# Plans, tasks

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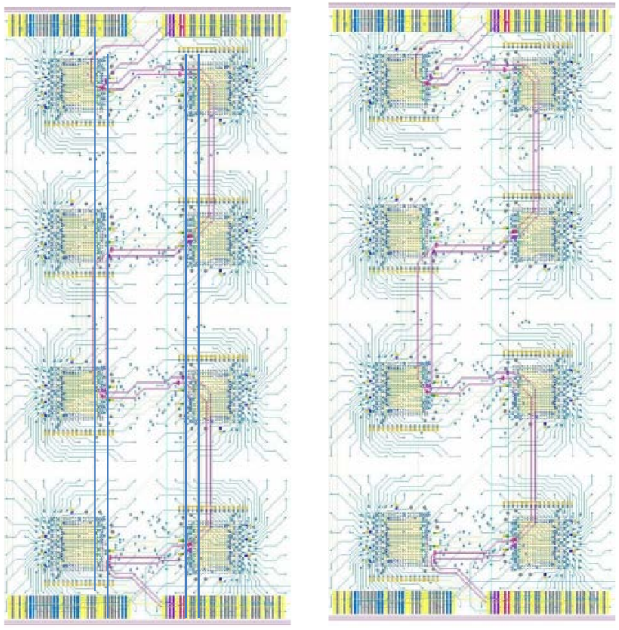
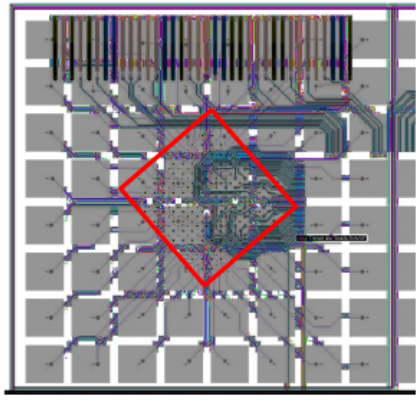
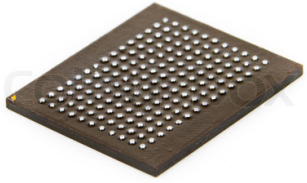
# New PCB, FEV8 $\rightarrow$ FEV9

FEV9 is in production. Improvements:

- correct SKIROC “grounding”: to stabilized 3.3 V
- swap of digital and analog power supply (bug) is fixed
- power line decoupling capacitors to reduce noises
- 2-3 times shorter signal traces (less input C and pick up noises)
- signal transmission over long distances ($\sim$ 2m, esp. for clock, two FEV9 options: with straight and snake lines)
- 16 SKIROCs
- new SKIROC BGA packaging (400 balls, 100 chips in production, end of Nov’13)





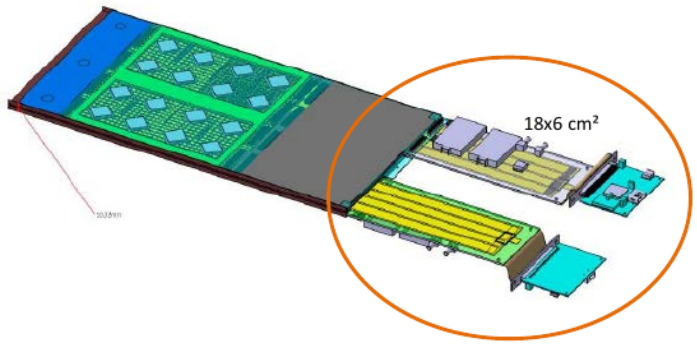


BGA pattern : 1/16$^{th}$ of the PCB

# Next steps

First, tests with BGA socket (ordered and received, pin compatible), SKIROC may be remounted (Dec'13). If Ok, permanently solder 4, 8 and finally 16 chips (for 4 wafers).
Qualification of FEV9 Nov-Dec'13.

SMB4 design (between many ASUs and DIF) has just started (with power for many ASUs and special line drivers for long line transmission). First SMB4 in Feb'14, tests in Mar'14.



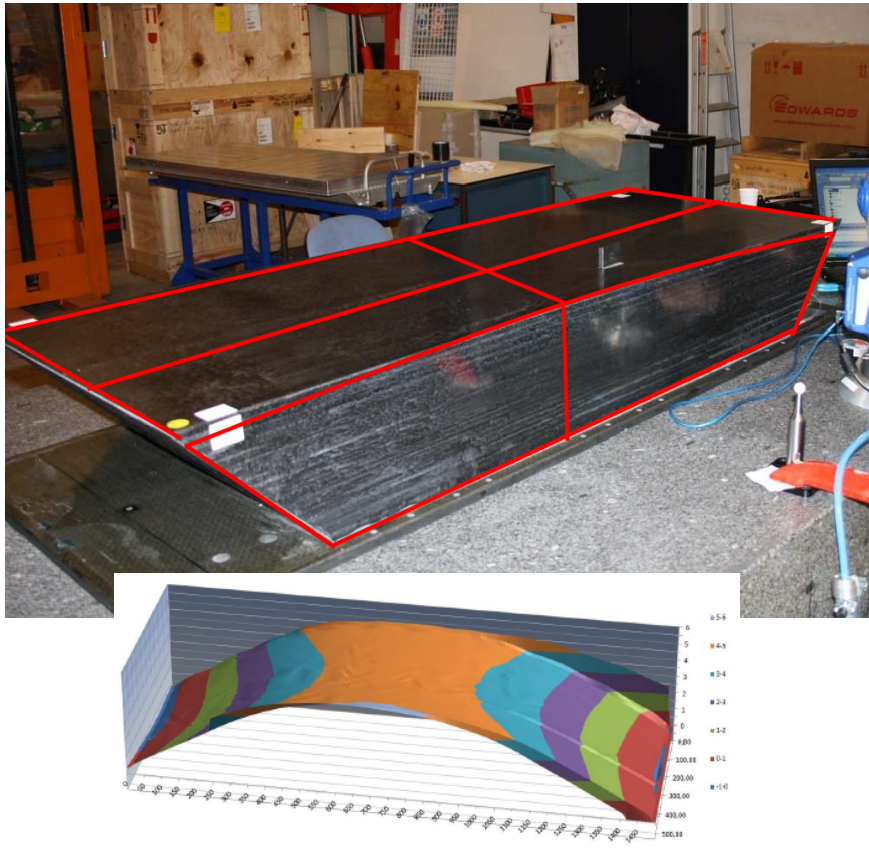

Decision on long line (straight or snake), qualification of next version FEV10 in Apr-May'14.
U-type short slab production, May-Jun'14
Physics tests (cosmics, laser, PHIL accelerator at LAL) June-Dec'14
Long slab production, Oct'14

In parallel, look at boards integration in ILD.

# Test of full scale tower

Plan: produce $\geq 1$ long and short slabs to fill alveolar tower. Reuse existing 1/4 ASU short slabs. With GEANT4 simultion, find their affordable fraction in the tower.

Test at CERN in 2015.



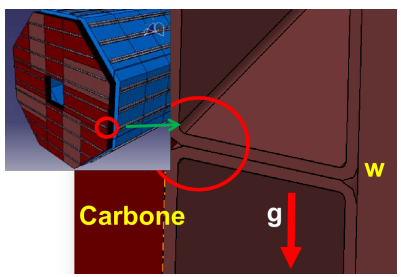
# Lab view

# LPSC

- Mechanical design of alveolar endcaps

  Molding of first 2.5 m one layer module with 3 alveoli. Special handling tool for endcap and barrel modules using their rails.

Alveolar skin of 1.82 m dummy structure cracks in real test at 6.6 MPa (35 MPa in simulation). ≈ 3 safety factor, probably not enough, see "Seismic Issues" by Toshiaki Tauchi, ILD'13 meeting in Cracow
ilcagenda.linearcollider.org/
conferenceOtherViews.py?view=standardconfId=6113




# LPSC (cont.)

- Cooling system (end-caps + barrel)

  Cooling station design, global pipe integration, sensors, controls; priliminary tests of full scale leakless loop
- Contribution to prototypes: internal and external plates of the EUDET module, heat exchanger
- ECAL support rails (endcaps + barrel)

# LPNHE

Si sensor gluing robot

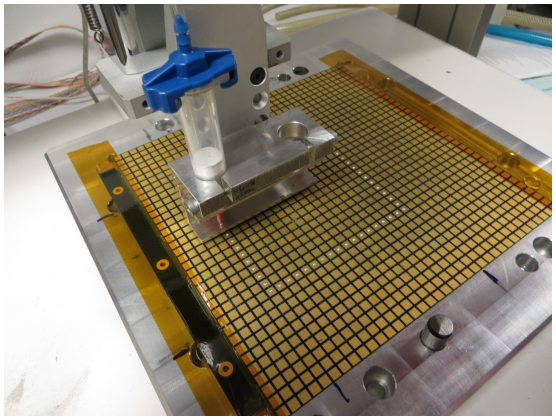
- Short-term : gluing of one sensor per PCB (9 sensors glued in total)

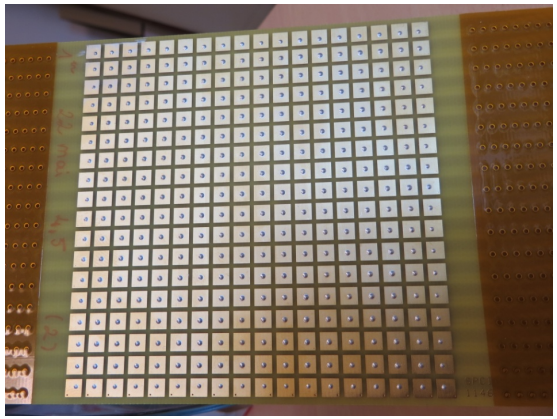
  Constraints on PCB are defined:

  - Flatness
  - Parallelism of the edges
  - Uniform height of ASIC soldered on board

  Improvements:

  - use of specific pumps for dry and clean vacuum
  - careful PCB cleaning
  - outer glue dots slightly shifted to center to avoid short cuts





# LPNHE (cont.)

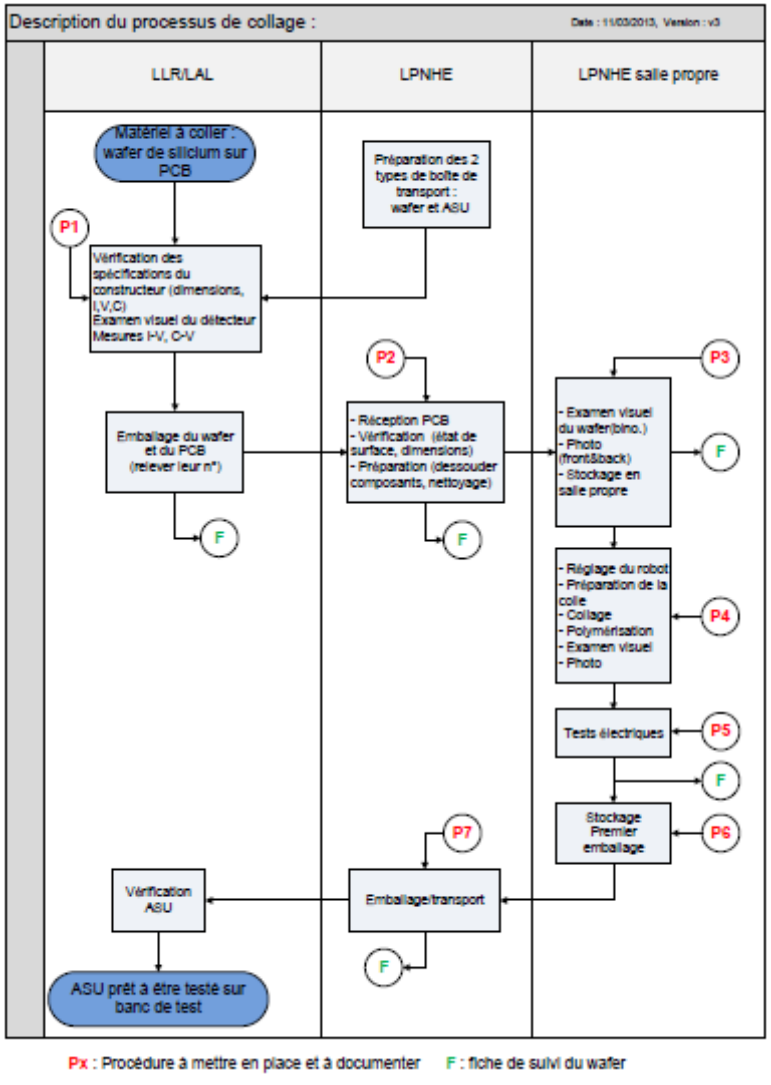
first task flow between LPNHE/LAL/LLR, reception and gluing procedures at LPNHE are written

- mid-term (in progress): fully automated process.

Positioning and aligning with the second robot. Glue 4 sensors on a PCB. Clean room for both robots.

- long-term: mass production

In parallel: Si sensor production at Lfoundry. Sensor specifications have been sent.



# PHIL accelerator at LAL

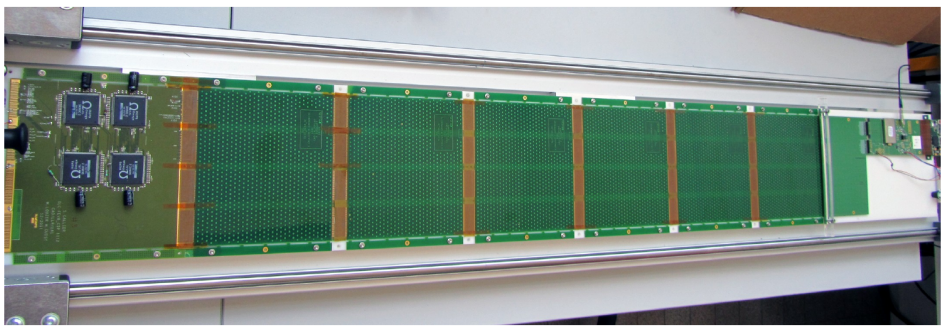
1-3 MeV $e^-$, minimal measurable bunch intensity $10^8$, very short duration. All electrons arrive at the same time: can mimic high energy showers at CERN.

$\sim 100 \times 100\ \mu m^2$ collimators (eg. 5-10 mm of steel) can reduce intensity from $10^8$ to $\sim$ 2000 MIPs measurable by ECAL DAQ. Point-like source, suitable for scans. 3 MeV $e^-$ can pass 2 or 3 layers with sensors and PCBs, can be put in coincidence. Most interesting: guard ring cross talk study.

Other tasks: measure cross talks between inner pixels, across SKIROC channels, efficiency scans, power pulsing tests with 5 Hz PHIL bunches. PHIL upgrade next year : bending magnet, variable beam intensity. Wide beam with $\sim 0.1 e^-$ per pixel will allow silicon sensor calibration.
Application for P2IO postdoc has been sent.

# LAL

- Slab assembly: HV Kapton, ASU interconnections, plan to semi-automate
- Analysis of beam test data
- Signal transmission tests for long slab with interconnections and simplified straight PCB lines
- COB design (Roman's request)

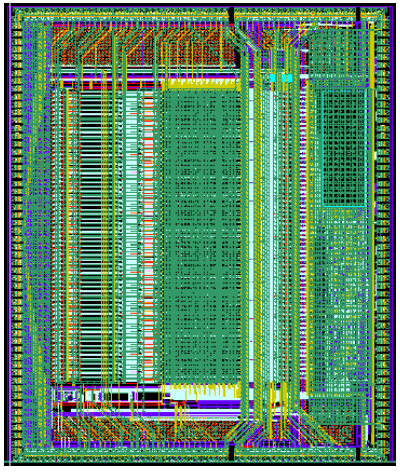


# Omega group

- Production of SKIROC 2B and SPIROC 2D : $\sim$ end 2014, <50 kEUR, large production

SKIROC 2B: improve performance and fix bugs, pin compatible with SKIROC2.

SKIROC2



- SKIROC3 development

  HARDROC3 received in Jun'13 (AIDA milestone): zero suppression, more complicated digital part, SCA depth 16 $\rightarrow$ 8, new slow control using I2C link. Not backward compatible with HARDROC2.

  Similar changes in SKIROC3, to be discussed after 2B.

# LLR

- ECAL ILD general design and optimization
- Si sensors (ordering, characterization, optimization)
- DAQ electronics (SKIROC packaging with Ω, FEV, SMB, DIF, GDCC)
- long slab design (w LAL)
- mechanical prototypes (w LPSC)
- slab assembly (w LPNHE, LAL)
- DAQ software
- beam tests, data analysis (w LAL); cosmic and laser tests

# Optimistic dates

- New PCB FEV9, BGA packaging. First, with BGA sockets. Nov-Dec'13
- New adaptor board SMB4 for many ASUs (Mar'14)
- FEV10 design, production (Apr-May'14)
- U short slabs May-Jun'14
- Long slab Oct'14
- Physics tests (cosmics, laser, PHIL accelerator) Jun-Dec'14
- CERN beam test with one tower in big mechanial structure in 2015
- SKIROC 2B in the end of 2014 (Omega), then SKIROC3
- Guard ring studies at PHIL (2014) and with laser

# Tasks assigned

| | |
|---|---|
| barrel mechanics | LLR |
| endcap mechanics | LPSC |
| support rails | LPSC |
| cooling | LPSC |
| 2d gluing robot for positioning/alignment | LPNHE |
| glue 4 sensors on PCB | LPNHE |
| beam test data analysis | LAL,LLR |
| Si production in Hamamatsu and others | LLR |
| Si production in Ldoundry | LPNHE |
| sensor tests on FEV with springs | LLR |
| SKIROC 2B, end 2014 | Omega |
| BGA packaging | LLR, Omega |
| DIF, GDCC (PP delay, config, lost pack., wrong spill #) | LLR |
| FEV9, SMB4 | LLR |
| HV kapton, ASU interconnections | LAL |
| workflow for slab production | LPNHE, . . . |
| long slab | LPNE,LAL,LLR |
| one tower, test at CERN | all |
| DAQ software | LLR |
| PHIL tests | LAL, LLR |
| laser, cosmic tests, analysis (GR/pix-pix cross talks etc.) | LLR |
| realistic MC | all |
| general ILD ECAL design and optimization | LLR |

# Other tasks

| | |
|---|---|
| Endcap rings | |
| SKIROC 3: indep. ch., random trigger, injection via DIF | Omega |
| cable? preamp? TDC? # SCAs?, cross talks? | |
| signals in masked ch? optimize high/low gain! | |
| further noise reduction | |
| HV/LV distribution | |
| DIF/GDCC integration in ILD | |
| Software: data base, configuration, debugging tools | |
| Vibration tests | |
| Test 60 kg structure with Bragg grating fibers | |
| Rad. tests of sensors, electronics components incl. big C | |
| Rad. doses in 10-15 years? | |
| Alternative(s) to Pandora | |
| Silicon thickness! | |
| Jets/gamma or e in very forward/barrel-endcap gap regions | |
| TDC for long lived particles, to reduce noises | |
| Not square pixel shapes, try energy sharing (even | |
| with squares: partial intersections in diff, layers) | |
| Pandora with soft. compensation | |
| GR on HV side?? | |
| pixels with FE?? | |