CALICE/ILD SiW-ECAL+SDHCAL T2-H2 26/09–10/10/2018

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LLR+LAL+Kyushu & IPNL+CIEMAT+Gent+LPC

H2/H4 Users meeting
27/09/2018

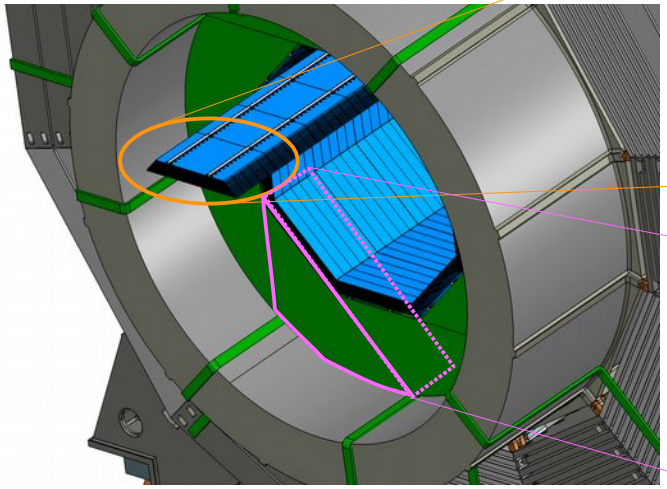
CALICE ‘high-granularity’ Prototypes

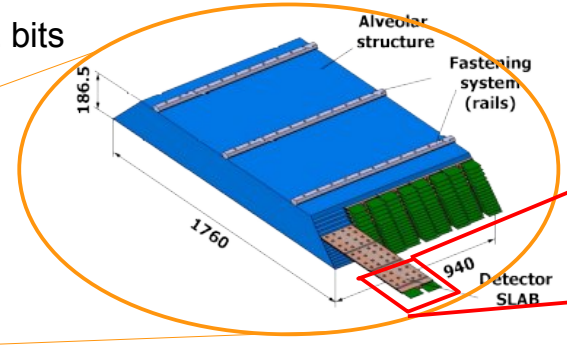
Highest granularity options for the ILC Calorimeters: SiW-ECAL + SDHCAL

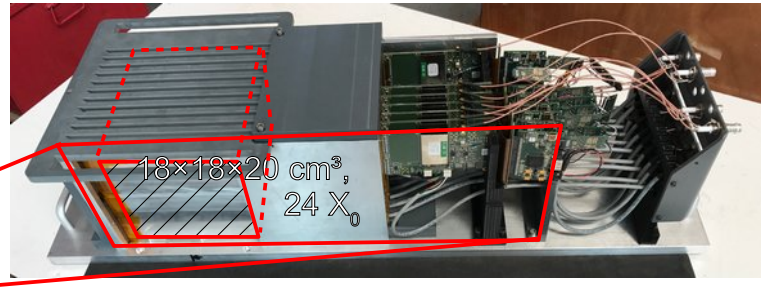
– Embedded, pulsed readout electronics

Being built (11 working layers)

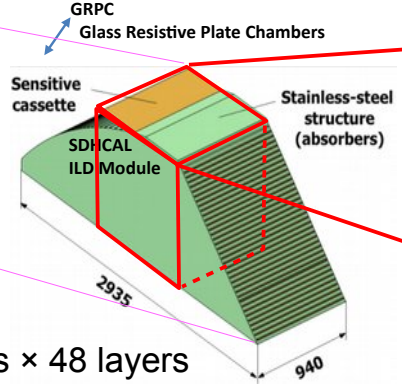
Silicon-Tunsgten ECAL, 12 bits
5×5 mm² cells

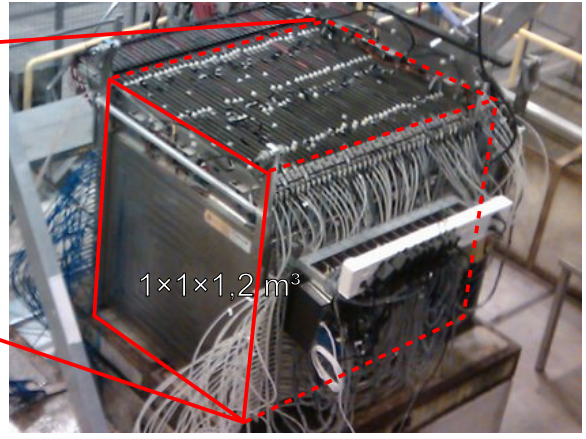






Operational for ≥4 years





Semi-Digital (3thr. → 2 bits) readout,
Fe-Gaseous Detector , 1×1 cm² pads × 48 layers

Installation

Preparation of Japanese Silicon Layers

- in CMS rooms (370 & 183): thanks to Laza

Delays (wrt expect.) due to heavy handling
needed by LEMMA exp.

«everything» on the scissor-table @ 4:30 PM

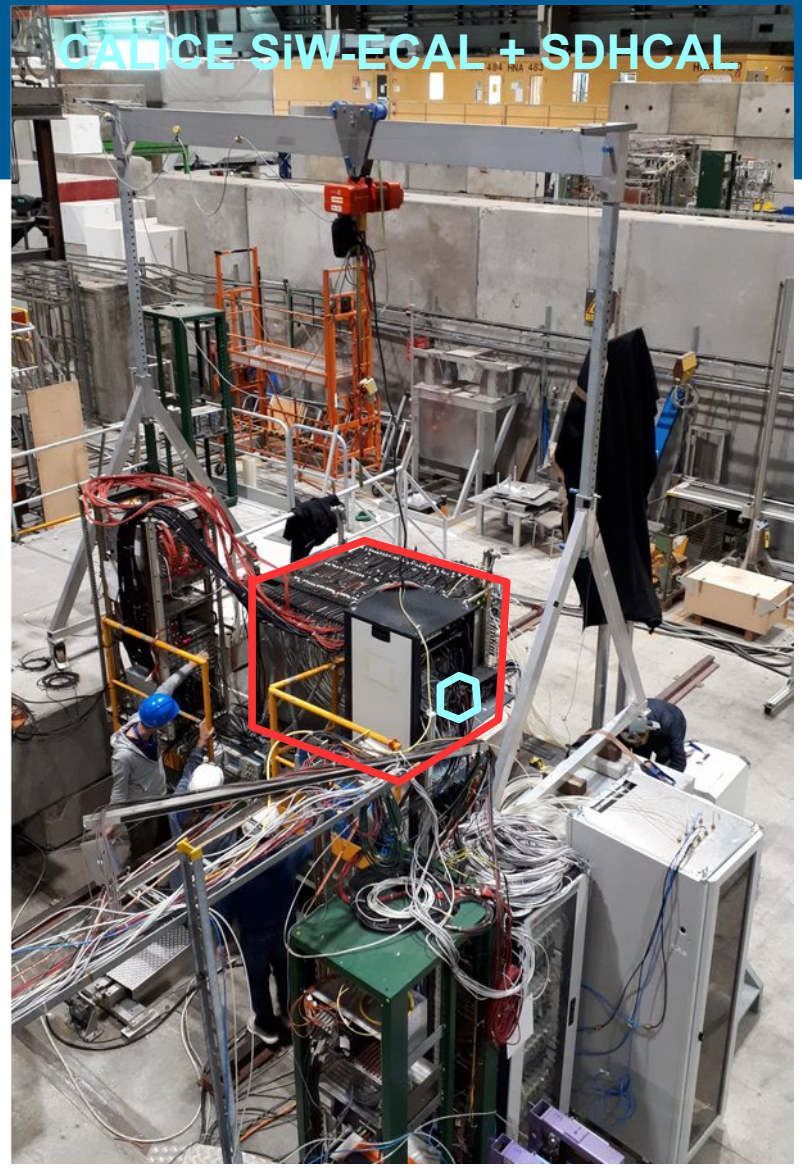
- big thanks to
  Pierre & the team of crane operators
  Michael for all organisation and solving all “small” issues

Beam set-up with high flux of 200 GeV Muon (20k μ / spill) (26th 19:00)

- Thanks to Bastien

Detector nearly ready for commissioning

Waiting for security validation...



Beam time profile (indicative)

Special needs :
• Infrastructure : none (if in H2B)
• Cherenkov
• A room near H2B for preparation of setups

September

Tue 25th: pre-installation (cabling …) in barracks near H2B
Wed 26th Installation...

Thurdays: **2-3 day of high E muons, large beam** (σ ~ 15 cm)

- Commissioning & calibration : Check of thresholds, sync between det. in NH

Thu 28– Tue 2nd: **3-4 days of electrons** (or positrons), beams spot σ ~ 2–5 cm

– Energy scan (2,5 day) 10, 20, 40, 80, 150 GeV, 10 kHz
– Freq scan (1,5 day), 80 GeV, 10 Hz – 10kHz

Wed 3rd – Wed 10: **7 days of pions**(+ or –) **energy scan (10–150 GeV), low freq (10–20 Hz)**, beams spot σ ~ 2–5 cm

– Pi- (no p contamination) and Pi+ (p contam.)
  - Change of wobbling on Wed. ?

Extra’s

Beam test in 2018

2 weeks @ **DESY June 2017** for SiW-ECAL

- excellent behaviour of 7 layers (1024 chan each): uniformity ~1%, thr @ 1/2 of mip (with auto-trigger), S/N ~20 (ADC) in Pulsed mode

2 weeks @ **DESY July 2018** → test of new SiW-ECAL layers:

- Same + new designs, ≠ Wafers thickness & Guard Ring designs, new ASICs (⊃ TDC) → low energy (1–5 GeV) response: 1 single layer.

2 weeks SiW-ECAL+SDHCAL, **CERN Sept 2018**

Fixed ECAL compact structure 10 layers 24 X_0 W + SDHCAL almost full prototype → **Test of combined DAQ**

Goals:

1) Response to **High Energy electrons** (min (10?) GeV – 150 GeV)

Linearity, (Uniformity), Leakage, SEU, TDC responses, "Square events"

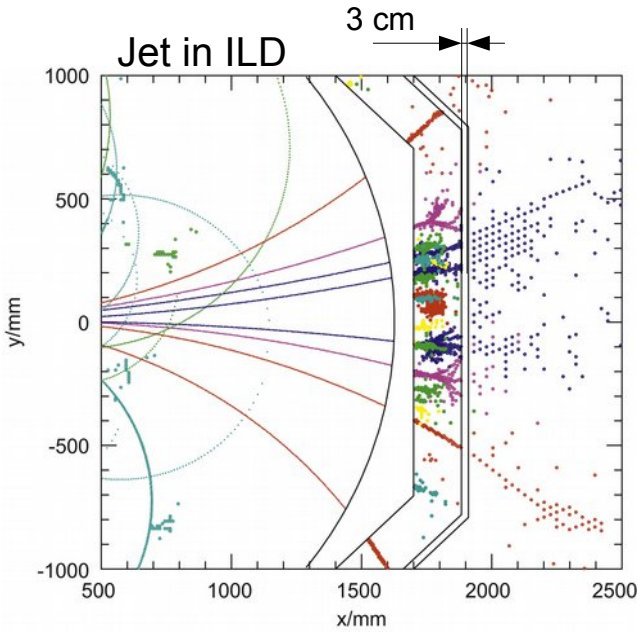
2) Response to **"High rates" EM showers** ~ 10Hz – 10kHz (=max rates in endcaps @ ILC "as high as" 10 evts in 1 ms).

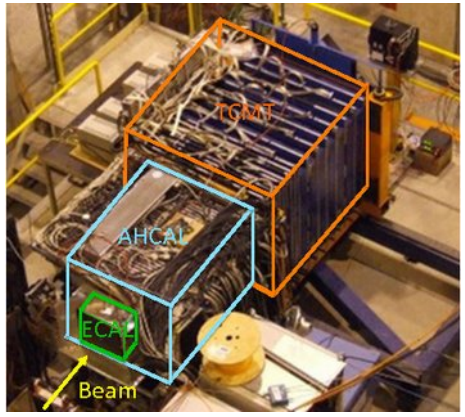
Linearity ECAL+SDHCAL, SEU, (sensitivity to fraction of π, μ's in EM showers, PID with high granularity, ...)

3) **Hadronic showers responses** (largest E scan), low freq (10 Hz)

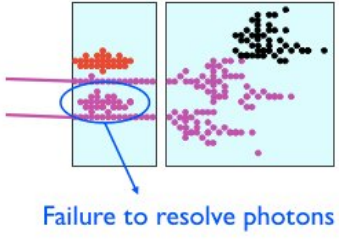
- Detailled description of hadronic showers (Number of secondaries, angles, …), PFlow algorithms tests with 2 dets (tracking between 2 detectors).

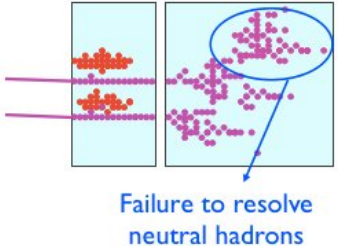
Particle Flow oriented calorimeters

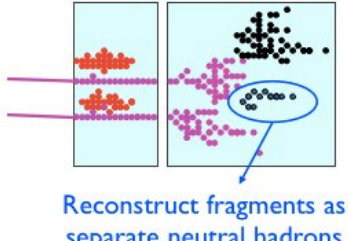




Physical prototypes
Combined BT in 2007
+ FNAL 2010–11
(1×1 cm² SiW-ECAL+
DHCAL, but no SDHCAL)


Failure to resolve photons

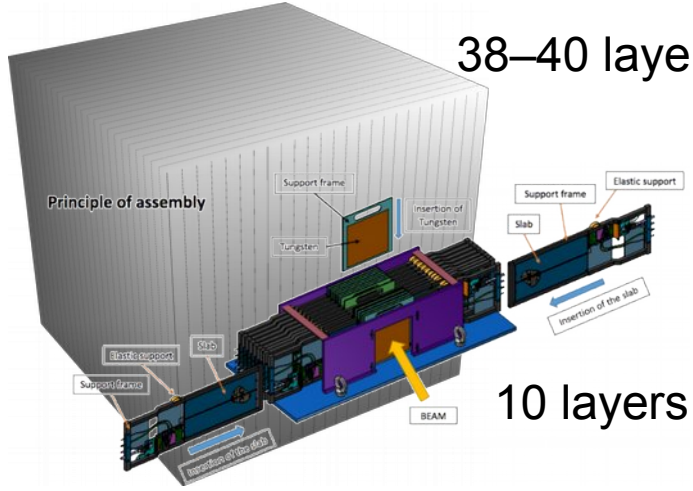

Failure to resolve neutral hadrons


Reconstruct fragments as separate neutral hadrons

Response of from **mip** to **High Energy** showers and High(er) rates

Test of **combined system for PFlow** in **realistic conditions** (number of layers, W configuration, gap).

– e(γ) + h for SW superposition



38–40 layers

10 layers