

Développement d'une échelle double face pour la trajectométrie en physique des hautes énergies.

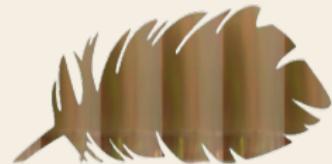
Ph. D. defense

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DESY

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1 Introduction

- Standard Model
- Higgs Boson
- ILC and ILD
- The two experiments at the ILC

2 Mechanical deformation

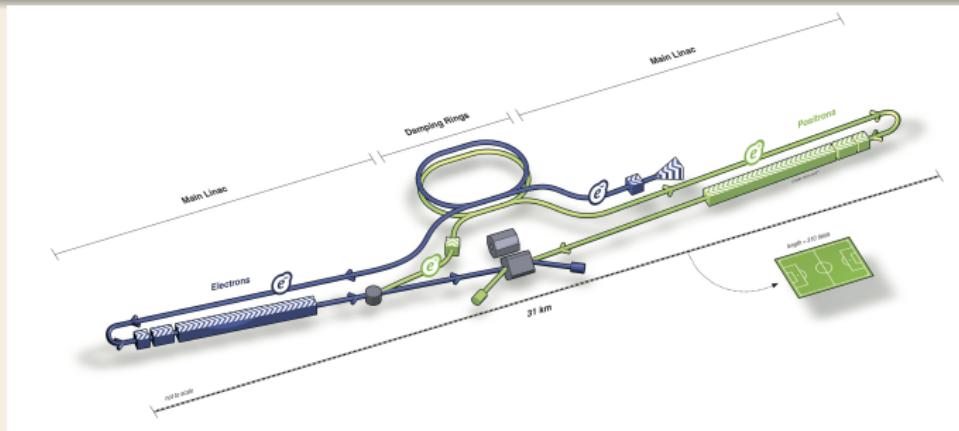
- TB-2011
- Spatial resolution
- Deformation

3 Radiation length measurement

- TB-2016
- Theoretical estimation
- Results

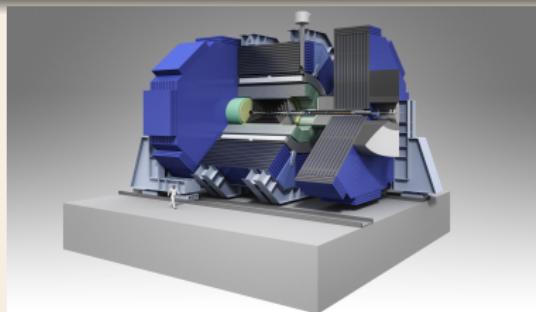
4 Conclusion and outlook

International Linear Collider



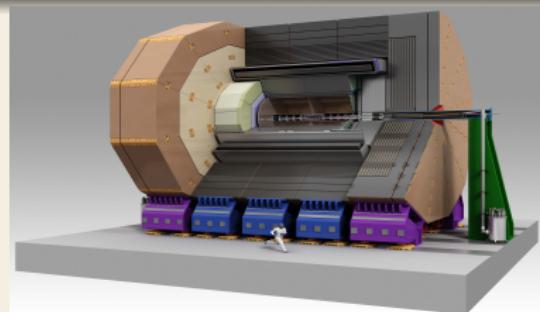
- Future e^+e^- linear collider at $\sqrt{s} = 250 - 500$ GeV (upgrade up to $\sqrt{s} = 1$ TeV)
- Polarised beam
- Luminosity $\simeq 2 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$
- Candidate site: Kitakami in northern Japan
- To study properties of the Higgs boson, top physics...

SiD and ILD



Silicon Detector

- Silicon tracking (radius = 1.2m)
- $B_{field} = 5\text{ T}$



International Linear Detector

- TPC + silicon envelope (radius = 1.8 m)
- $B_{field} = 3.5\text{ T}$

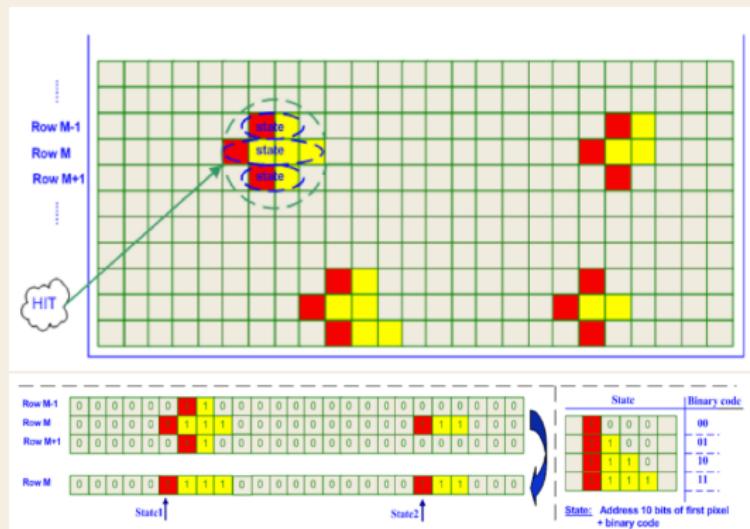
Both detectors designed for Particle Flow Calorimetry

- High granularity calorimeters (ECAL and HCAL) inside solenoid
- Low mass tracker to reduce interactions and conversions



Thanks for your attention !!!

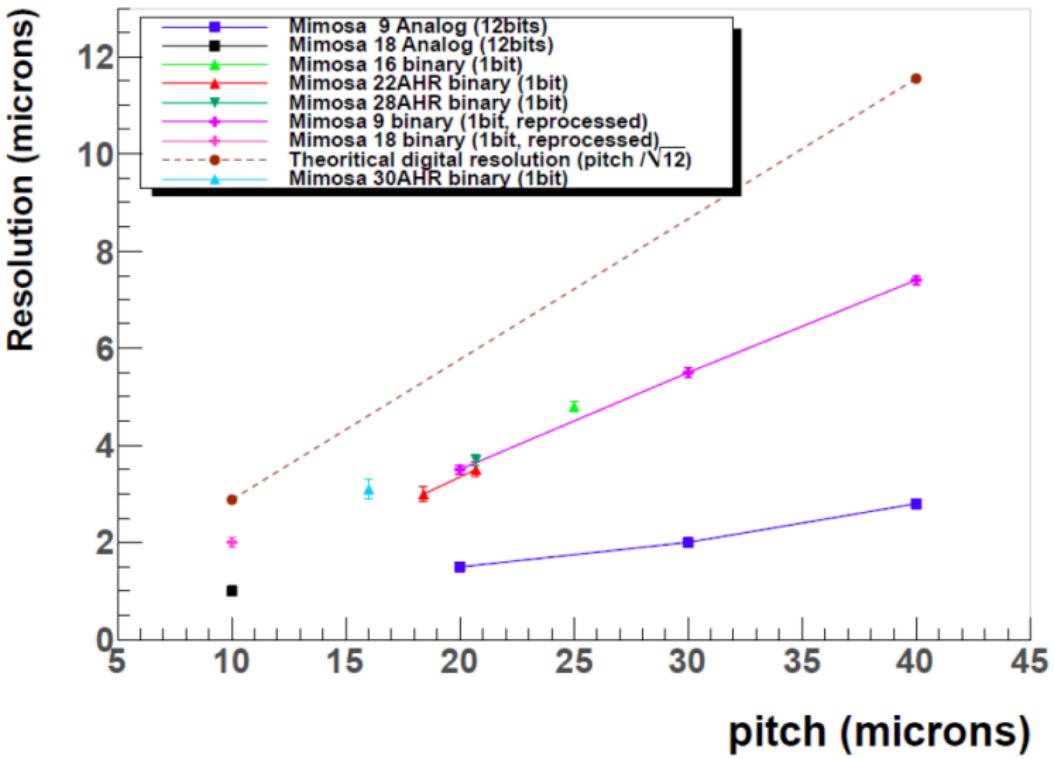
Zero Suppression logic (SUZE)



SUZE logic split in 3 blocks:

- **Sparse Data Scan (SDS)** Hit detection per line and data encoding, until 6 states consecutive pixels (1 to 4 pixels) per block of 64 columns;
- **Multiplexing Logic (Mux)** giving up to 9 states;
- **Memory storage** 2 blocks to store the states of the full frame, switching to avoid dead time (during one acquire states of event N, the other one transfer the information of frame N-1).

Spatial resolution for different pitch (IPHC-Strasbourg)



Higgs Strahlung kinematics

$$E_H = \frac{s - M_Z^2 + M_H^2}{2\sqrt{s}}$$

$$E_Z = \frac{s - M_H^2 + M_Z^2}{2\sqrt{s}}$$

$$|\vec{p}_H| = |\vec{p}_Z| = \frac{\sqrt{[s - (M_H + M_Z)^2] \cdot [s - (M_H - M_Z)^2]}}{2\sqrt{s}}$$

If $M_H = 125$ GeV, $M_Z = 91.2$ GeV and $\sqrt{s} = 350$ GeV, then:

$$E_H \simeq 185.4 \text{ GeV}$$

$$E_Z \simeq 164.6 \text{ GeV}$$

$$|\vec{p}_H| = |\vec{p}_Z| \simeq 68.5 \text{ GeV}$$

Detector performances

Vertexing

$$\sigma_{\text{IP}} = 5 \oplus \frac{10}{p \sin^{3/2} \theta} (\mu\text{m})$$

Tracking

$$\sigma(1/p) = 2 \times 10^{-5} (\text{GeV}^{-1})$$

Jet energy

$$\sigma_E/E = 0.3/\sqrt{E(\text{GeV})}$$

Particle Flow Algorithm

- Typical jet:
 - Charged hadrons \simeq 60 %
 - Photons \simeq 30 %
 - Neutral \simeq 10 %
- Standard approach
 - All jet components energy measured in ECAL/HCAL
 - $E_{jet} = E_{ECAL} + E_{HCAL}$
- Particle flow calorimetry
 - Measurement of charged particles in tracker
 - Measurement of photon in ECAL
 - Measurement of hadrons in HCAL
 - $E_{jet} = E_{Track} + E_{\gamma} + E_n$