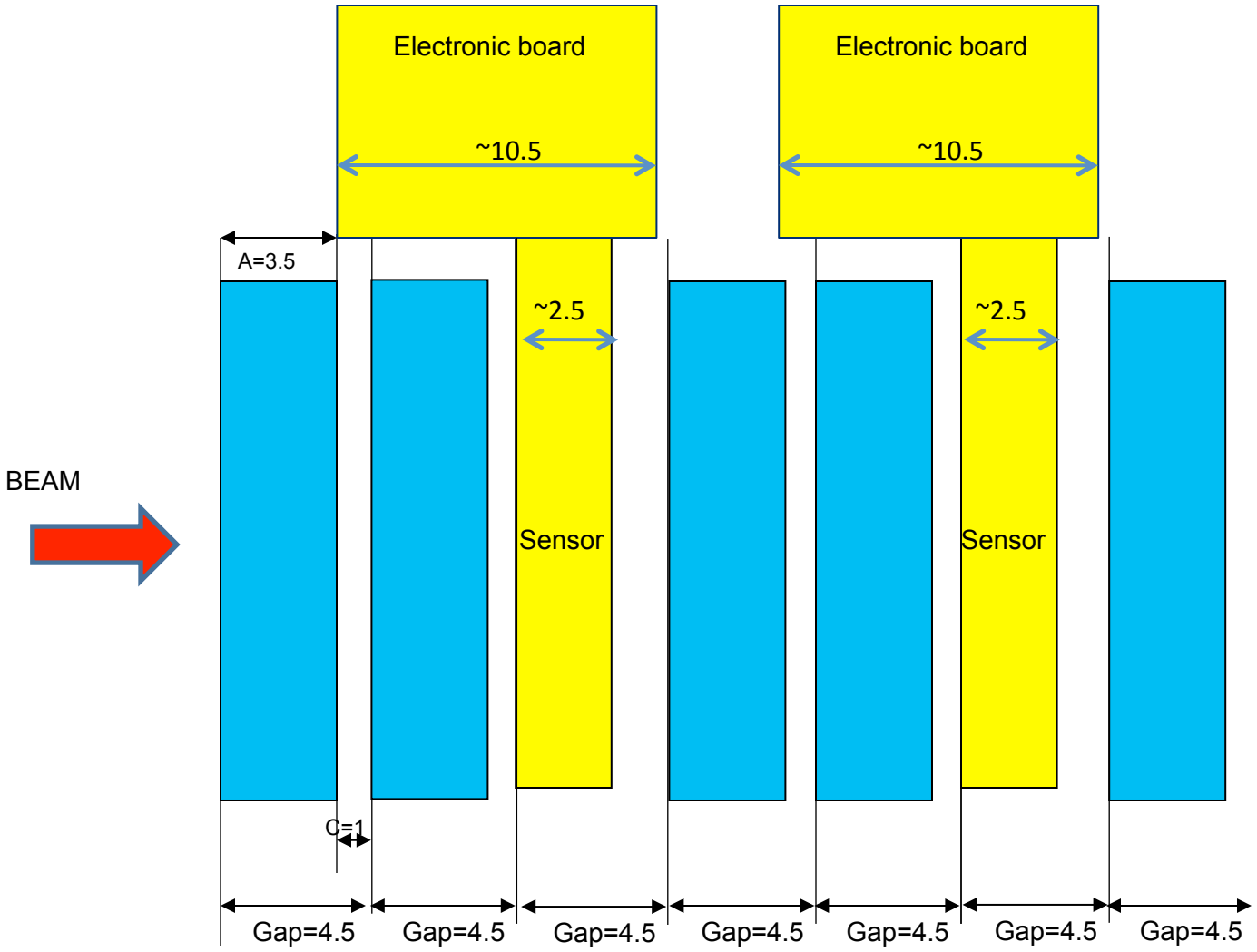
- Allowing to insert a silicon sensor in the 1mm gap.
- For very compact sensor layer: 0.7 mm in active area and <4.5 mm in readout area
- Mechanical integration concept is under study



The existing cradle can support tungsten plates at 1 mm or 2 mm distance to 50 µm accuracy.



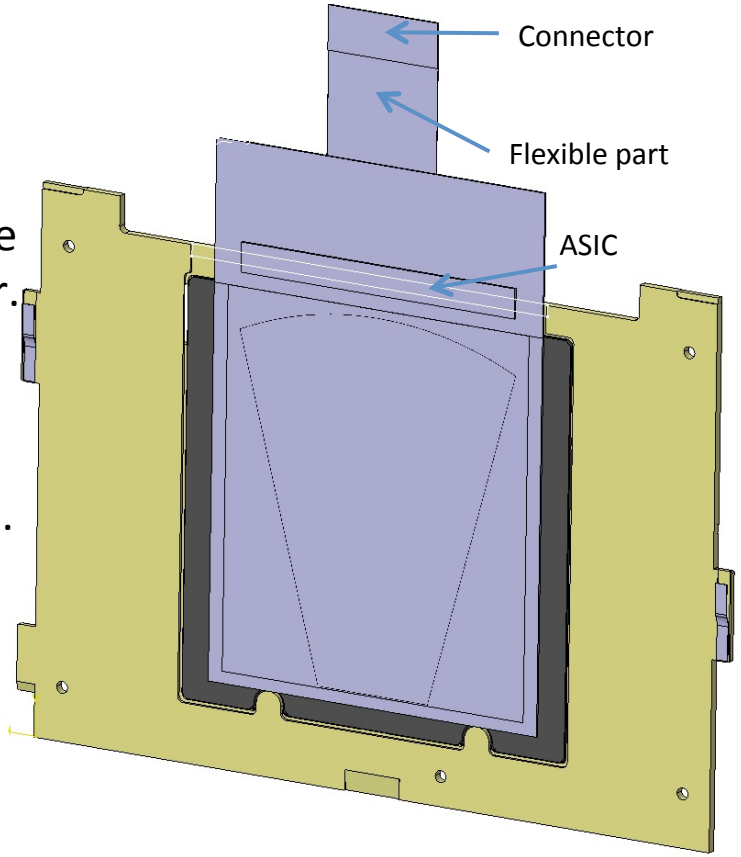
Current test beam configuration

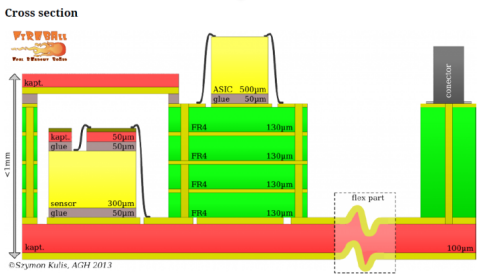


In the current configuration the sensor planes are placed in a 5.5 mm interspace (one tungsten layer removed)

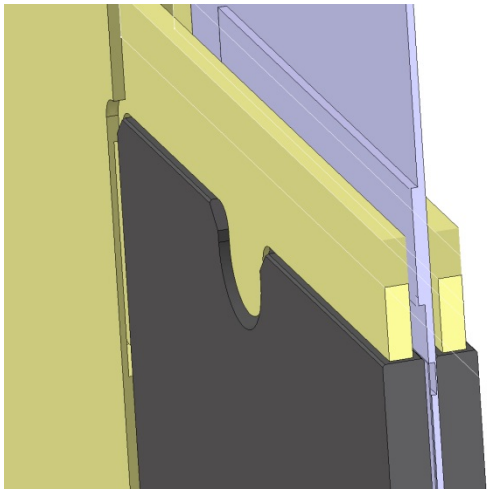
Silicon sensor integration proposal

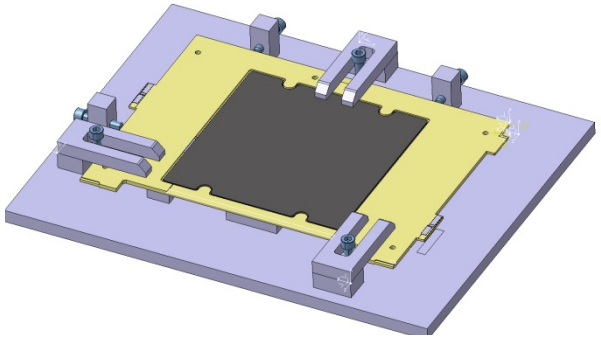
- In the future: mount the sensor on the existing tungsten + permaglass assembly.
- For each layer, the tungsten plate and sensor frame are assembled together using a thin (removable) glue layer.
- A minimal re-machining of the permaglass frame is necessary (can be done without dismounting the tungsten plates). Re-machining tool has been designed.
- Concept based on compact sensor design (S. Kulis).





(see slide 17)



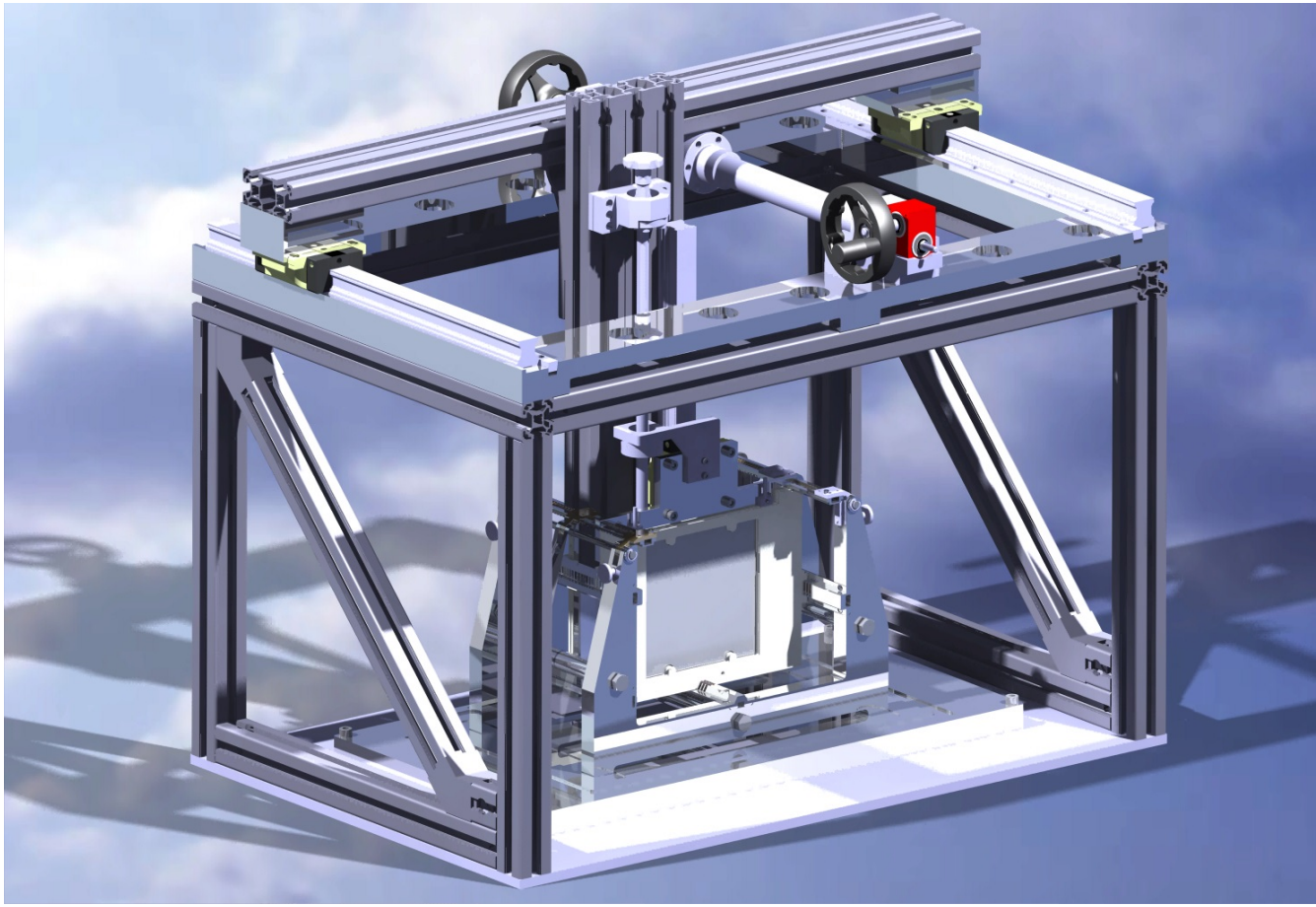


Silicon sensor integration proposal

Only ~300µm clearance to realise the insertion of tungsten + sensor assembly: mounting by hand impossible.

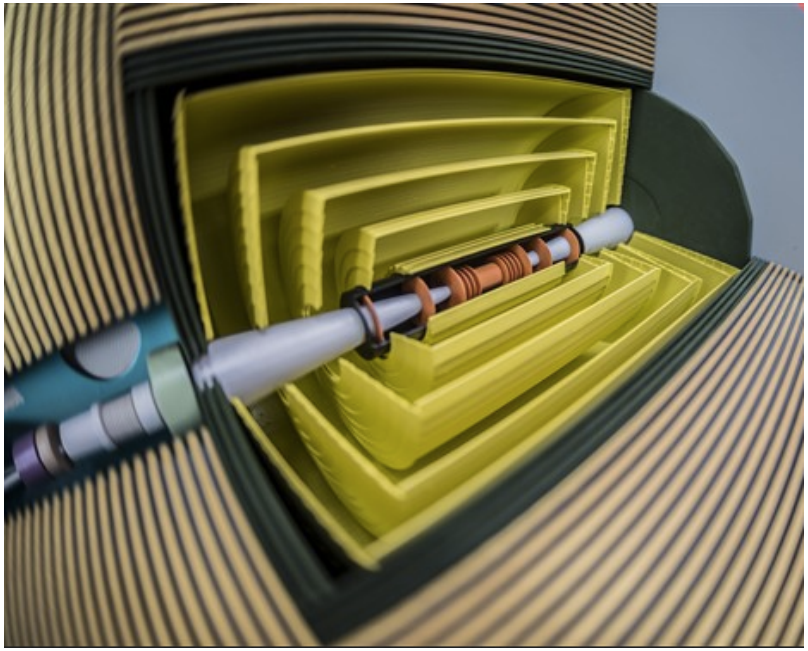
Loading frame, with 2 axes

The system will precisely position tungsten+sensor assemblies during insertion.



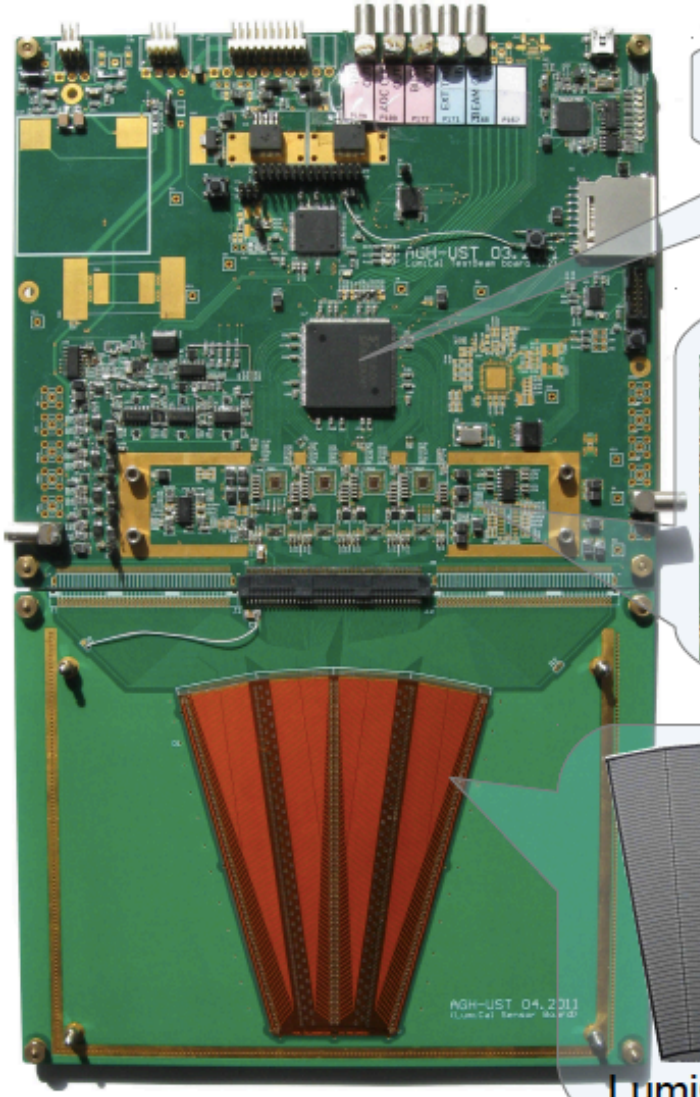
FCAL electronics status:
for FCAL and for ECAL with SiPM readout

Szymon Kulis



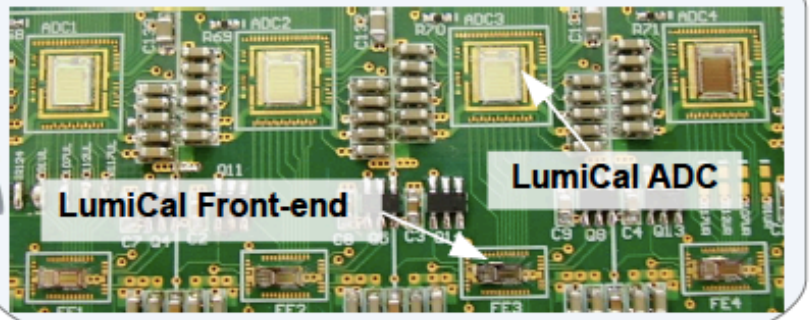
Current FCAL electronics

What has been done so far (AGH)



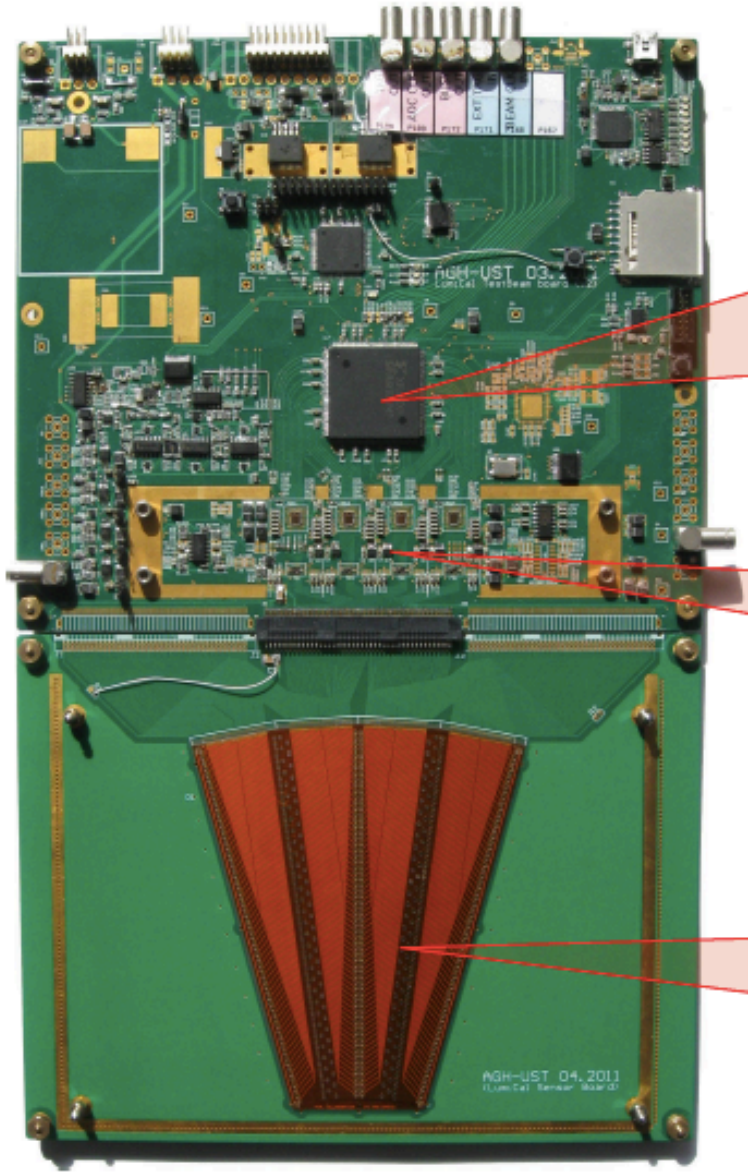
FPGA + microprocessor based **data concentrator**

32 fully equipped readout channels



LumiCal sensor

What are we planning to do?



electronics side (AGH+CERN)

- **Update** FPGA to something modern (Spartan6?)
- **Simplify** DAQ architecture
  (FPGA only, no microprocessor, no "software" the board)
- **Increase** data transition rate
  (Gigabit links or Ethernet instead of USB)
- **Improve** synchronization between multiple boards

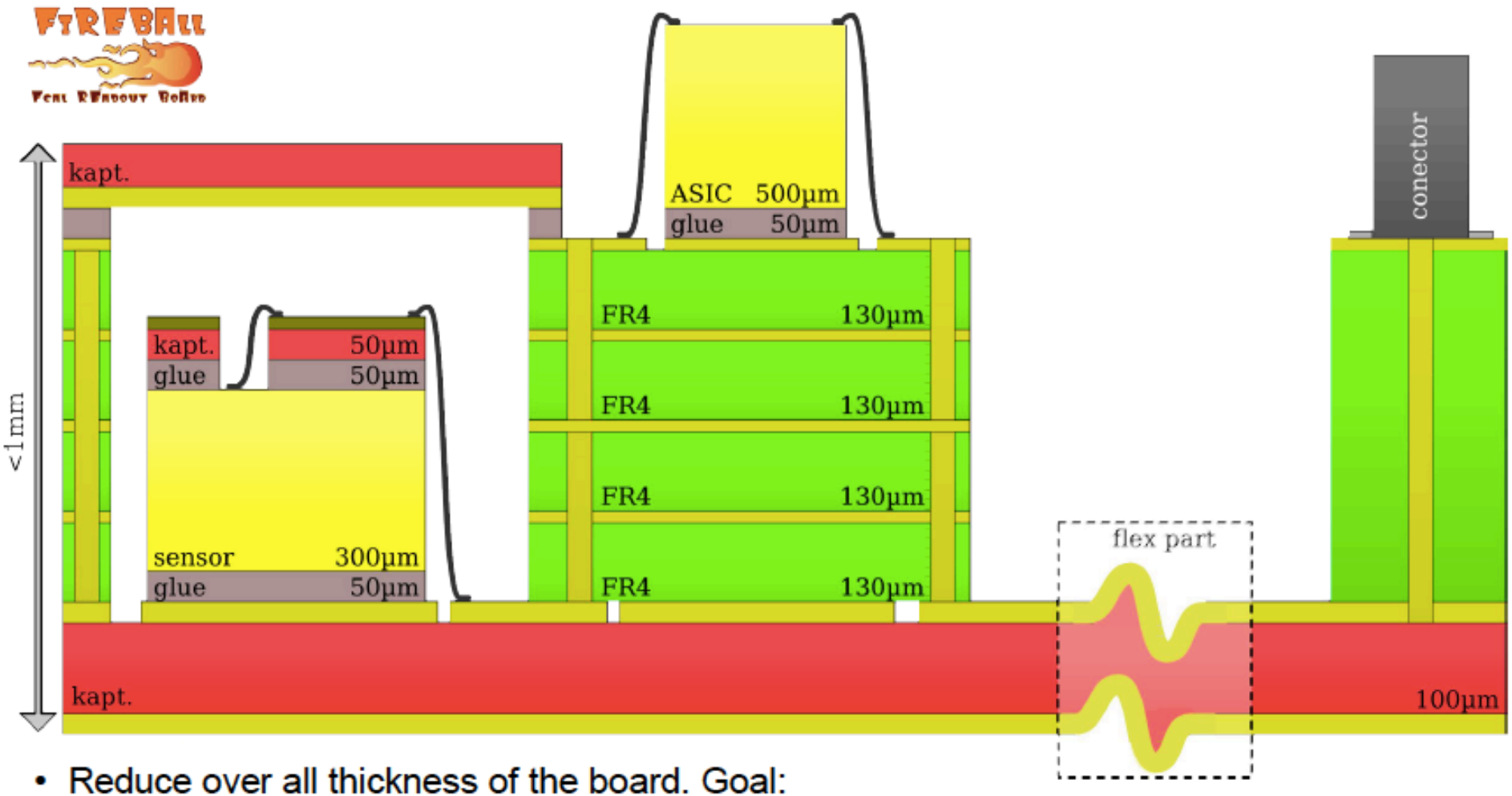
- Change ASICs to "**the newest generation**" (130nm)
- **Increase** number of channels (ASICs)

ECAL specific

- Try to **adapt** this readout architecture for SiPMs
  (Silicon PhotoMultipiers for ECAL prototype)

What are we planning to do?

integration side (AGH+CERN)



- Reduce over all thickness of the board. Goal:
  < 1 mm for sensor part **< 4.5 mm** for read out part
- Address mechanical / integration issues from the very beginning

How are we planning to go?

Phase 1: *Validation of readout architecture for SiPMs*
use a front-end test board (AGH) to read signal from 1 SiPM
(design of coupling network, checking stability,
examination of signal to noise ratio …)

Phase 2: *Firmware development*
Development of firmware using a FPGA evaluation board (ATLYS) together with AGH-UST test boards (FE+ADC)

Phase 3: *PCB Design*
Development of a complete detector module

Phase 2 and phase 3 may overlap.

Thank you !

Visit our new CLCdp web site: http://clicdp.web.cern.ch/

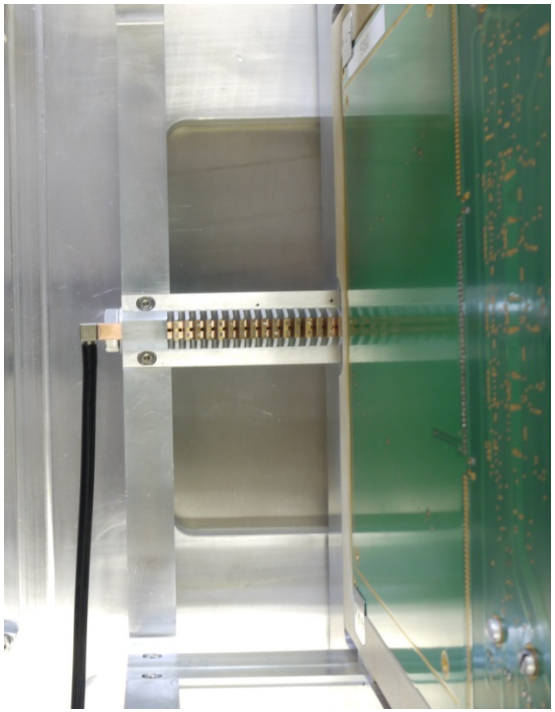
CLICdp 2-day meeting, June 10+11: http://indico.cern.ch/event/314222

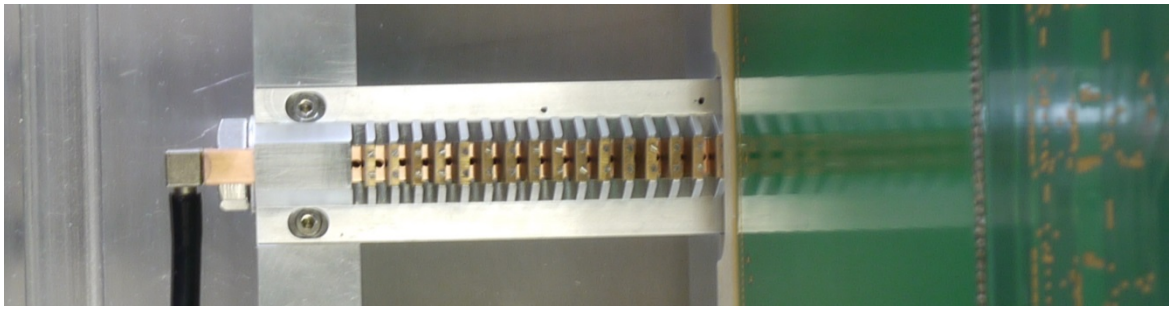
SPARE SLIDES

Integration tests

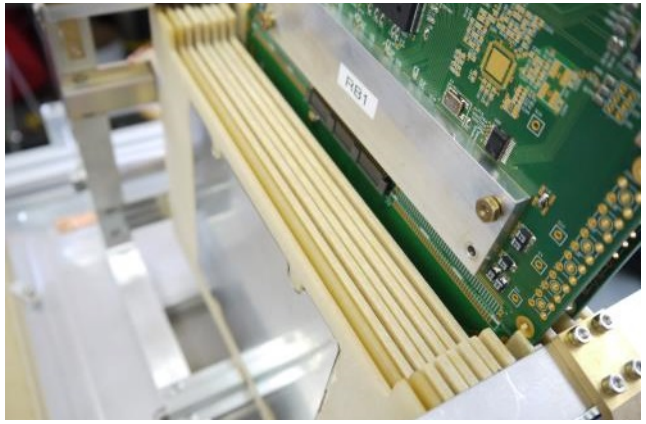
2/10/2013

Implementation of a cooling system





Checking of the tungsten sandwich



CLIC detector and physics (CLICdp)

Australia	Australian Collaboration for Accelerator Science (ACAS), University of Melbourne
Belarus	National Scientific and Educational Centre of Particle and High Energy Physics (NC-PHEP), Belarusian State University, Minsk
Chile	Pontificia Universidad Católica de Chile, Santiago
Czech Republic	Institute of Physics of the Academy of Sciences of the Czech Republic, Prague
Denmark	Department of Physics and Astronomy, Aarhus University
France	Laboratoire d'Annecy-le-Vieux de Physique des Particules (LAPP), Annecy
Germany	Max-Plack-Institut für Physik, Munich
Israel	Department of Physics, Faculty of Exact Sciences, Tel Aviv University
Norway	Department of Physics and Technology, University of Bergen
Poland	The Henryk Niewodniczanski Institute of Nuclear Physics, Polish Academy of Sciences, Cracow
Poland	Faculty of Physics and Applied Computer Science, AGH University of Science and Technology, Cracow
Romania	Institute of Space Science, Bucharest-Magurele
Serbia	Vinca Institute for Nuclear Sciences, Belgrade
Spain	Spanish Network for Future Linear Colliders
Switzerland	CERN
United Kingdom	The School of Physics and Astronomy, University of Birmingham
United Kingdom	University of Bristol
United Kingdom	University of Cambridge
United Kingdom	University of Glasgow
United Kingdom	The Department of Physics of the University of Liverpool
United Kingdom	Oxford University
USA	Argonne National Laboratory, High Energy Physics Division
USA	University of Michigan, Physics Department

Light-weight cooperation structure
No engagements, on best-effort basis
With strong collaborative links to ILC

http://clicdp.web.cern.ch/

CLICdp: 23 institutes

Focus of CLIC-specific studies on:

- Physics prospects and simulation studies
- Detector optimisation + R&D for CLIC

CLIC forward calorimetry

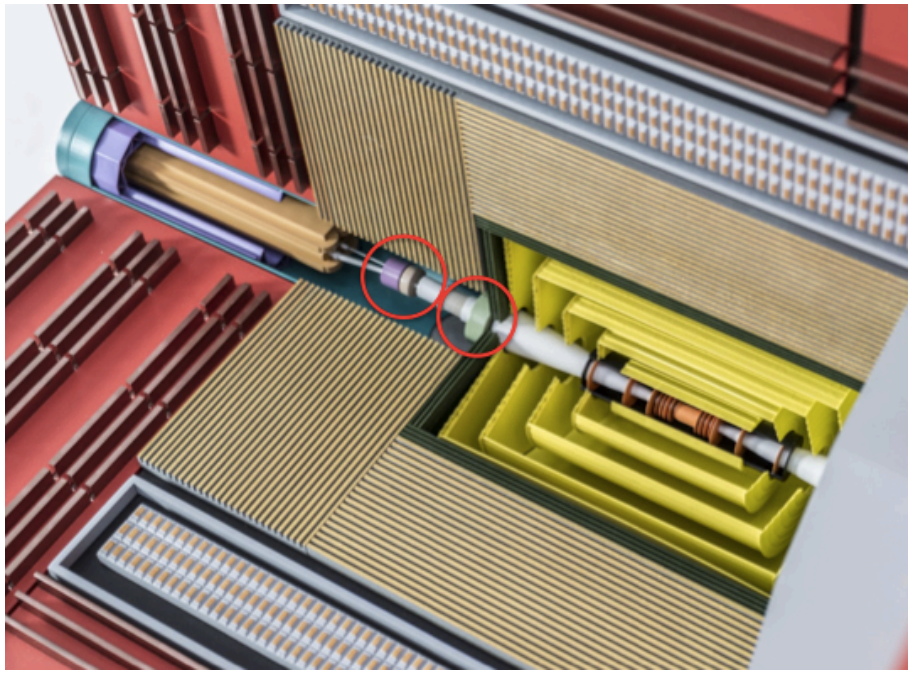
2 forward calorimeters: Lumical + Beamcal

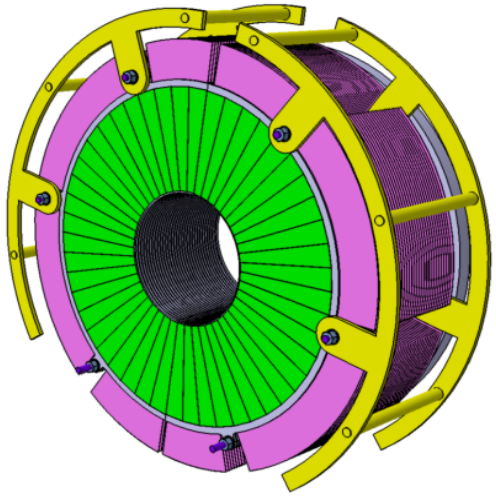
- e/γ acceptance to small angles
- Luminosity measurement
- Beam feedback

Tungsten thickness 1 X_0, 40 layers
BeamCal sensors GaAs
LumiCal sensors silicon

BeamCal angular coverage 10 - 40 mrad
LumiCal coverage 38 – 110 mrad

doses up to 1 Mgy
neutron fluxes of up to 10^{14} per year





Very compact !
Active layer gap is 0.8 mm
Moliere radius 11 mm