

# Quelques réflexions sur le 'concept CALICE' pour FCC

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***FCC-Contact, 13/05/22***



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# Concept CALICE vs ILD

CALICE est une collaboration de R&D:

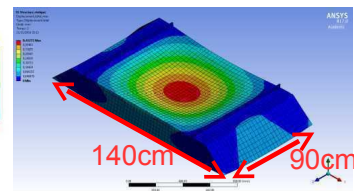
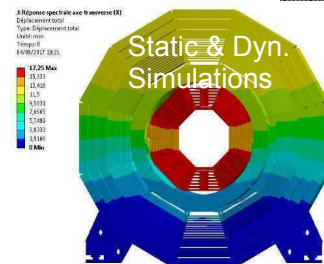
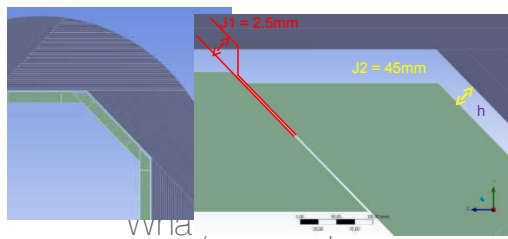
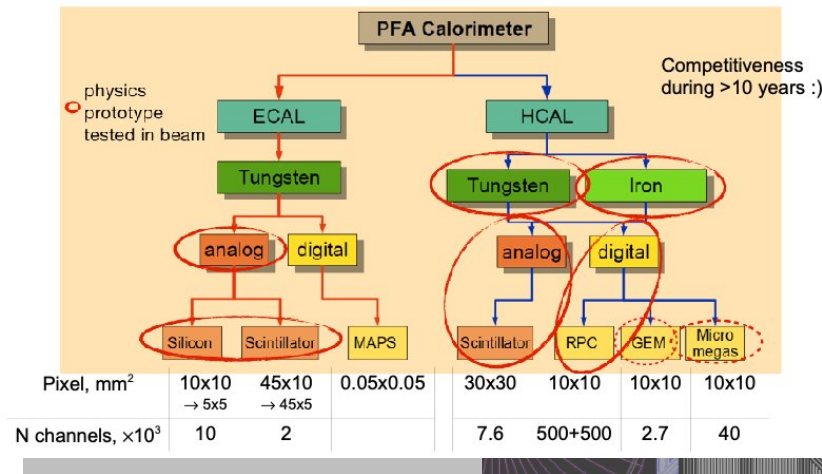
- MasterProject en FR (⇒ ILD en 2019 ?, ⇒ DRD en 2023+ ?)
- Calorimètres de haute granularité adapté au PFA
  - Résolution spatiale >> Resolution énergétique
- Prototypes, tests → test PFA

Concept ILD (CLICdet, CEPC-baseline, CLD) ↔ SiD

- Simulations : 2 ECAL opt. × 2 HCAL opt. × 2 radius
  - Analyse de physique full sim.
  - Thermique, mécanique
- Besoins:
  - Digitization, Timing, Re-optim. (at low E)
  - Looking forward on how to adapt to lower energy

## Technologies

Best PFA favors ~5x5 / 30x30 mm<sup>2</sup> granularity in analog ECAL / HCAL, but no final word yet.  
⇒ Several technologies within CALICE with different granularities

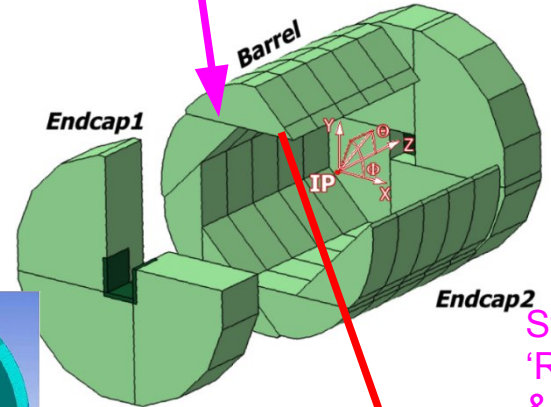
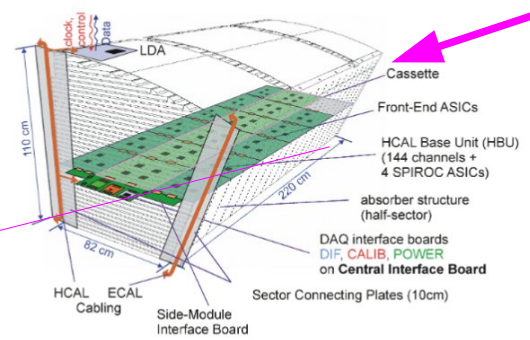
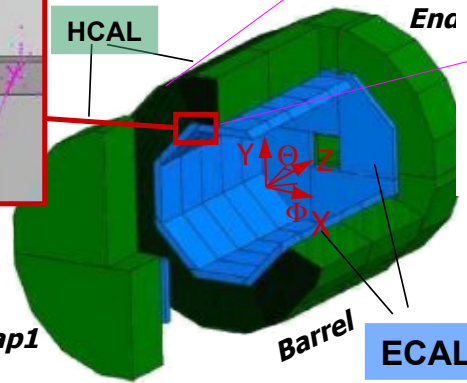
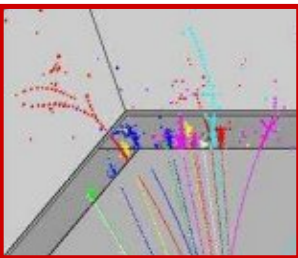


# Geometries & Services



HCAL elec 'accessibility'

Prism vs diapragm



Structural 'Robustness & Precision'

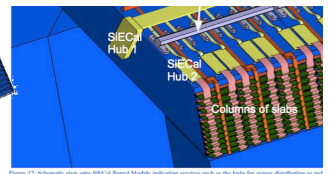
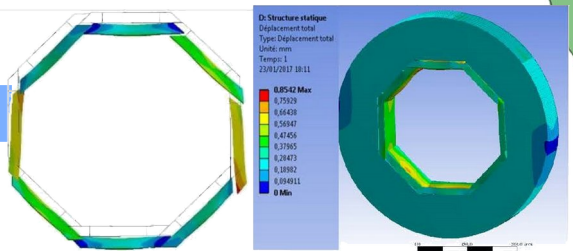
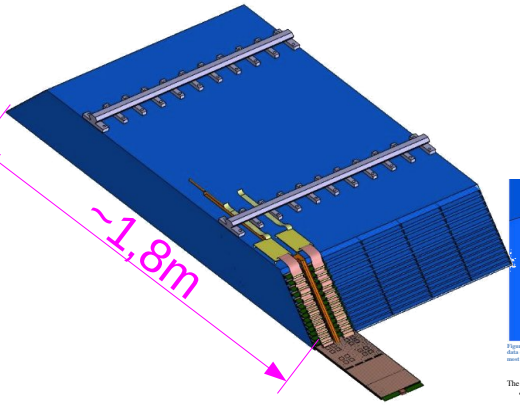
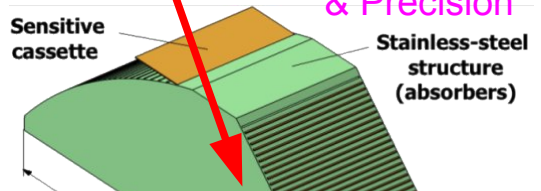
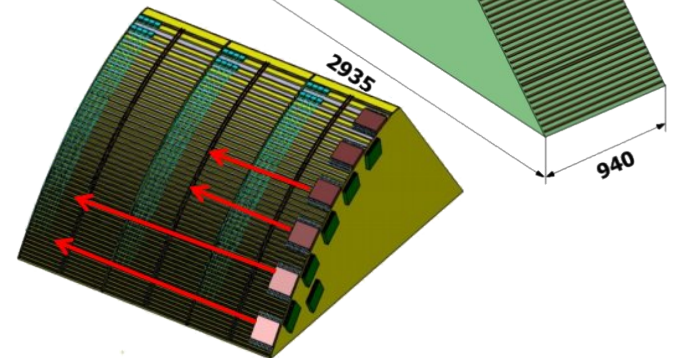


Figure 17: Schematic view into SIECal Barrel Module indicating services such as the hubs for power distribution as well data concentration and distribution of control commands. Note that the size of the hub may still vary (in particular hubs must presumably too small). Shown are also parts of the cooling system that is described below.

The following conventions will be used for the identification of the external hubs:

- SIEH1\_n: Here "H1" means that it is an external hub (Concentration Level 1), "n" labels a hub in front of a slave and "n" identifies the slave. In the endcaps the "n" may be replaced by a "c".

1.12. Block diagram



# Concept for Particle Flow oriented detector @ FCC-ee

Most complete presentation:  
*F. Simon @ FCC Week Nov 20*

## Tracking:

- decorréle du calo
  - ⚠ budget materiel

## Calorimètres Imageurs

## Aimant

- A l'extérieur !
  - suivi des particules critique

Etudes du CEPC (cf CDR)

## ECAL

- Scint (JP, CN ↔ DE) ou Silicium (FR)
- Granularité + grossière (1–2 cm)
  - Inclusion de cooling dans simulation
  - optimisation pour Z pole

## HCAL

- AHCAL : Scint 3×3 cm<sup>2</sup> ← HGAL option
- SDHCAL: RPC 1×1 cm<sup>2</sup>, multiplexed RO

## Geometry

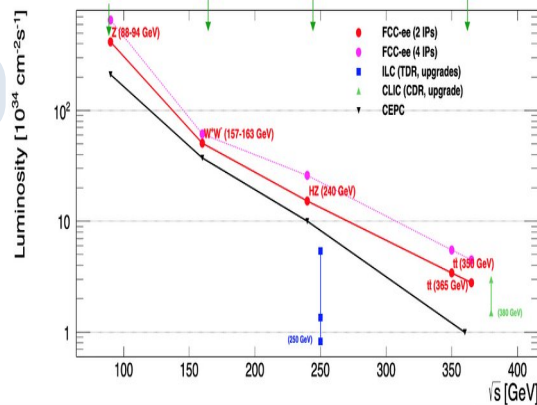
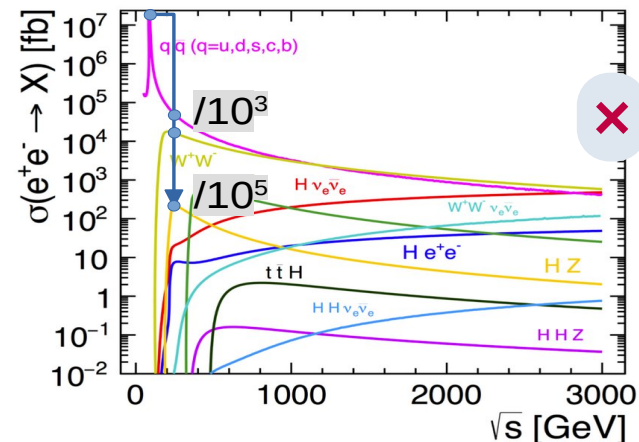
- Prisme vs Diaphragme

# Options pour avancer...

## Option 1: Ré-inventer

- Refaire une réflexion de fond sur les besoins

- $90\text{ GeV} \times 10^7 \text{ fb} \times 5 \cdot 10^{36} \text{ cm}^{-2} \text{ s}^{-1}$  (qq  $\times$  20000 ILC @ 250)
- $150 \text{ GeV (WW)} + 250 \text{ GeV (ZH)} + 280 \text{ GeV (tt)}$   
 $\sim 10^4 \text{ fb} \times 5 \cdot 10^{35} \text{ cm}^{-2} \text{ s}^{-1}$  (qq  $\times$  5–10 ILC @ 250)



## Option 2 : adapter depuis (aka CEPC, CLIC) $\rightarrow$ new collaboration

- Cooling, DAQ, etc.
- 1 detector fit-all ? e.g.  $\gamma$  resolution ?
- Replaceable parts ?  $\rightarrow$  adapted geometry
- Adaptive  $\mu$ -elec (cells grouping, optimal resol)
- B-field optim.

## Option 3: collaborer

- = option 2 with all ILD people
  - ECFA Higgs Factory path...
- Look at
  - Tech specific for High Rates  $\rightarrow$  TOOLS (PD FCC/CMS)
  - Timing for detectors, for PFA (en cours)
- Réflexions en cours dans ILD...

