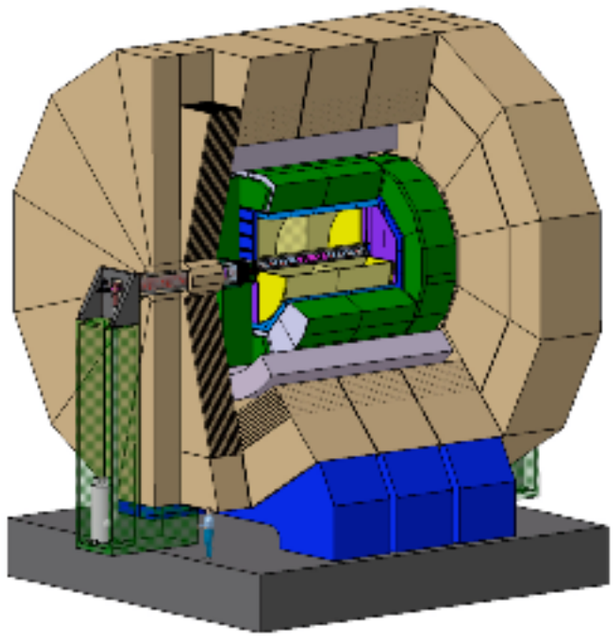
ILD status & plan



LOI Mar.2009

Paris Jan.2010

performance study

evaluate technologies

integration

solid & reliable design

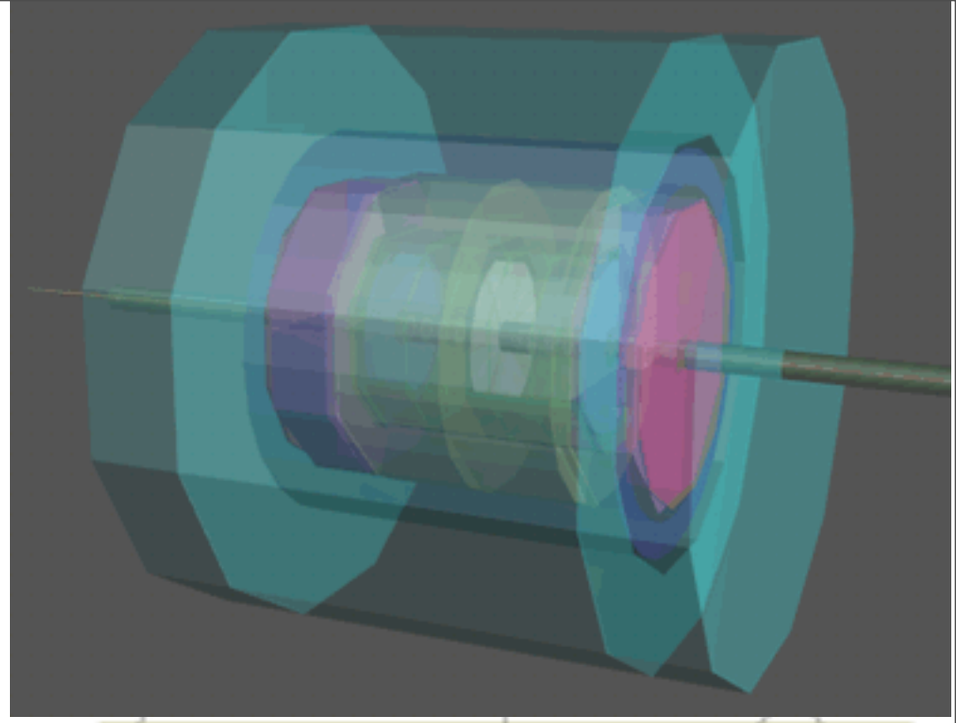
DBD end of 2012

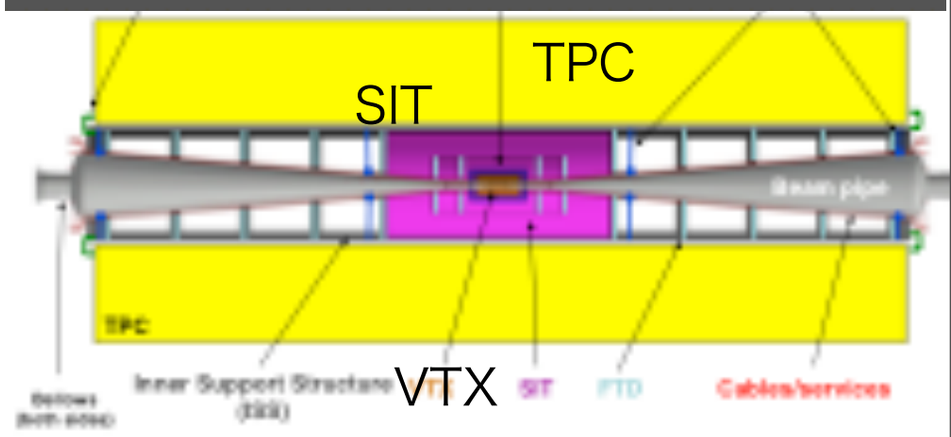
信州大学
SHINSHU UNIVERSITY

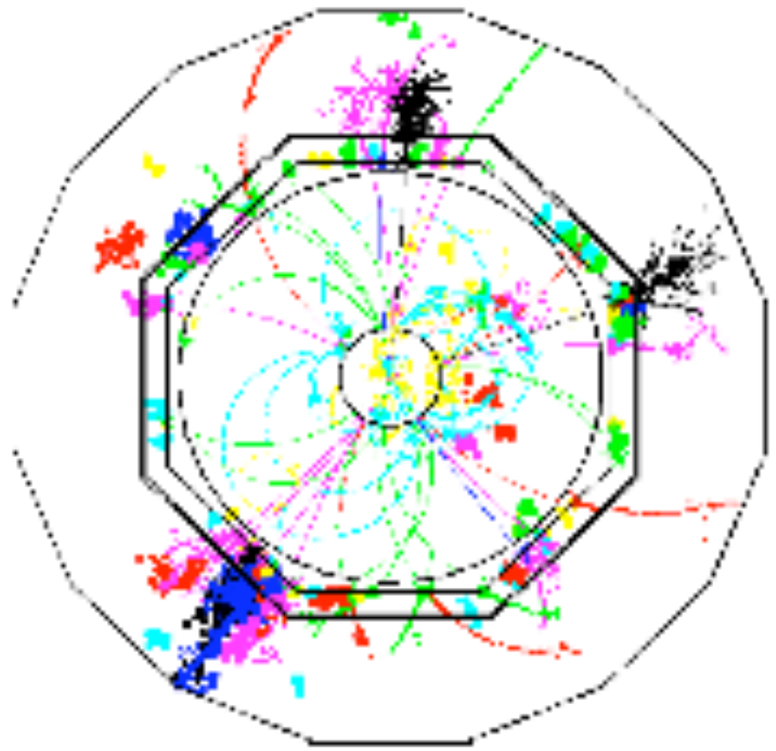
Tohru Takeshita for ILD concept group

ILD concept

- **Large Detector for PFA**
- long tracking distance :
  30-180cm, ~200 points TPC
  & silicon track. comb.
  full angular coverage
- VTX : close to IP ~1.5cm
- fine calorimeter
  segmentation 0.5/R>185cm
- as possible technologies
  pursued for sub-detectors







goal of ILD at 2012

- Define a detector with options, which are considered “ready” by the R&D groups and ILD

- Include list of alternatives which are less advanced, but are promising candidates

- Improve based on real engineering the integration of the detector and its overall realism

Overall funding situation of R&D is critical, and decreasing

ILD base lines

- **simulation base line** SBL performance
  - a unique set of sub-det. with reality
  - includes detailed det. model
  - will be defined in 2010
- **detector base line** DBL technology
  - realistic technical solutions for sub-det.
  - discuss with R&D group
  - will have a review in 2012

ILD simulation BL

- to improve
  - tracking code
  - ghost sim. in tracker
  - background overlay (forward)
  - details in sub-detector cables, services, material, cracks,,,
  - calorimeter difference
- to evaluate **physics performance**

ILD **reconstruction**

- simulation Base Line
- improvements are needed
  - tracking code to handle BG
  - Silicon tracking
  - TPC digitization
  - tuning of PFA for different cal.
  - complete bunch-train

Goal of **Det. BL**

- define a detector with options
- feasibility proven
- with real engineering model
- include alternatives
  - promising candidates
- choose sub detector as late
- integrations & consistency for push-pull / MDI : engineers
  - cooperation with SiD

ILD time line in **SBL**

Main Milestones

Year	2010				2011				2012			
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Hardware reviews
Exact date to be discussed

Detector integration — Continuing integration

2 simulation scenarios

Detector optimization

Simulation Software

Reconstruction Software

Large Scale Production 1

Physics analyses

Reconstruction Software

Large Scale Production 2

Review Options

Review Alternatives

Define Detector

Write DBD

Milestone
Finalise procedure

Milestone
Define Simulation detector

Milestone
Define hardware based detector

ILD Det. BL

- integration of sub-det.
- geometrical boundary
- space between sub-det.
- cooling model
- power distribution

ILD Det. BL

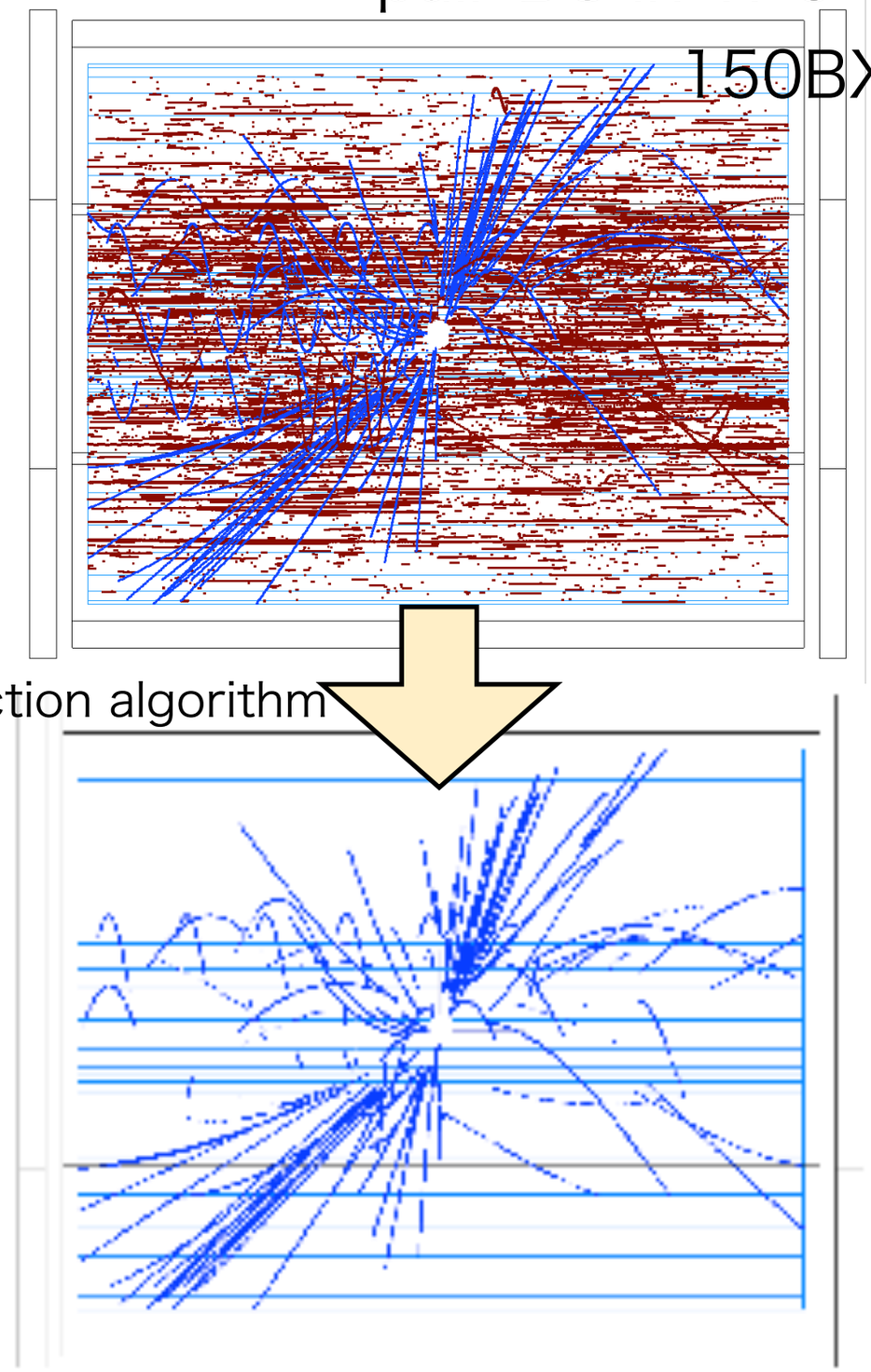
- Sub Detector
- technology
- mature and ready
- integration model with sim.
- dead material (cables, services, cooling and cracks)

BackGround

- improve estimation for SB2009
- two photon BG
- synchrotron radiation
- beam halo muons

pair BG in TPC

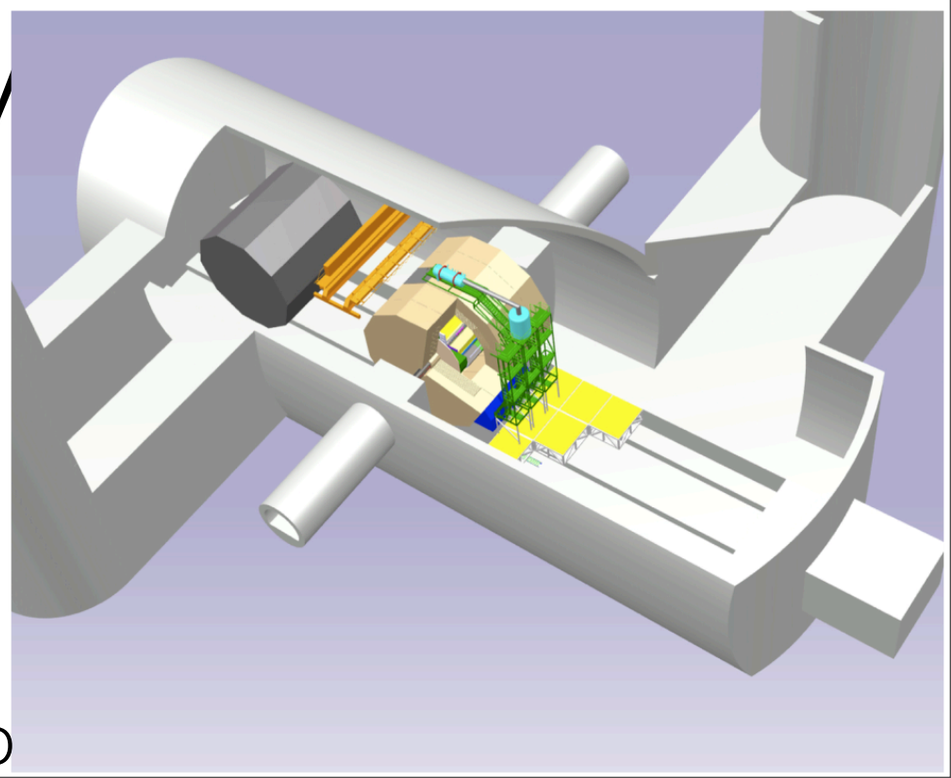
150BXs



rejection algorithm

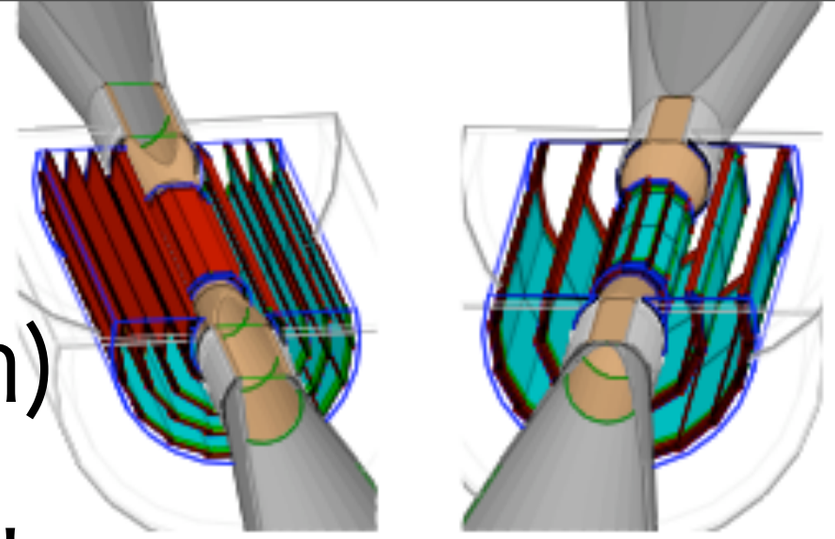
ILD DBD in 2012

- **physics performance** with better simulated detector
- based on the SBL det.
- **realistic det.** technology choice with options



VTX status

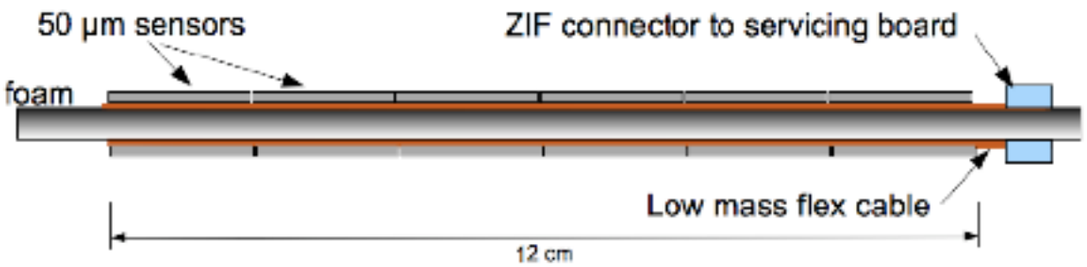
Flavor tagging & vtx. charge

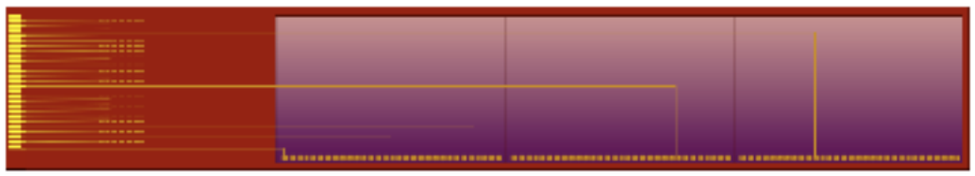


- beam background study (sim)
  - two photons as well
- granularity & material budget
  - 0.16%X0/ layers (double layer)
- occupancy & rad. dose

- two designs: in sensor and ladder comb.
  - MIMOSA/FPCCD/DEPFET/APSEL/3D
  - single/double sided
    - 5 / 6=2*3 layers
  - mech. ladder

  - innermost unsupported



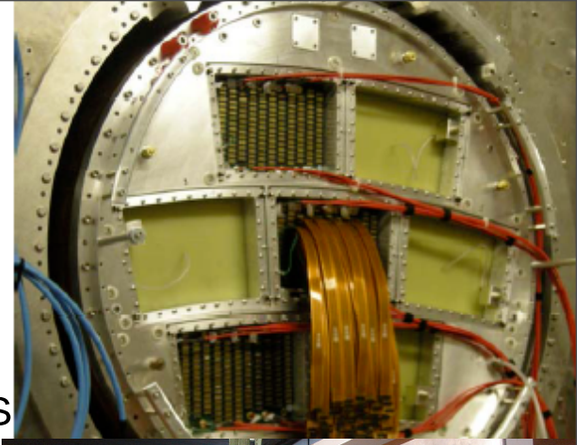


VTX plan

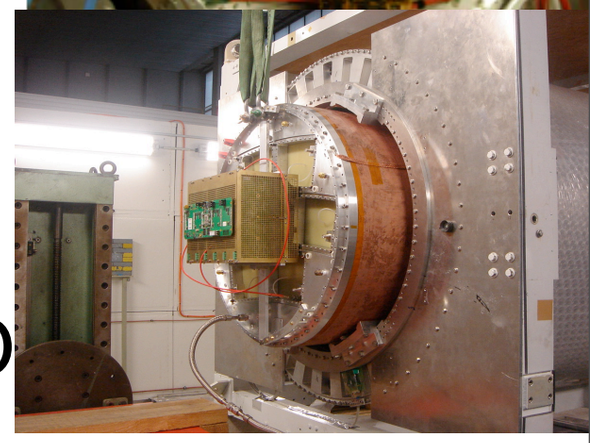
- 2011:parameters frozen
  - sensor parm. for pixel technologies
  - ladder designs
  - Cryostat & service
- 2012: performance
  - sensor performance
  - ladder parameters : material budg.
  - alignment
  - engineering integration

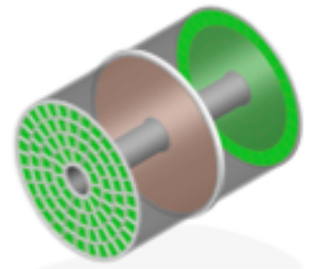
TPC status

- achievements
  - SP & LP1 endplate with GEM & Micromegas
  - gas, position resolution, resist. ano



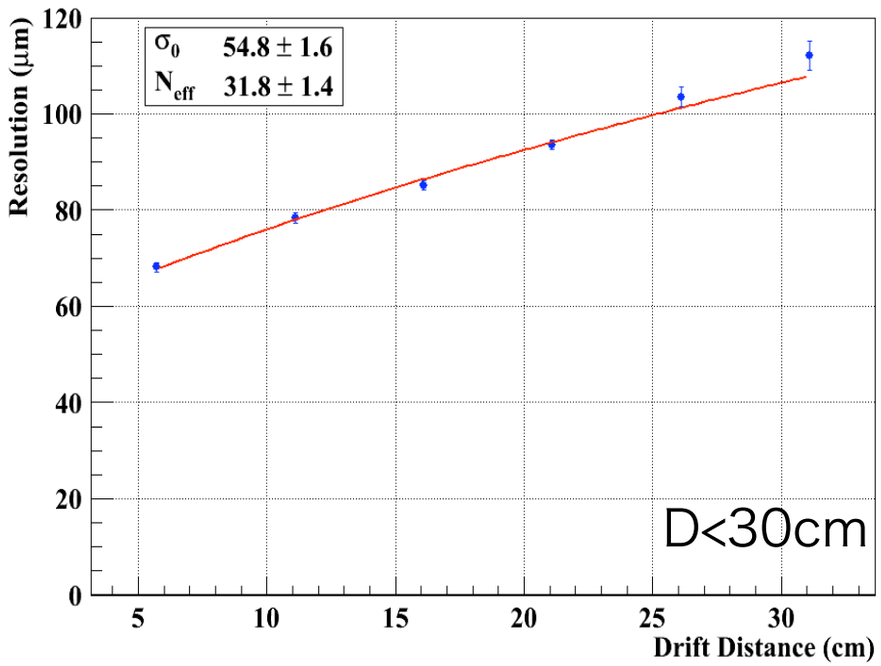
Micro megas GEM



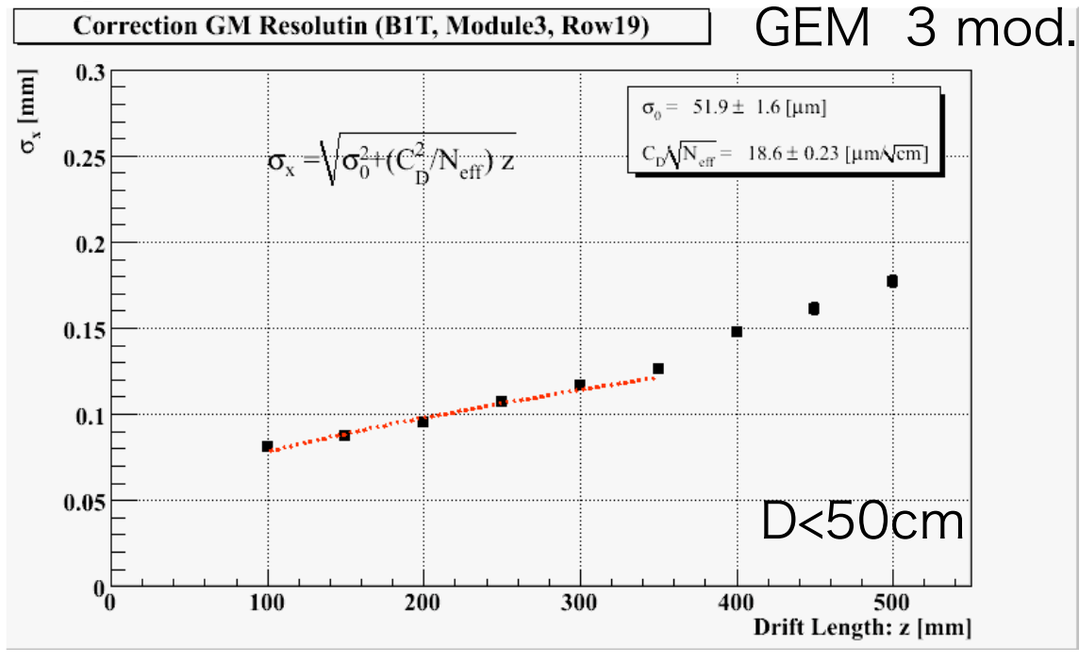


- current activities
  - LP1 (GEM, Micromegas)+pix read out

Micromegas 1 mod.



GEM 3 mod.



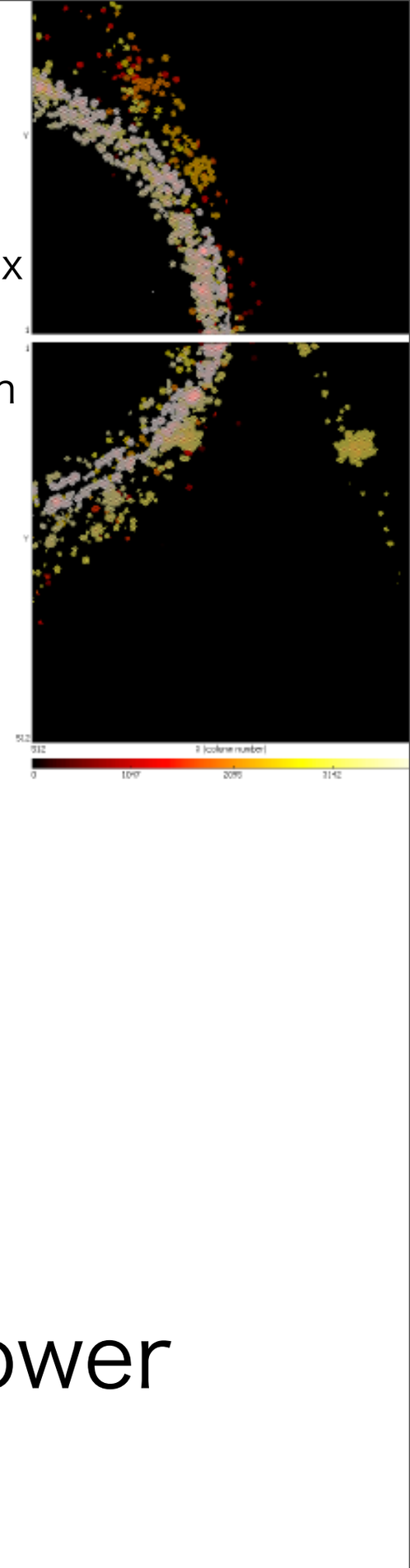
TPC plan

- LP1 : 2007-2012
  - test construction technique
  - demonstrate momen. measure 6GeV/c
- LP1.5:~2012
  - demonstrate measure. momenta
    two track separation
  - ion back flow : gating
- LP2: 2012~
  - prototype include elex. ,cooling, power pulsing, thin end plate 0.15X0 ,,,

time pix

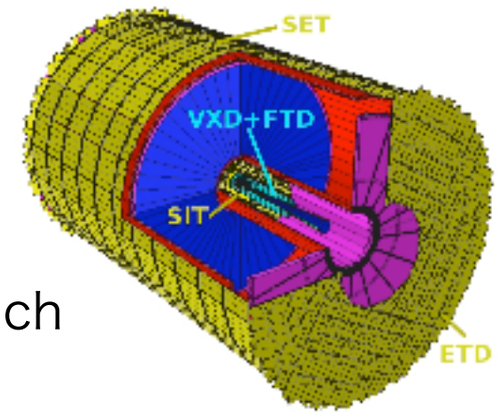
chips

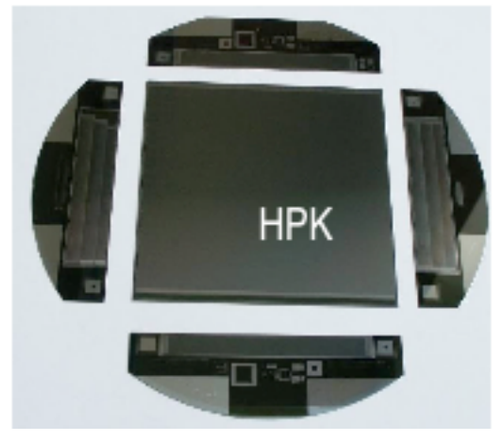
500kch

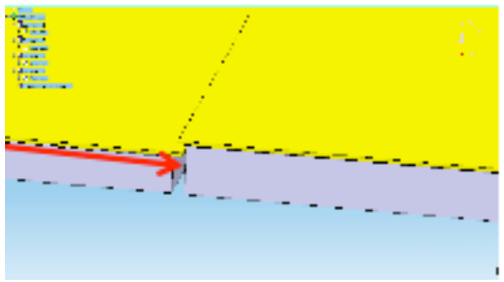


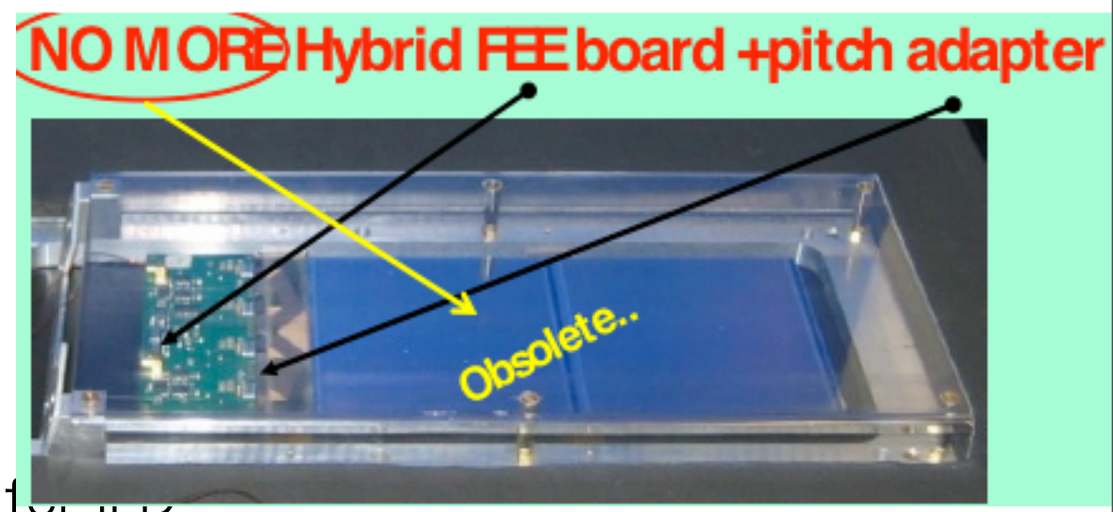
Silicon tracker status

- disk(very forward) & barrel/endcap
  ONE size, 180m^2
- silicon strip sensor : 6' to 8' 200 μm
  10^7 ch
- alignment
  - improve laser trans. 20 to 70%
  - new method ready
- edgeless sensor dev.
- FE and RO electronics
- direct connection
  processing , synchronization,
- DAQ
- Beam Test









Silicon tracker plan

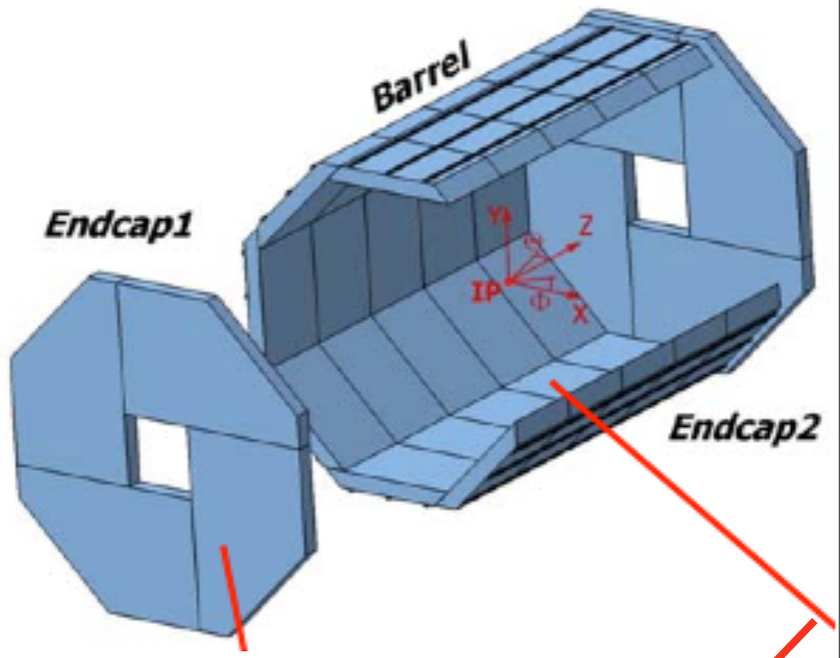
Workpackage	item	2010	2011	2012
1) **sensors**	Strips 200µm/8''	Collab with	Industry Test	1st series
	A.F. strips	R&D →	Full proof Ind	ustry transfer
	Active edge strip	R&D	R&D	Industry transfer
2) Direct	Wire bonding	Prototyping &	R&D with firm	industrialisation
connection	Bump bonding	Prototyping	& R&D with	Industry (HPK)
Chip-strips	3DVert connect	R&D	R&D	R&D
	alternative	R&D	R&D	prototyping
3) FEE chip	130nm-128ch	Foundry/test/	New prod for	Test beam protos
R.O.->DAQ	90nm*, 256ch	design	Layout test	Equip protos F.P.
	New version**			New version
	Connect/Cabling	R&D	R&D & tests	R&D & tests
	Path to DAQ	R&D	R&D & tests	
4)Detector	Elem. Module			
Construction	cooling			
&integration	Alignment syst.			
	Support struct.			
	CAD detector studies			
	Integration study			
5) Test beams	Will accompany	& complete the	R&D studies &	developments
& simulation	Will accompany	& complete the	R&D studies &	developments
studies				

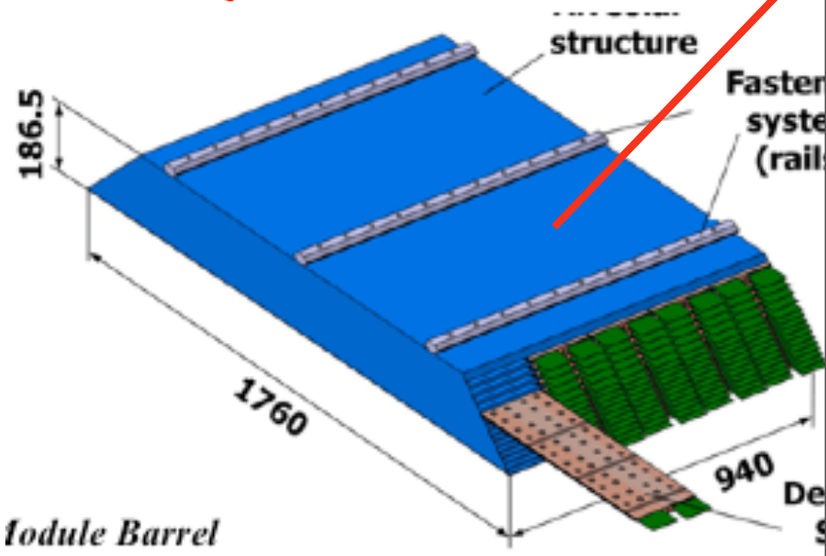
ECAL overview

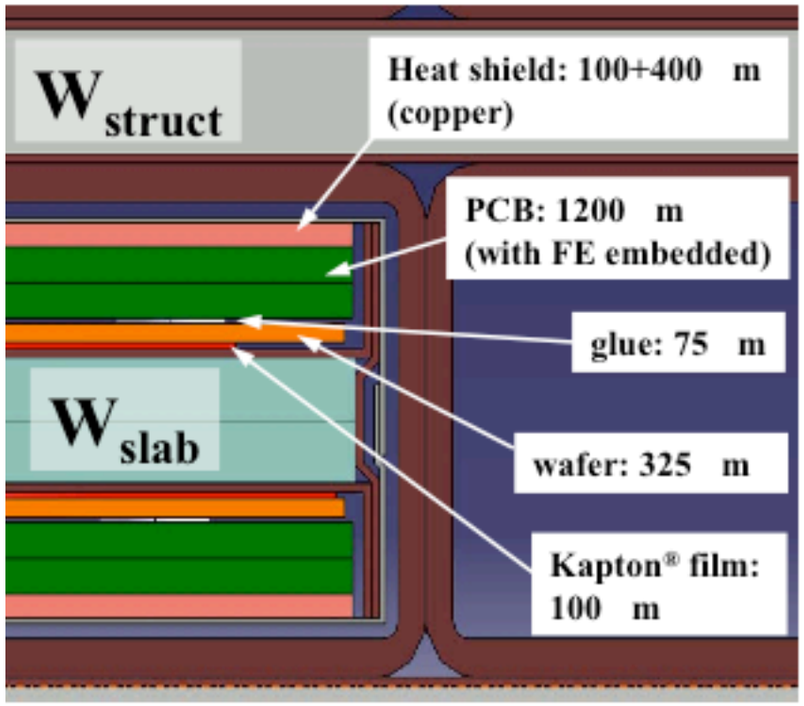
PFA

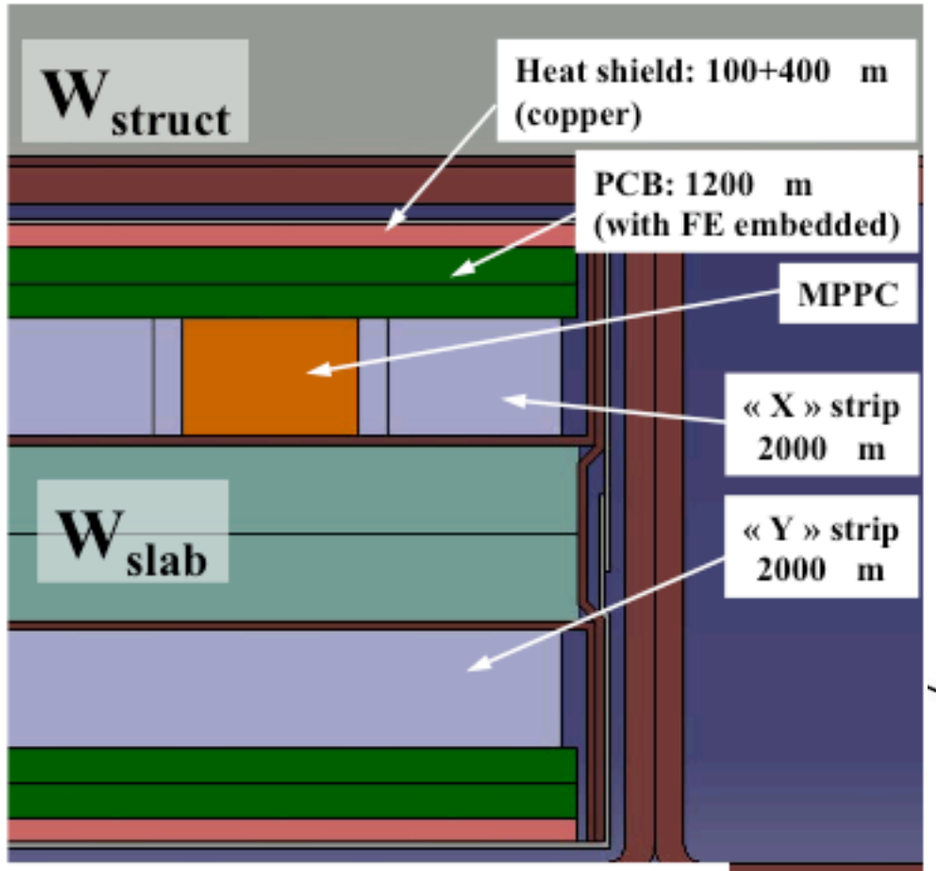
- fine segmentation ~ 5x5mm^2
- large R : 2400m^2 ~ 100Mch
- 30 layers
- two options for sensor

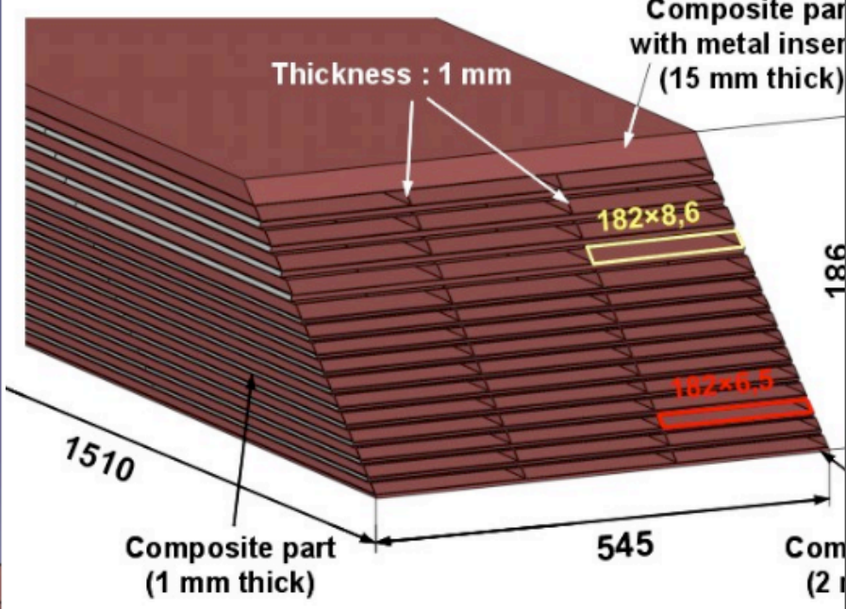
silicon / scintillator







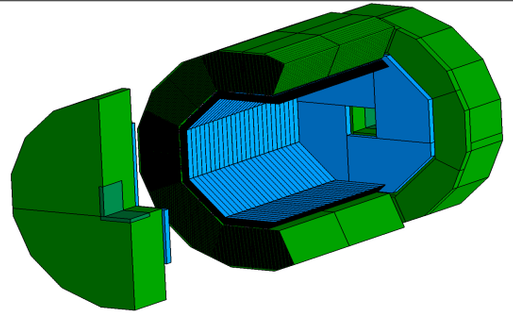




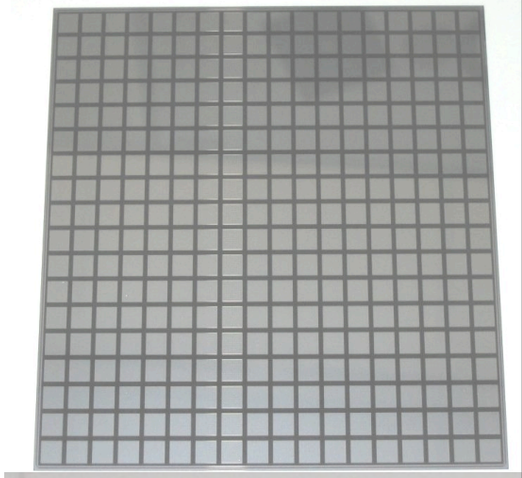
Thickness of slabs :

6,8 mm (W=2,1 mm)

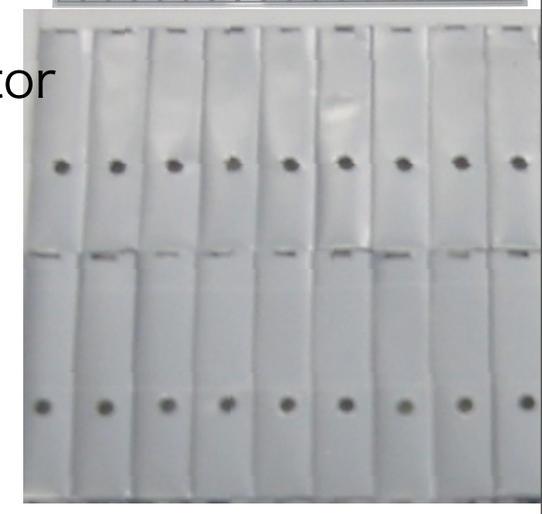
8,9 mm (W=4,2 mm)



ECAL status



silicon pad



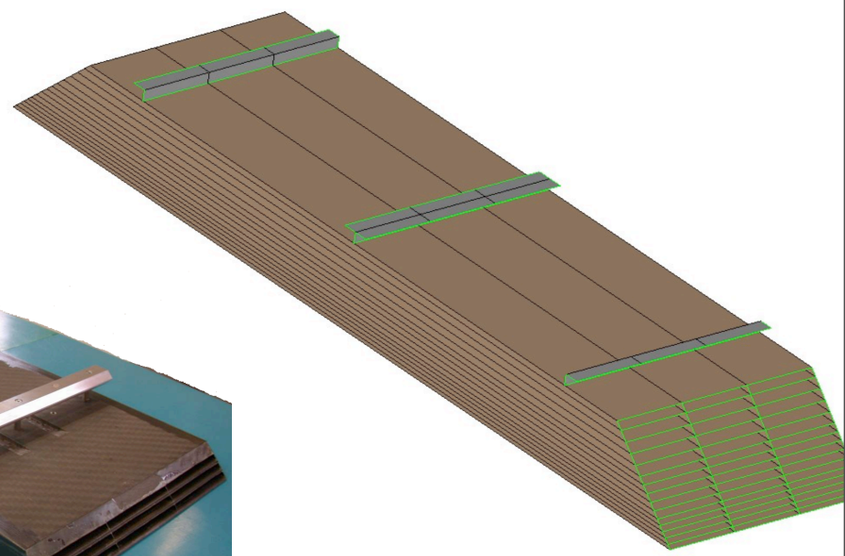
scintillator strip

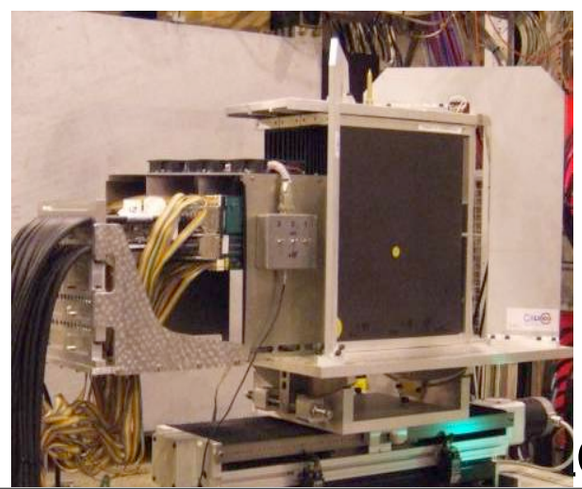
- tungsten absorber
- 2 technologies as sensor
  - silicon pad : BT 10kch
  - scintillator strip : BT 2160ch

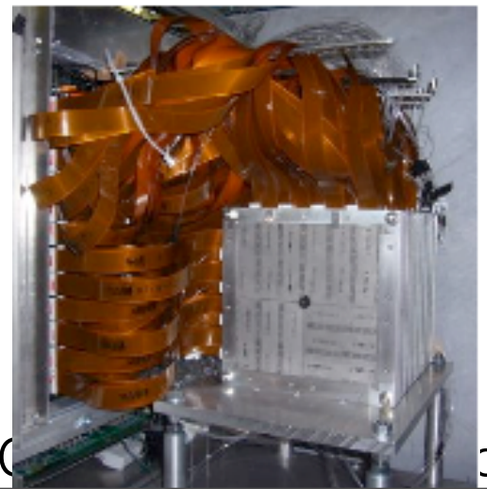
current act.

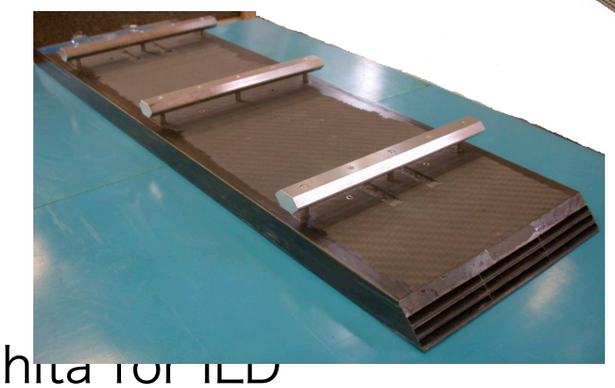
- in the same mechanical structure
- may have a combination

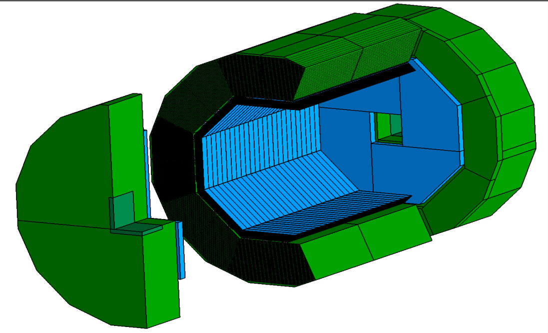
slide in structure











ECAL status

- tungsten absorber
- 2 technologies as sensor
  - silicon pad : BT 10kch
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current act.

- in the same mechanical structure
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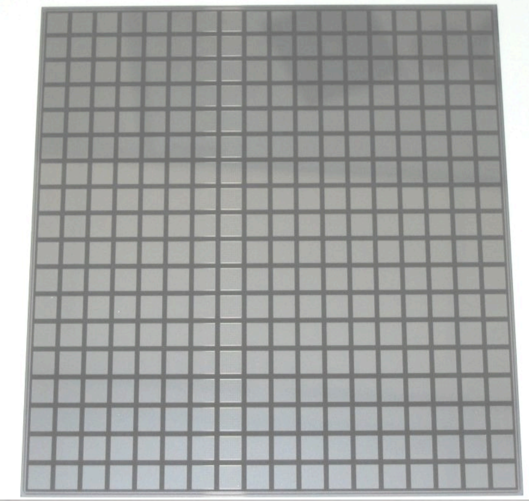
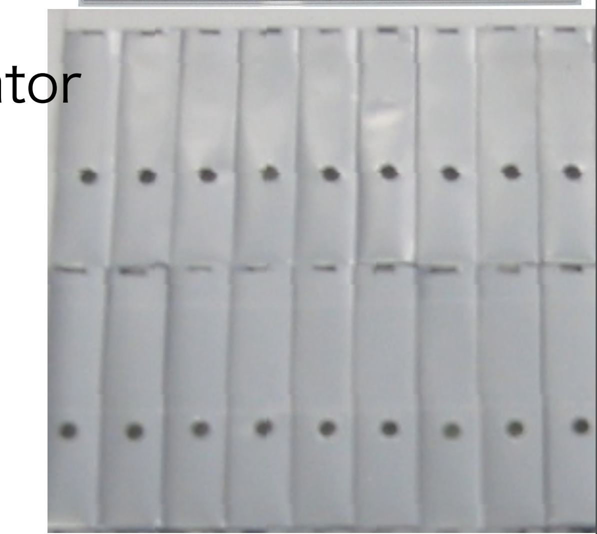
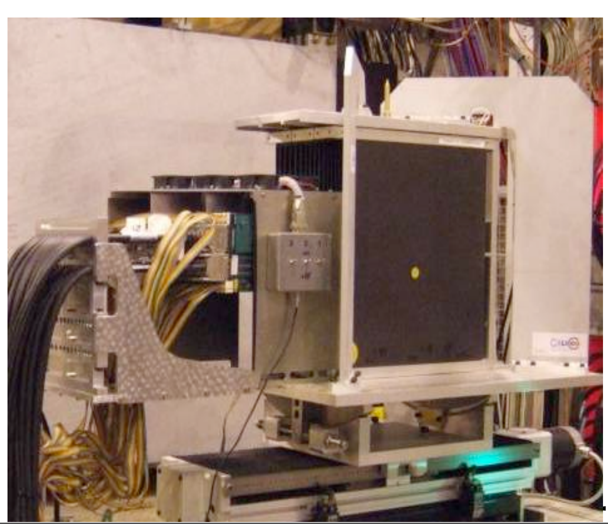
silicon pad

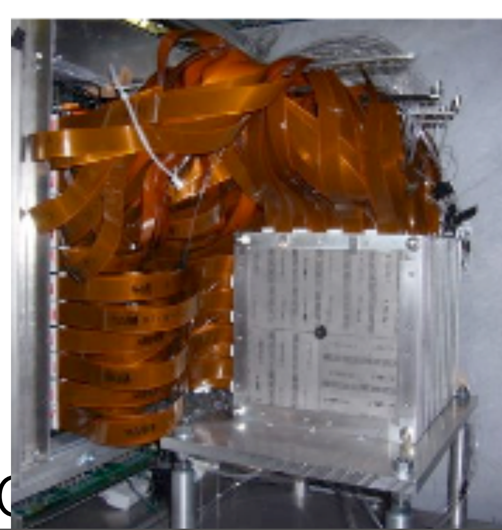


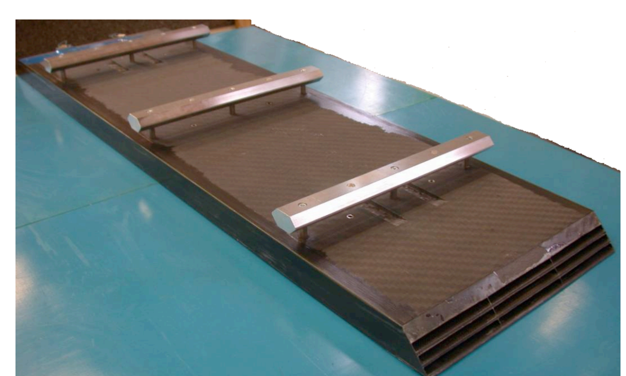
scintillator strip



slide in structure

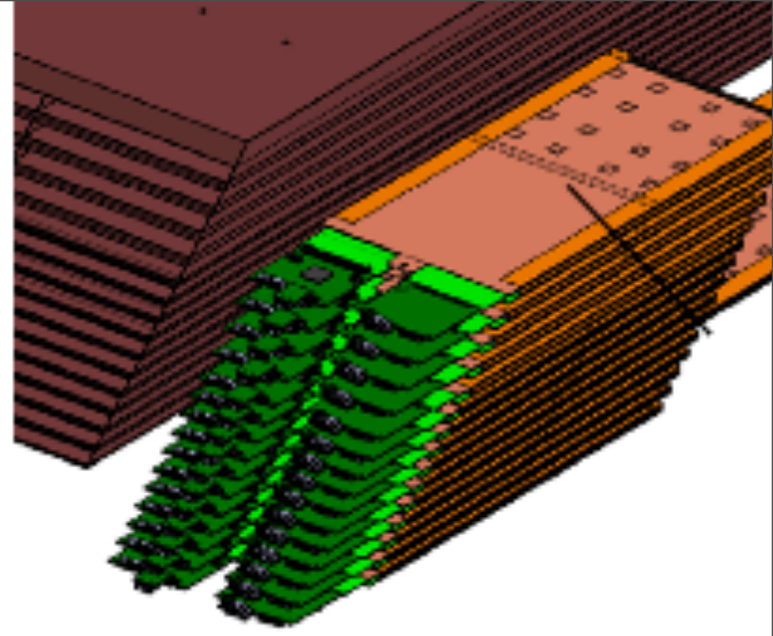




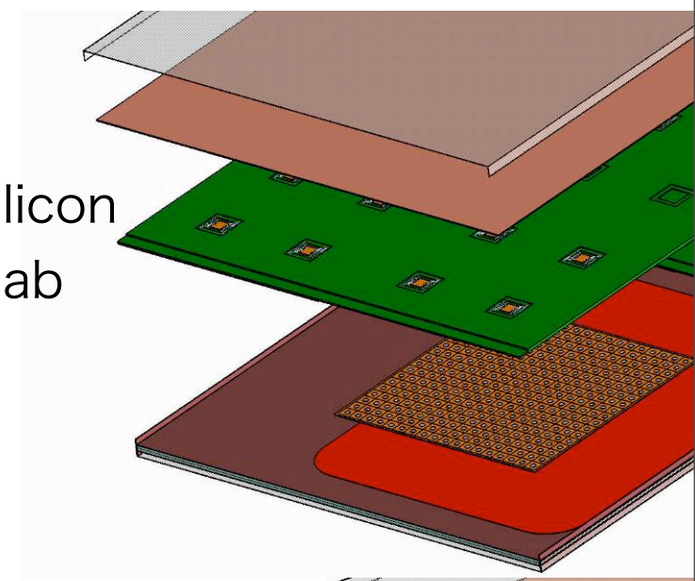


ECAL plan

common slab design

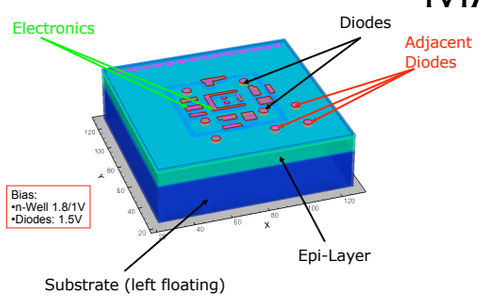


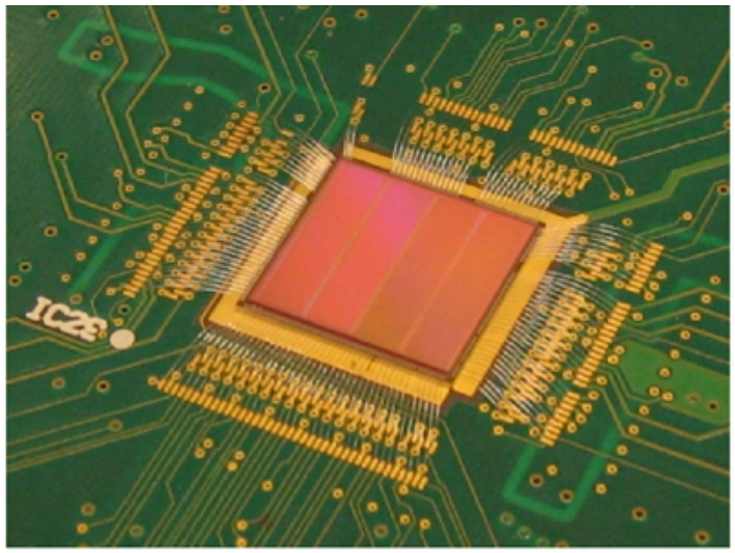
- 2010: slab prod. w. elex.
- 2011: test thermal & mecha.
- 2012: test beam



- sim. study of combined module
- digital MAPS development

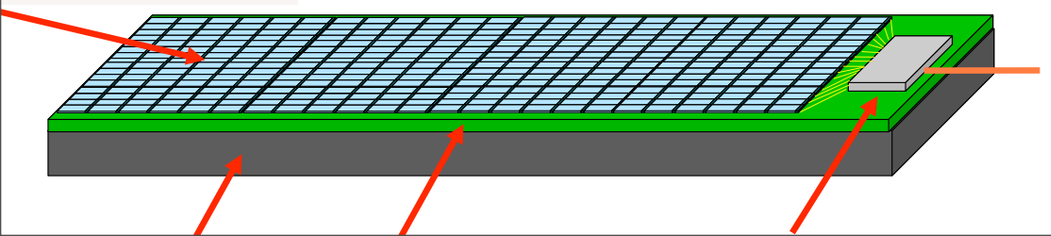
MAPS chip

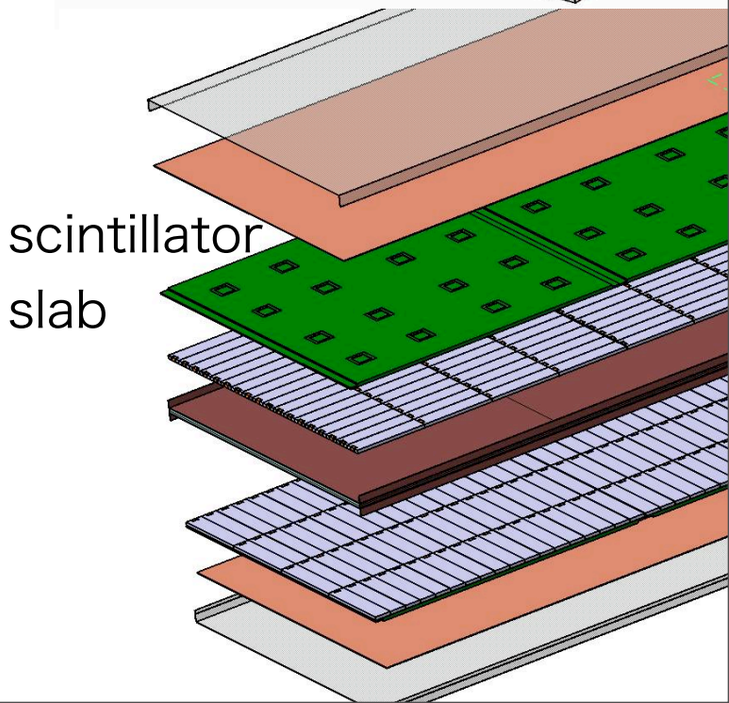


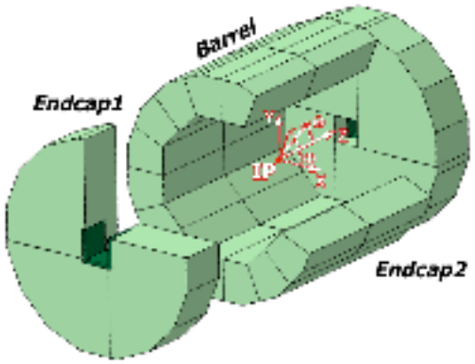


Tohru Takeshita for ILD

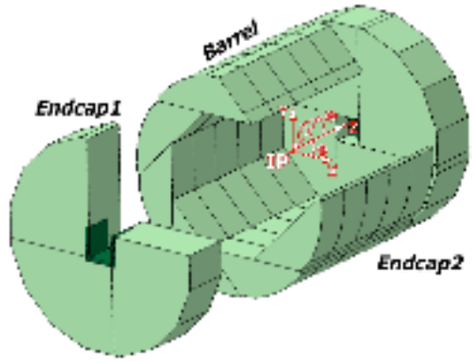
MAPS det,



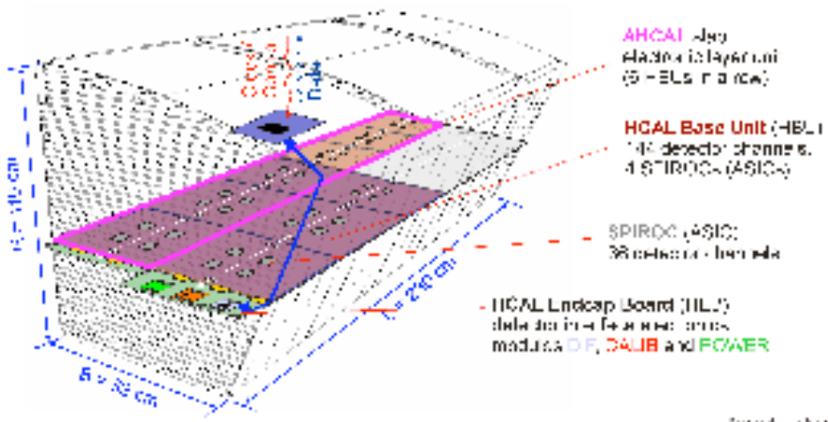


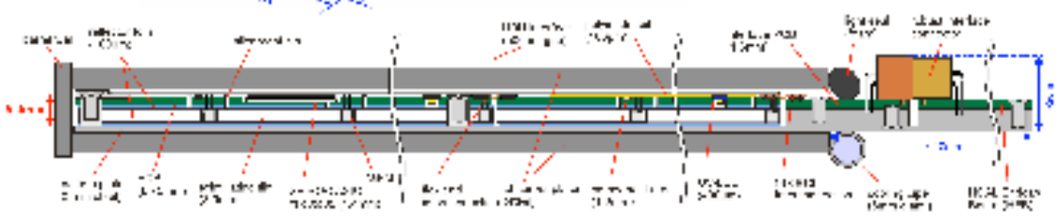


HCAL overview

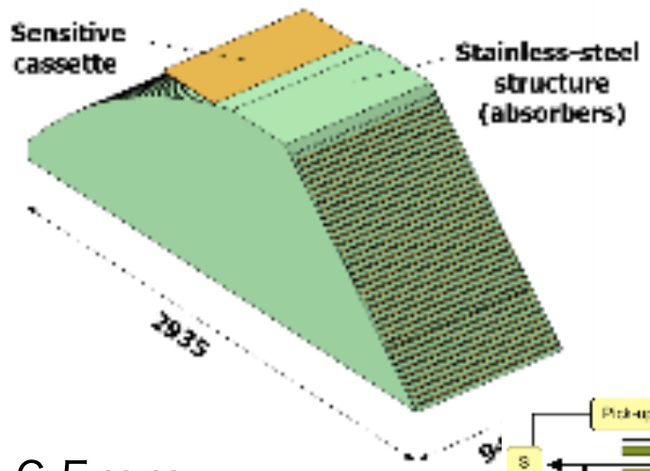


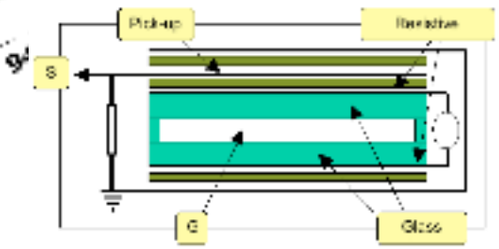
- steal absorber
- 2 sensors
- Analog : scintillator tile 3cm x 3cm
  1cm x 1cm
- Semi-Digital : RPC / Micromegas





6.5mm





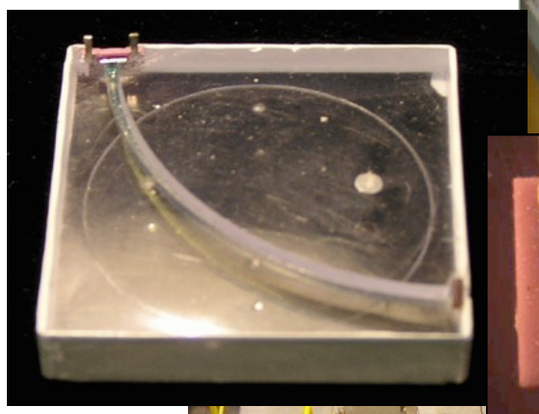
3.3mm

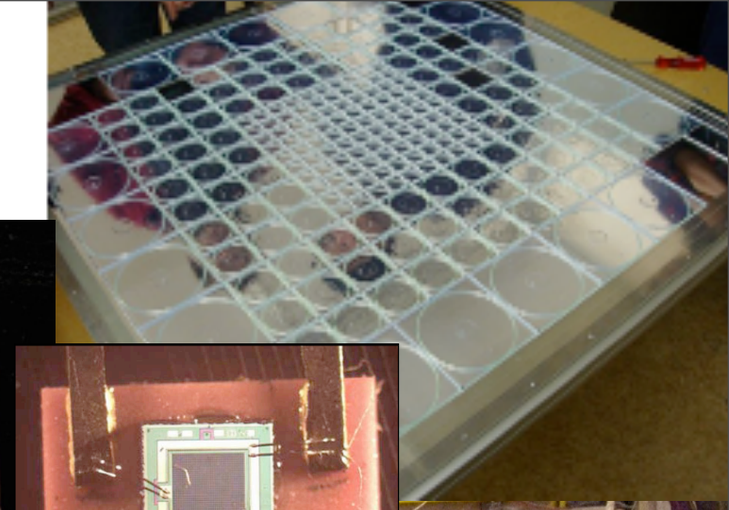
AHCAL status

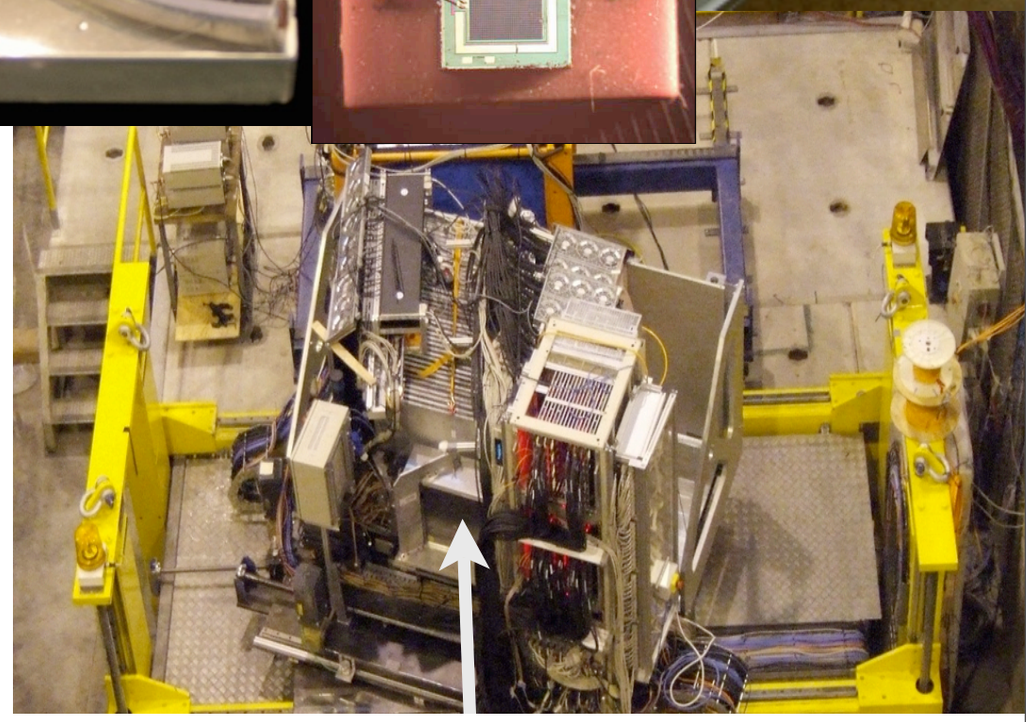
- scintillator tile 3x3 cm^2
- 38 layers of 1m3 7600ch
- TB at 4 years 2006-2009
  stable operation

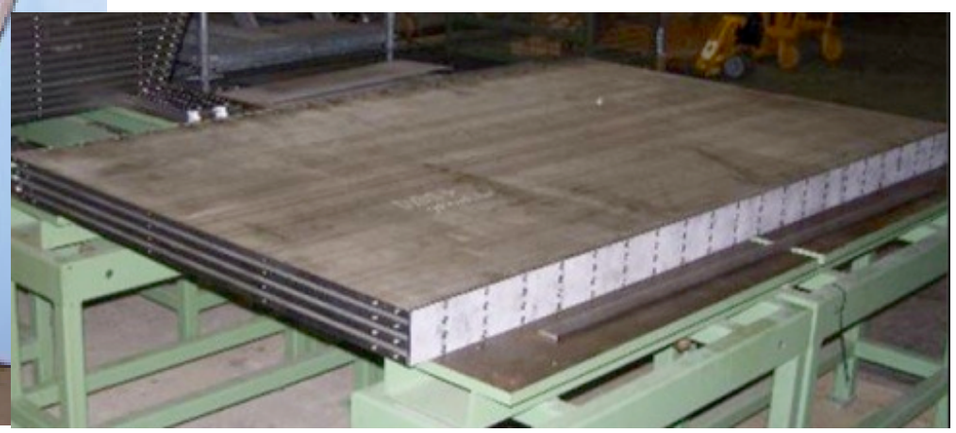
current act.

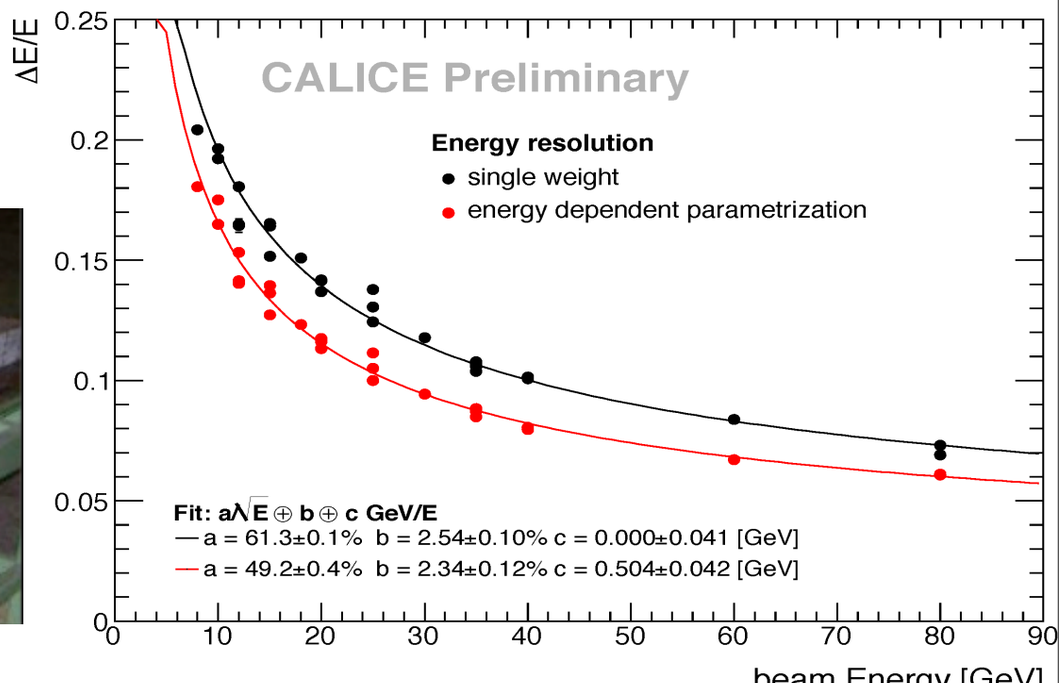
- mechanical structure

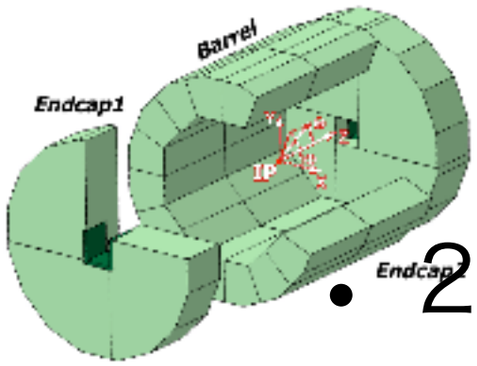








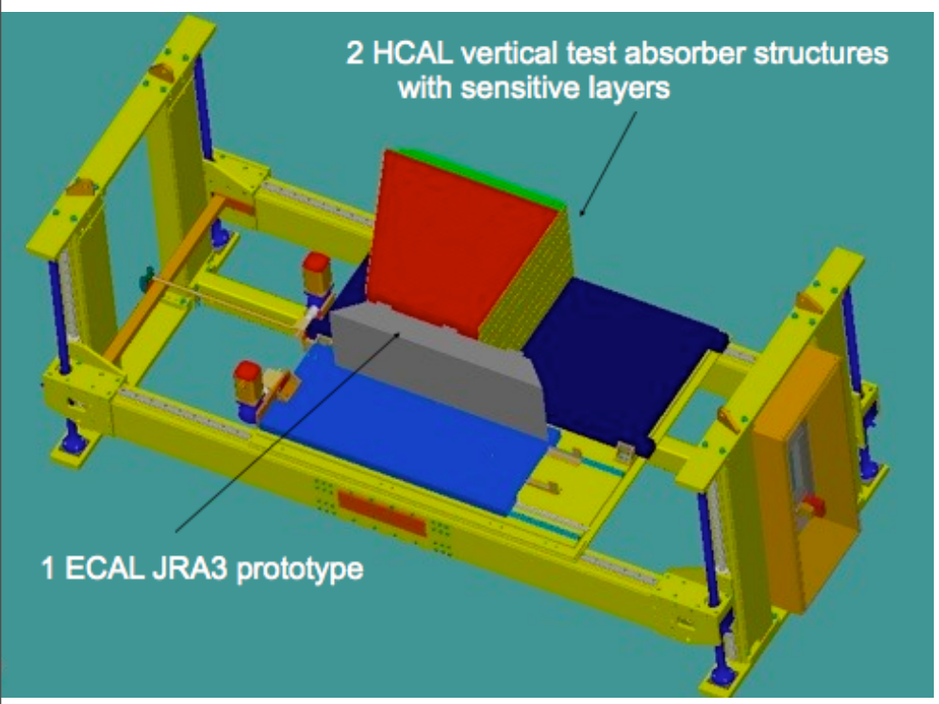


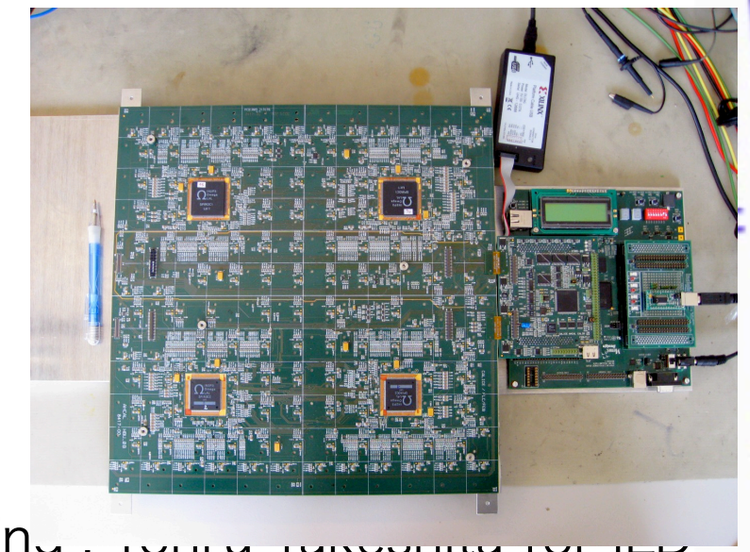


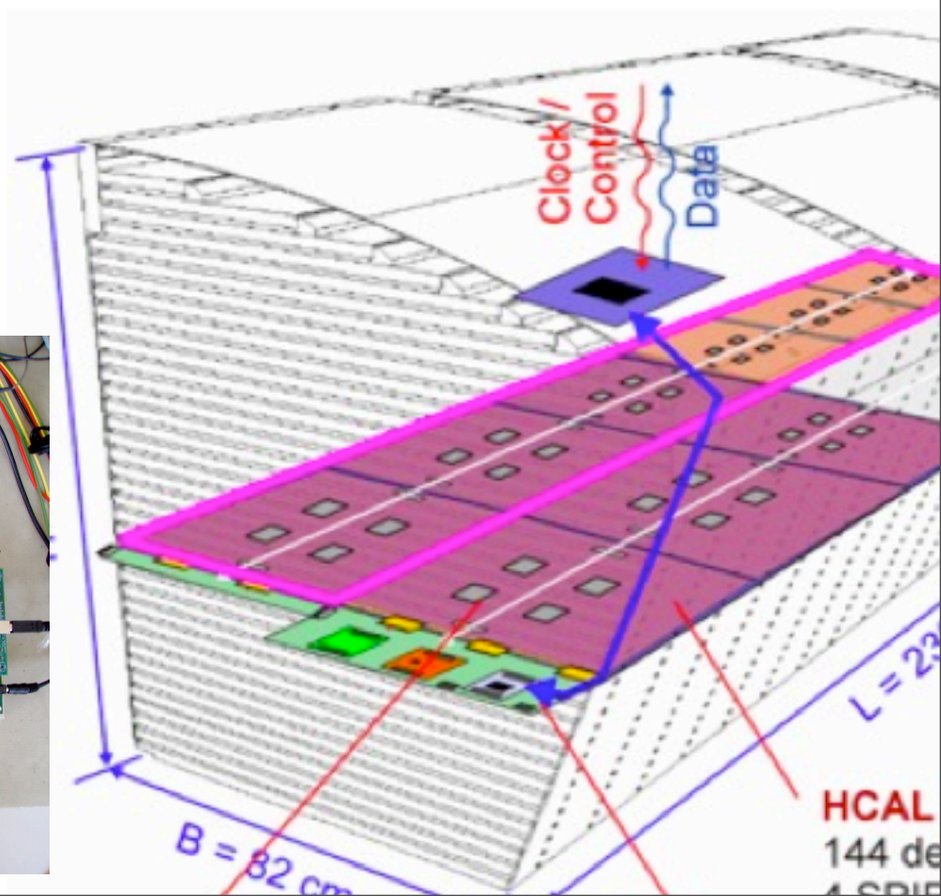
AHCAL plan

- 2010 : beam tests with a single readout module with embedded electronics, & build 2m long layer demonstrator
- 2011 : test of 2m long layer and build small e.m. size tower demonstrator
- 2012 : test of e.m. tower, ready for full HCAL module

- beyond

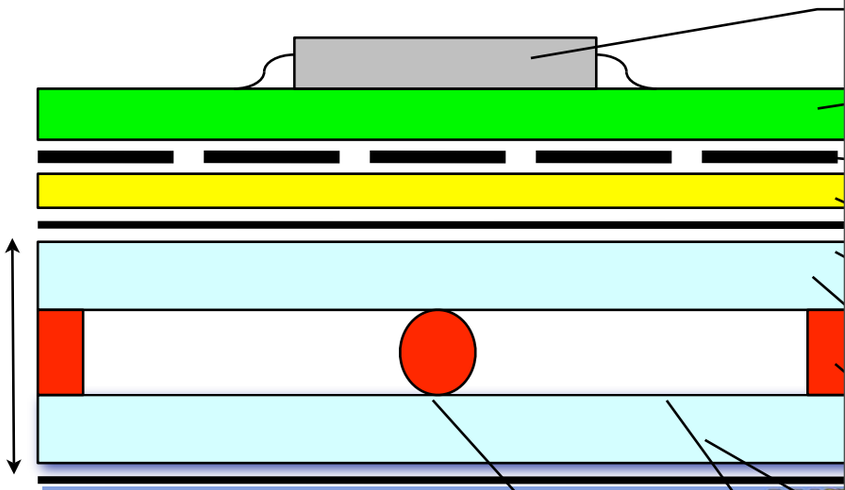






SDHCAL status

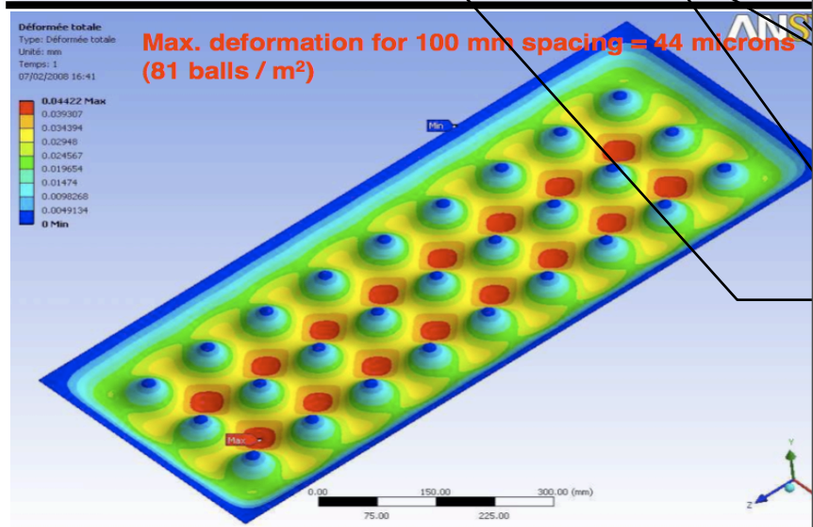
GRPC cross section



3mm

- GRPC :1m²
  - flatness

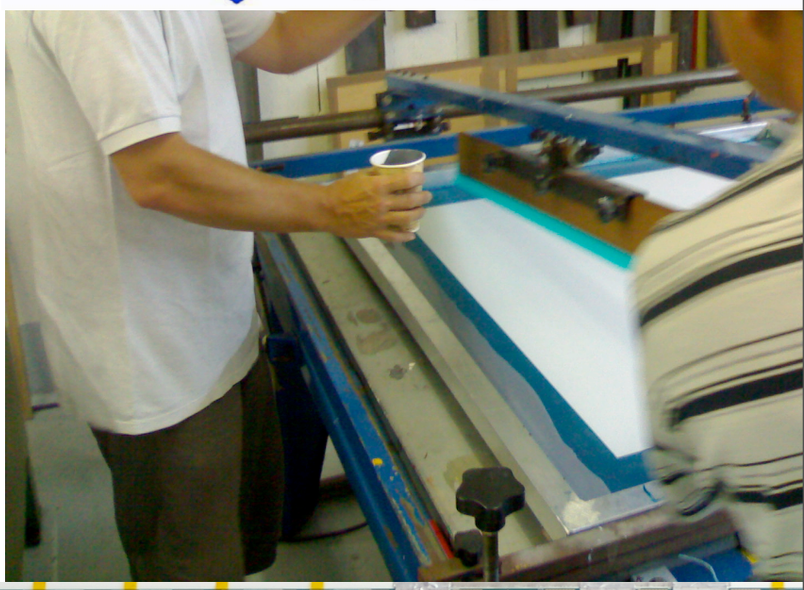
<44 μm



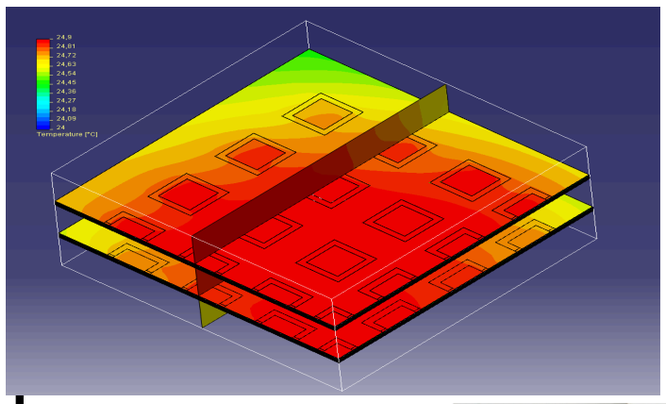
  - resistive coating

few M Ω/ □

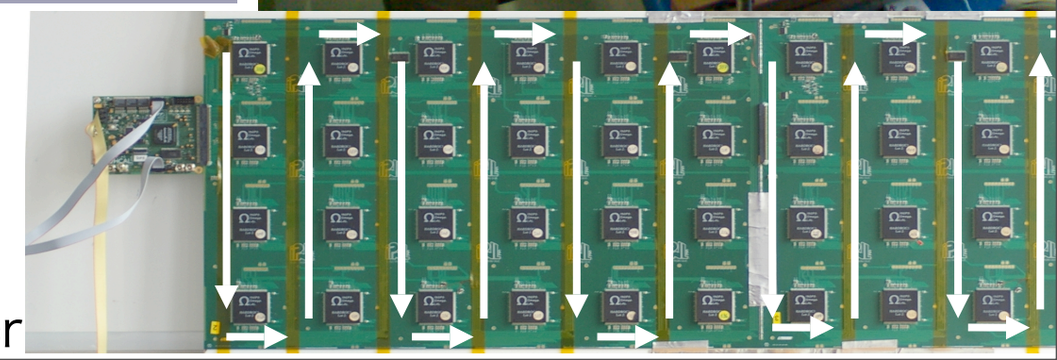
  - silk screening paint



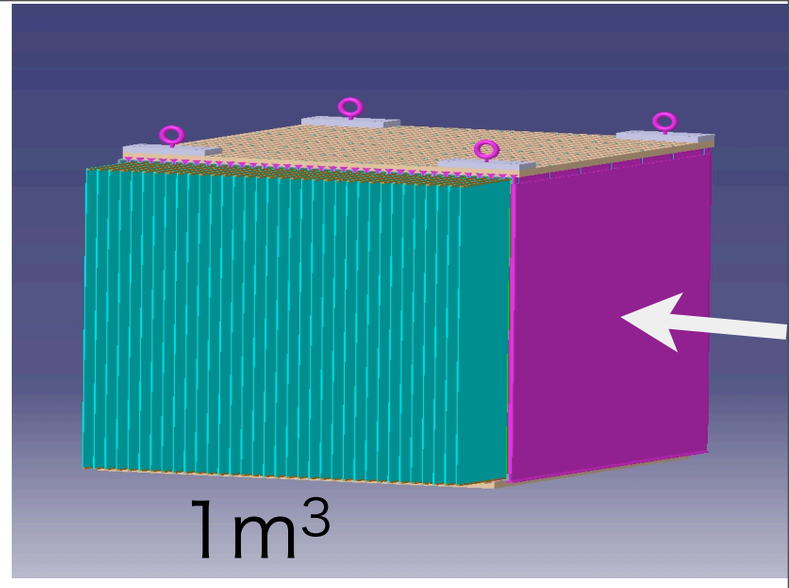
5C by cont. power



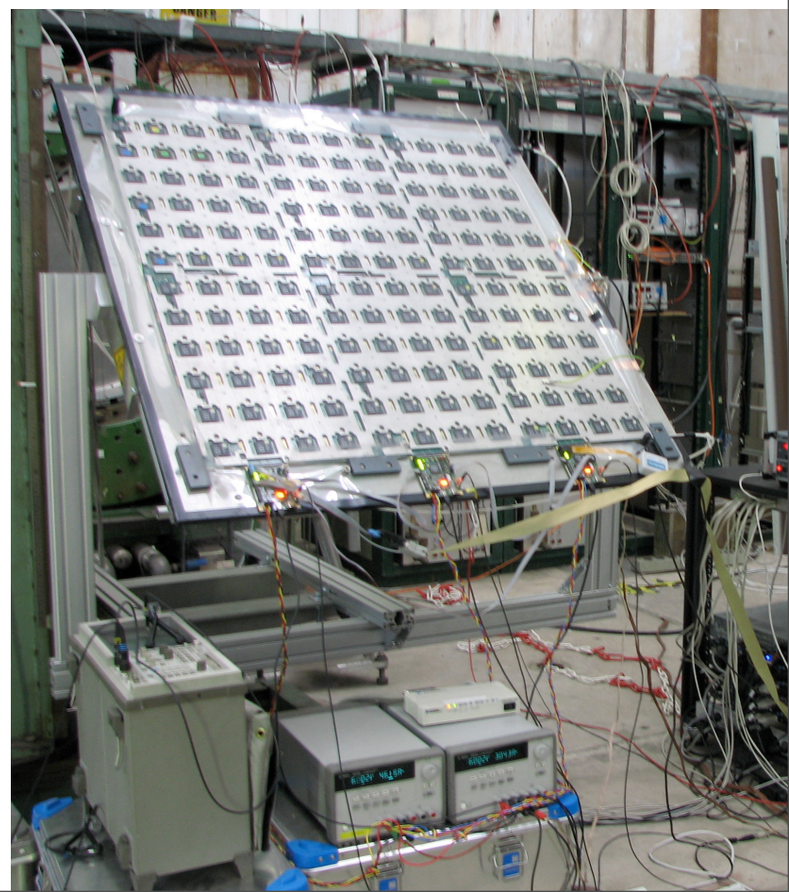
- electronics
- thermal study
- cosmic test bench



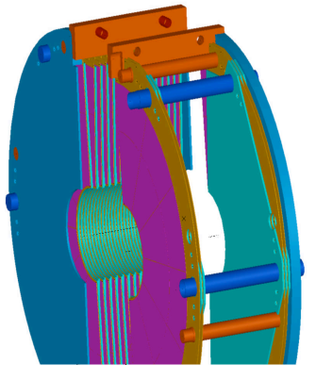
SDHCAL plan

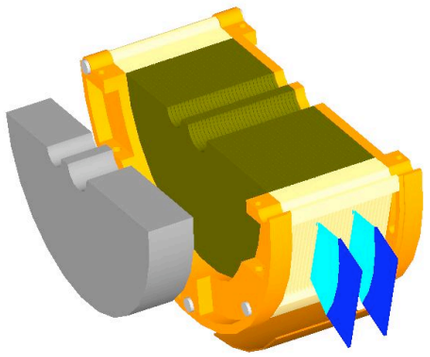


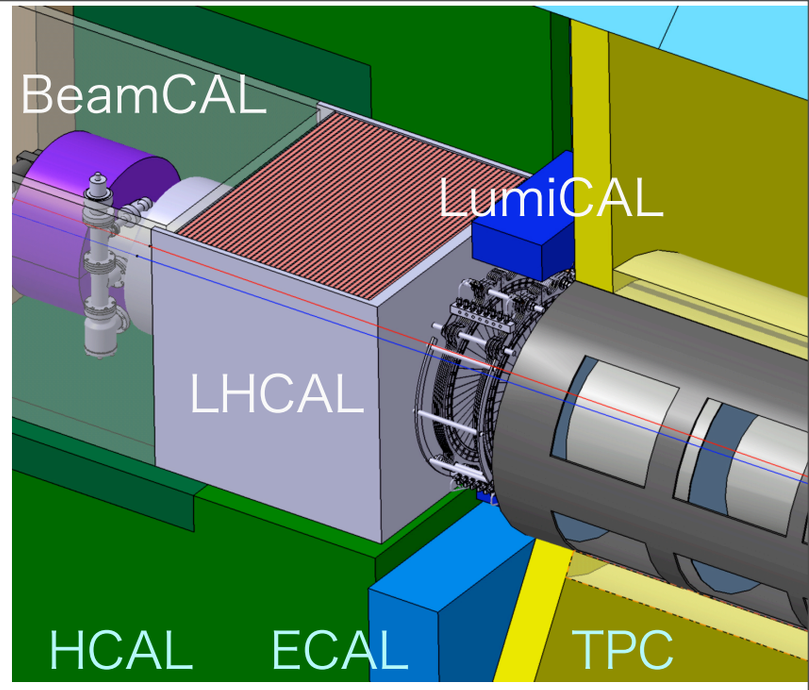
- 2010 : construction of 1m^3
  GRPC mass production
- 2011 : BT of 1m^3
  equipped : power pulsing, auto-support structure, services,,,
- 2012 : proof of principle of semi-digital HCAL
- test with multi-gap GRPC

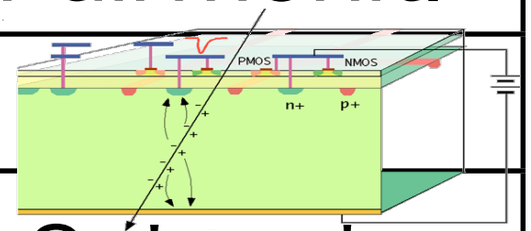
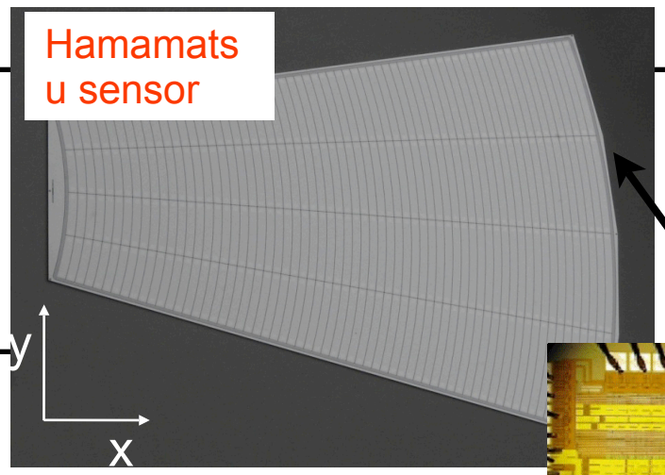
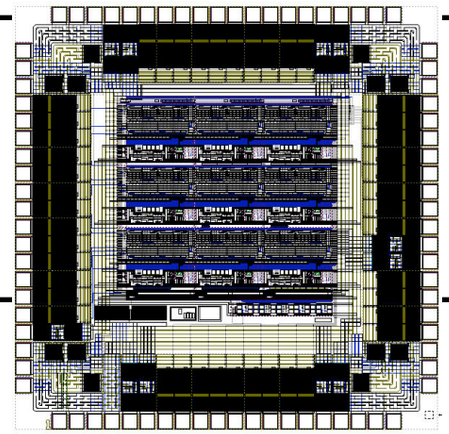


FCAL status & plan

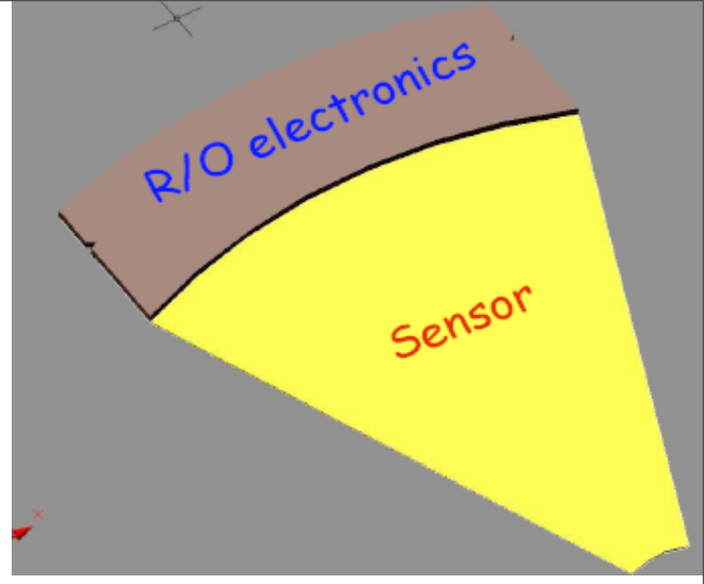


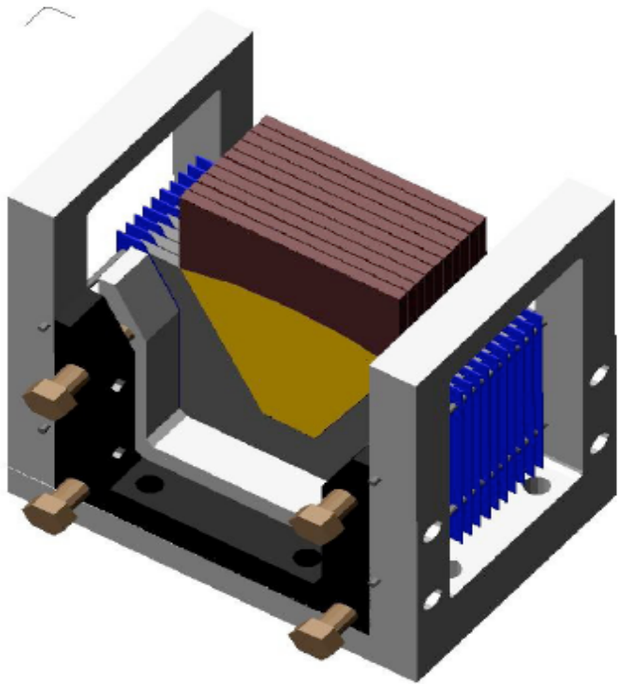




	LumiCal	BeamCal	Pairmonit.
design	si/W	si/W	
sensor	Hamamatsu/Si	JINR /GaAs	Sol tech.
current	V-I	thickness	small chip
photo			

FCAL plan





- 2010 : Full assembly of a prototype sector LumiCal & BeamCal
  - sensor & ASICs
  - DAQ development
  - lab and beam test
- 2011 : Beam Test
- 2012 : analysis & prepare DBD

sub. det. summary

		2010				2011				2012			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
VTX		pixel dev.				pixel perfo..							
Silicon TRK		sensor R&D								sensor indust.			
TPC		LP1											
						LP1.5							
												LP2	
ECAL		ECAL SLAB											
						Slabtest							
AHCAL		2m mod. const.								2m mod. tower			
						2m mod. test							
SDHCAL		1m3 const.											
						1m3 BT							

summary ILD status and plan

- simulation BL and detector BL
- simulation BL : performance
  - add & tune : improved BG, det. dead space, better modeling,,,
- detector BL : technology
  - decide end of 2012
  - depend on R&D group
- significant progress from LOI
- prepare a DBD 2012