Hybrid ECAL Mokka driver

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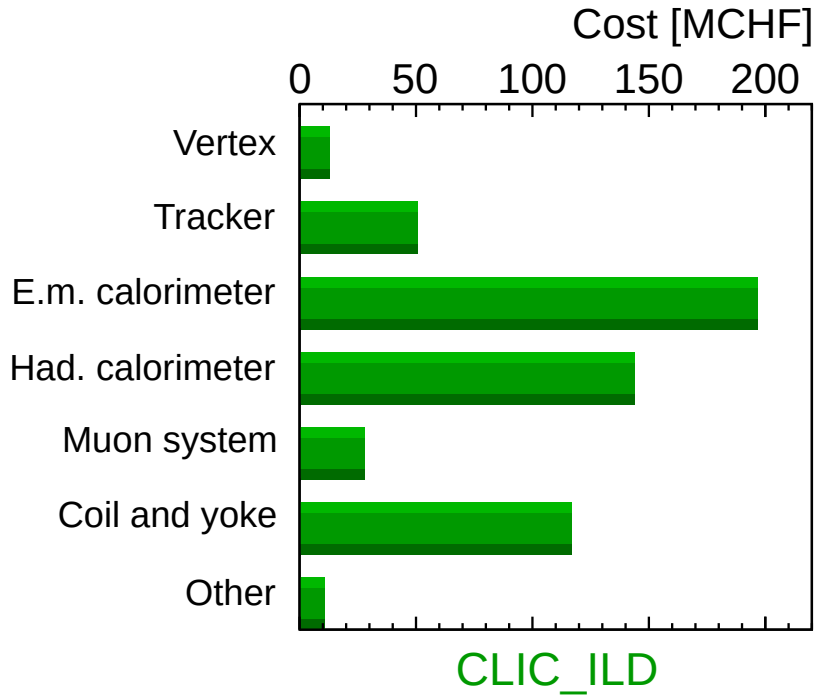
Introduction

- Simulation model for CLIC ▸ Conceptual Design Report (CDR): CLIC_ILD_CDR
- Based on GEANT4 application ▸ Mokka

ECAL in CLIC_ILD_CDR

- Sampling calorimeter: 30 layers of silicon-tungsten (23 X_0, 1 λ_I)
  - 30 tungsten absorber plates: 2.1 mm $\times 20 \approx 0.6\ X_0$
    4.2 mm $\times 10 \approx 1.2\ X_0$
  - 0.5 mm thick silicon cells of 5.1×5.1 mm^2

- ECAL is the cost driver (35%), mostly due to the price of the Si wafers
- Would like to decrease the price without loosing performance
  $\Rightarrow$ **ECAL optimisation studies**

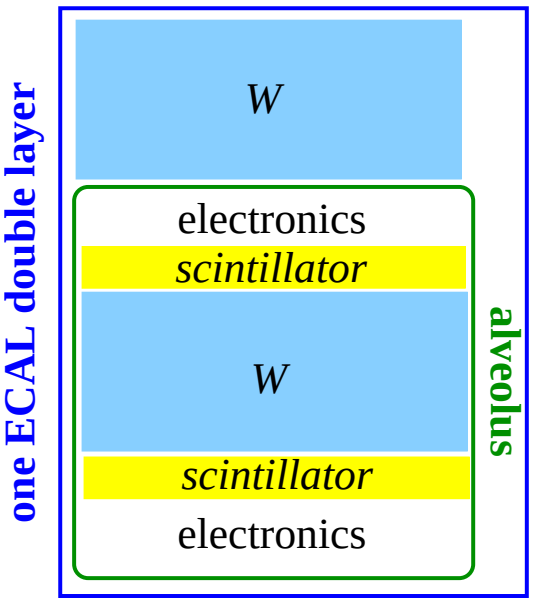


Simulation studies towards ECAL optimisation

- Several possibilities to decrease price without degrading detector performance too much:
  - geometry changes (e.g. number of layers and absorber thickness)
  - combination of silicon and **scintillator** strips/tiles ⇒ hybrid ECAL
- For an overview of previous studies see for example talk at kick-off meeting for CLIC ECAL studies

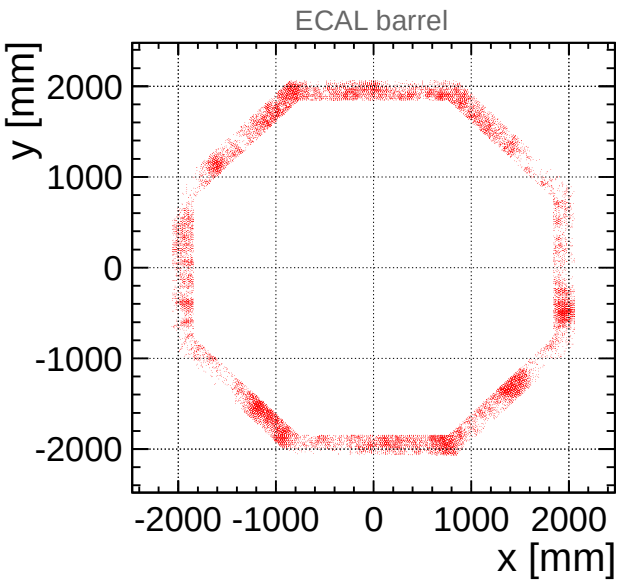
Hybrid ECAL Mokka driver

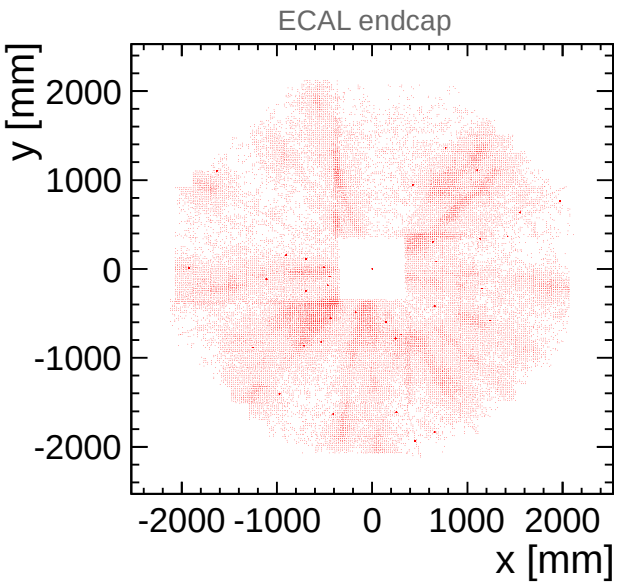
- Idea: start from `SEcal04` Mokka driver (silicon and scintillator strips) and adapt it for **scintillator tiles** of 2 cm $\times$ 2 cm $\times$ 2 mm
- Size adjustable via steering parameter *Ecal_scintillator_cell_size*

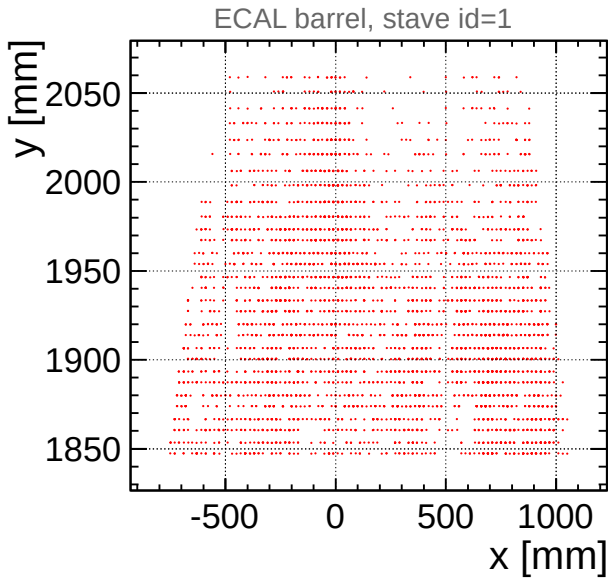


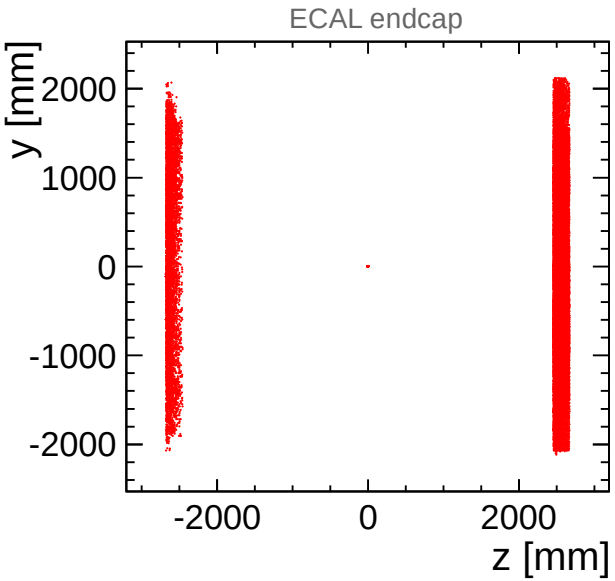
- Active material selected with steering parameter *Ecal_Sc_Si_mix*:
  15 numbers from 0 to 3, for each **double layer**
- Convention: '0'=silicon, '1'=scintillator
  - Both layers silicon $\rightarrow$ '00' $\rightarrow$ 0
  - Both layers scintillator $\rightarrow$ '11' $\rightarrow$ 3
  - First silicon, second scintillator $\rightarrow$ '01' $\rightarrow$ 1
  - First scintillator, second silicon $\rightarrow$ '10' $\rightarrow$ 2

Hybrid ECAL: hit maps









Conclusions

- Mokka driver of hybrid ECAL with scintillator tiles ready for testing
- Geometry sketches can be found in note from ECAL meeting on December 13, 2012