



PS Upgrade

22 June 2010

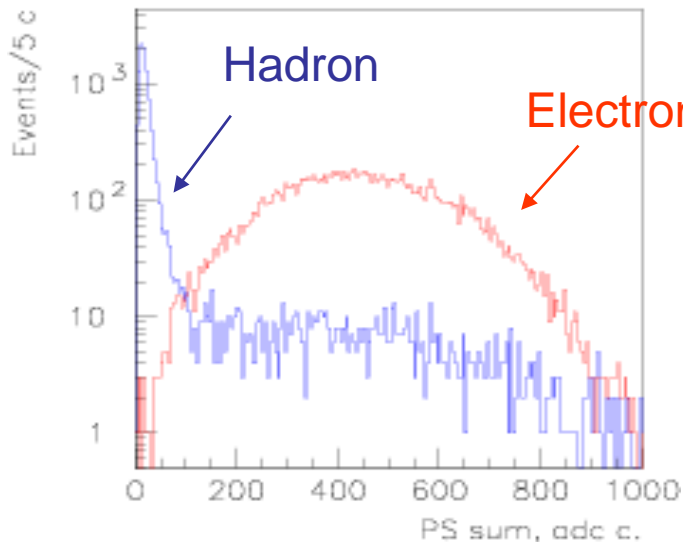
CALO Upgrade Meeting

Pascal Perret
LPC Clermont

PreShower Function

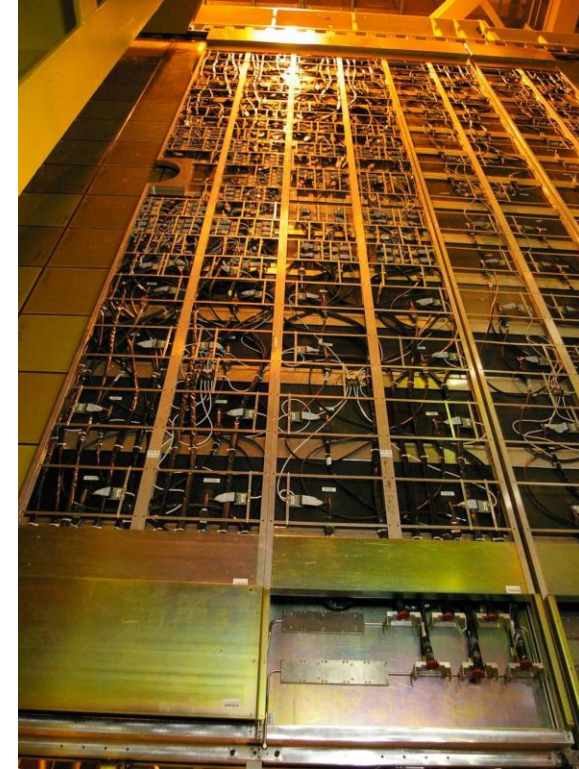
◆ Part of CALO system: SPD, PS, ECAL, HCAL

- Same granularity than SPD and ECAL
- 6016 cells used for:
 - Trigger L0: hadron /electron differentiation



Threshold at ~ 5 MIP

⇓
1 bit



- Offline: correction of electromagnetic energy measurement

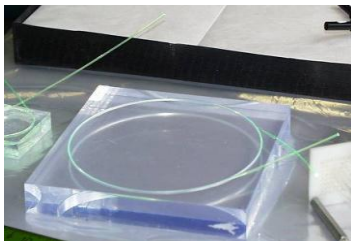
⇒ **Dynamics of the electronics:**

- Usefull dynamic range typically from 1 MIP to 100 MIP

⇒ **10 bit ADC with LSB = 1/10 MIP**

PS Electronics Characteristics

- ◆ Dynamics: 10 bits and 1 trigger bit

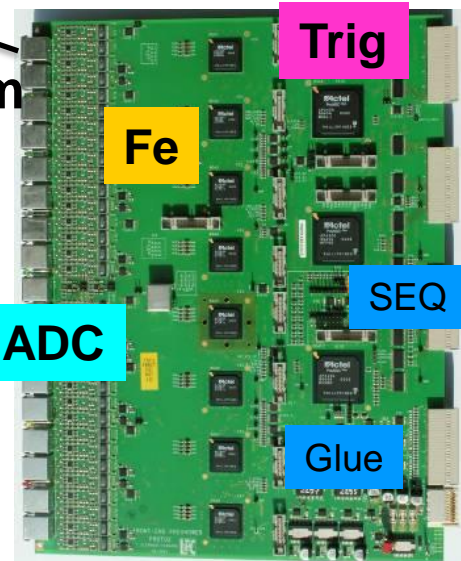


Cables ~27 m



chips

VFE board



FE board

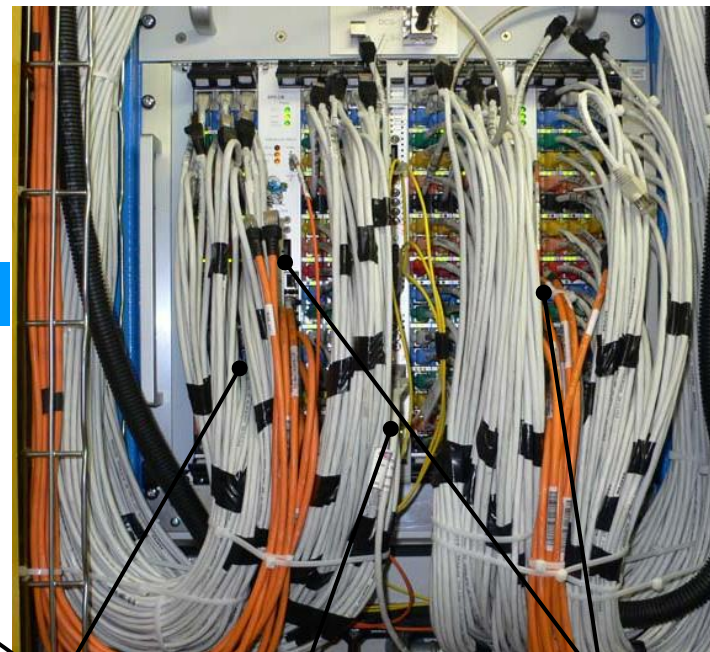
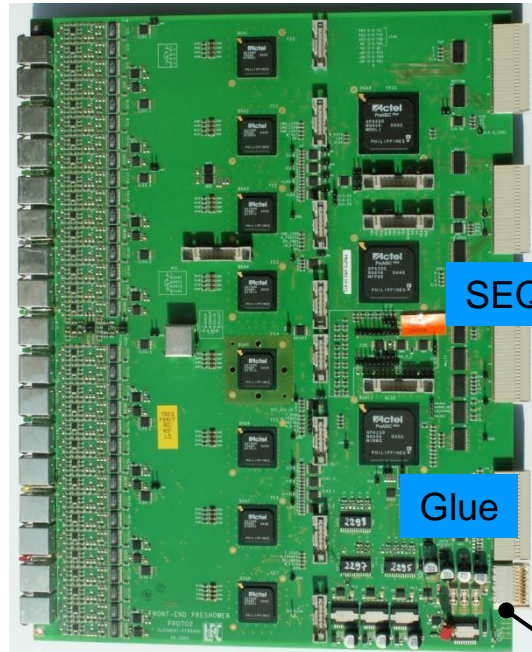
6016 channels:

64 channels/board \Rightarrow 100 boards

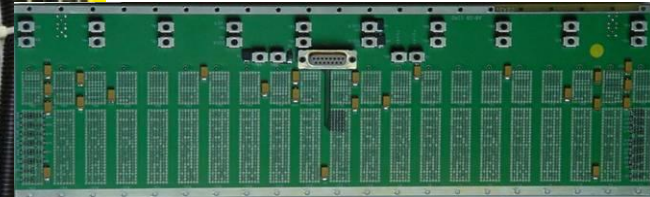
- ◆ **Processing in 2 parts:**

- A VFE part (analog) closed to PM: 16 chips dealing 4 channels each (sampling, signal integration, ...)
- A FE part (digital) in racks above the detector (27 m from VFE): 64 channels per board (ADC, calibration, previous sample residue subtraction, trigger threshold, fetching neighbourhood, SPD data processing, data storage, ...)

Common Solutions



Common Back plane
ECAL, HCAL, PS/SPD FE



Role of PS/SPD at 40 MHz cf Jacques' presentation 21/04/2010

Conclusion on PS/SPD

- Discussion on telephone conference April 16th (Hugo, Miriam, Marie-Noelle, Pascal, Frederic, J.L.)
- PS/SPD role minor for photon trigger
- PS/SPD changes candidates by about 1.6 for electron trigger
- Conclusion
 - It would be nice to redo main plots with higher luminosity Monte Carlo selecting events with multiple interaction (Hugo's but not immediately)
 - One should check with Hans (i.e. trigger group) the fraction of time spent in track finding in T stations ONCE THE TRACK LOCATION IS DEFINED BY THE ECAL CLUSTER (Hans intuition => smaller cluster => smaller road => faster than for Hadron trigger with HCAL seed)
 - Frederic checks role of PS/SPD in off line photon ID
 - In // study of offline role of PS/SPD for electron ID (Victor+Dimitri)
 - The decision based for trigger on cost of PS/SPD 40MHz vs bigger farm

To be done!

Role of PS/SPD at 40 MHz cf Frederic's presentation 21/04/2010

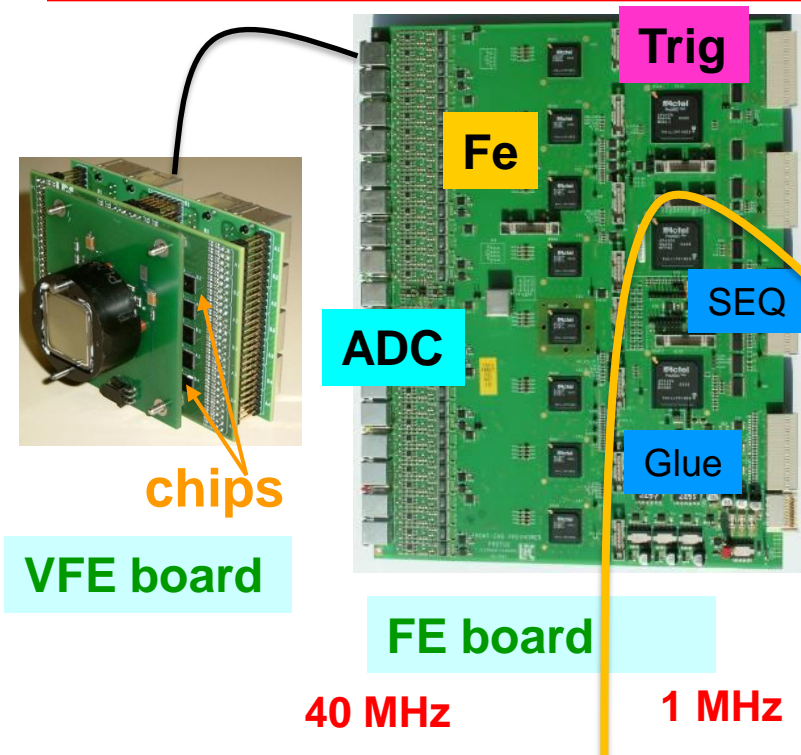
◆ Effect on the γ PID:

Conclusion

- The Prs information do help a lot especially at low Pt
- No taking this information into account leads to a degradation of the
 - Signal efficiency
 - or
 - Background rejection of $\sim 15-20\%$
- The Pt cut reduces the background contamination and counterbalance the effect
- Working at low Pt at high luminosity is difficult because of the pile-up
 - 2 examples (from presentation Upgrade meeting - 26/03/09)
 - High Pt photons : $P_{\text{sig}} \sim 10^{-4}$; $P_{\text{bkg}} \sim 2.5 \times 10^{-3}$; $\theta < 100 \text{ mrad}$

**More work
to do!**

PS Electronics @ 40MHz



◆ Probably the trigger part is no more useful ... Let 's assume it

■ 40 MHz part:

- VFE electronics: already exist
- FE electronics: same or similar components could be used
- MAPMT aging and radiation hardness to be checked ...

■ 1MHz part:

- DAQ/ECS: similar solution to XCAL electronics could be used?

◆ How many optical links?

- Data compression to be studied ...
- Backplane could be used for optical link in/out ...

◆ Cost: similar to current version ?~ 5000€/board?

Conclusion

- ◆ It could be useful to have a PS in the LHCb upgrade project, mainly for PID
- ◆ A lot of work to do:
 - Motivation to keep/remove the PS
 - Check that the VFE part could be used in high luminosity
 - Data compression and packing to be studied
 - Electronics to be studied
 - ...
- ◆ Manpower ...