Mechanical frame for LUXE ECAL-P (very initial/starter questions)

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ECAL frame: design assumptions

Absorber planes

- number of planes (20 ?, 15 ?)
- plane thickness (1 X_0 = 3.5 mm ?, some of them 2 X_0 = 7.0 mm ?)
  (some of them below $<$ 3.5mm, esp. in the few first layers ?)
- transverse size of single plane: 90 $\times$ 540 mm^2
  (two halves of 90 $\times$ 270 mm^2)

$\Rightarrow$ Each absorber plane should rather consist of a single tungsten plate.
Putting smaller plates together would make design much more complex and required precision (eg. concerning air gap) more difficult to obtain.

Frame design

- air gap for silicon sensors: 1 mm ?, 1.5 mm ?
- "open architecture" (15 layers with more empty slots $\div$ option for 20 1 X_0 layers)
- "double slots" with option to house also 1 X_0 layers ?
- **access (inserting/removing) the planes (silicon + tungsten) from the side ?**

$\Rightarrow$ Power and signal cables connected from the top (?). With access from the side the structure is constrained from two sides only. Why is it needed?
Can be more difficult for mechanical stability and positioning...

- mounting of the frame on the experimental table in the hall?
- ???

ECAL frame: design assumptions

Sensors

- what will be the exact size (XYZ dimensions) of CALICE sensors ?
- independent mounting (in carbon fiber “envelops”) ?

$\Rightarrow$ Can six sensors in one layer be put in one envelope?!
This would significantly simplify the structure and also provide more precise alignment between sensors!
Independent envelop for each sensor would probably result in increased dead area between them.

- sensors glued to the tungsten planes ?

$\Rightarrow$ Can make removal of a single sensor or sensor plane more difficult.
Alignment between sensor planes is also more difficult.

ECAL frame: design assumptions

Alignment

- positioning tolerances ? spacers ? sensor alignment between layers ?
  (Tungsten Moliere radius: 9.3 mm (PDG) 20 mm ECAL study; pixel 5.5 mm)

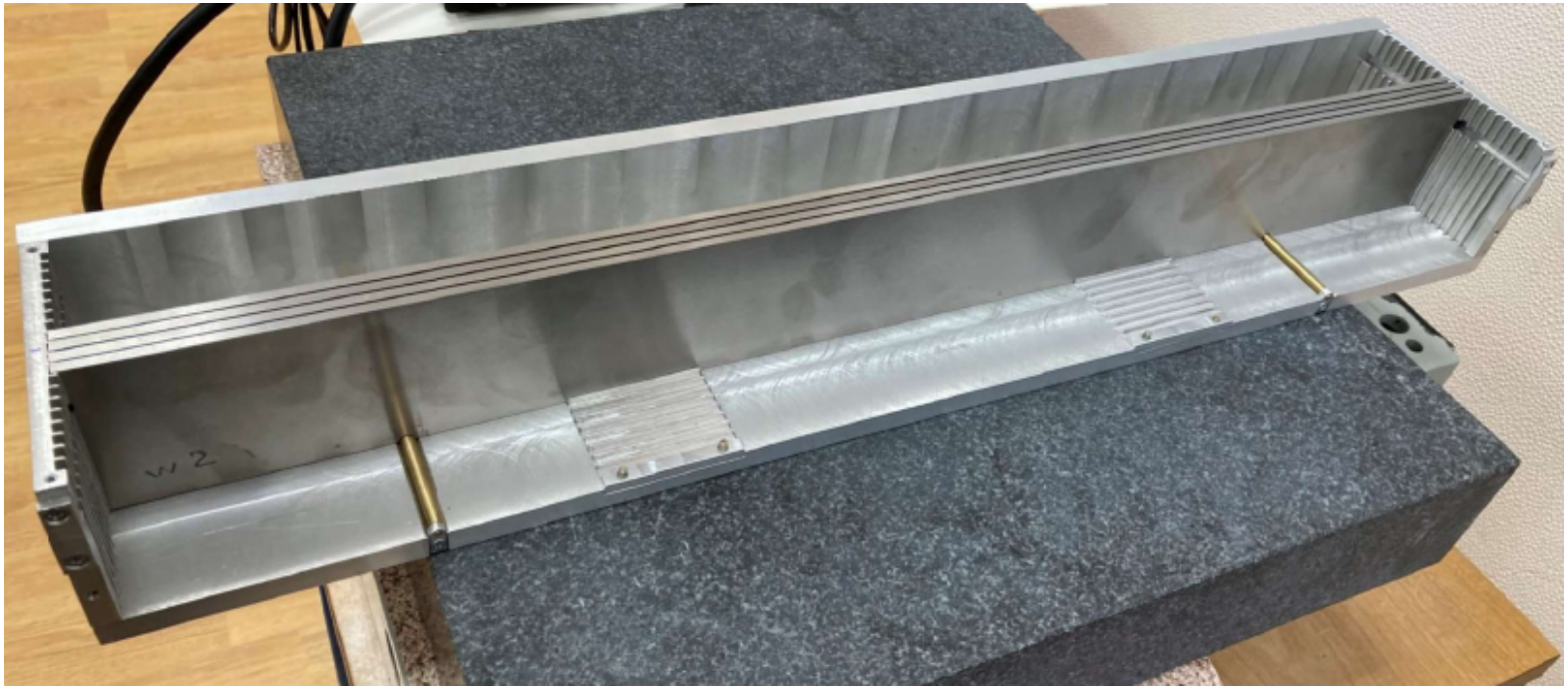
$\Rightarrow$ Not relevant on event-by-event basis, but can be important for systematics (eg. position vs energy scale determination).
What is the precision of beam spot position measurement in beam tests?

- Frame positioning in the experimental hall:
  - extra “fixture points” on the frame ?
  - some extra “degrees of freedom” ?

  $\rightarrow$ moving/shifting/rotating the frame ?

  $\rightarrow$ adjusting the tilt ?
- ???

ECAL frame: existing old prototype

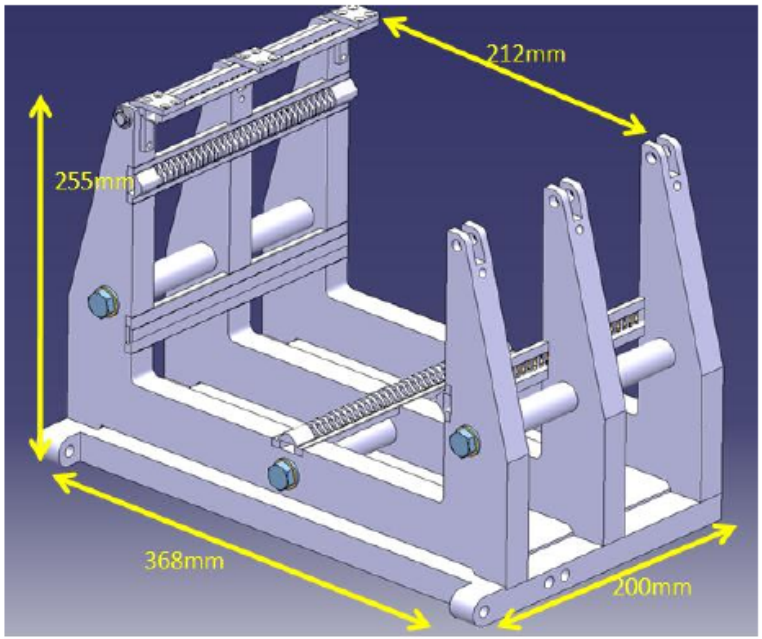


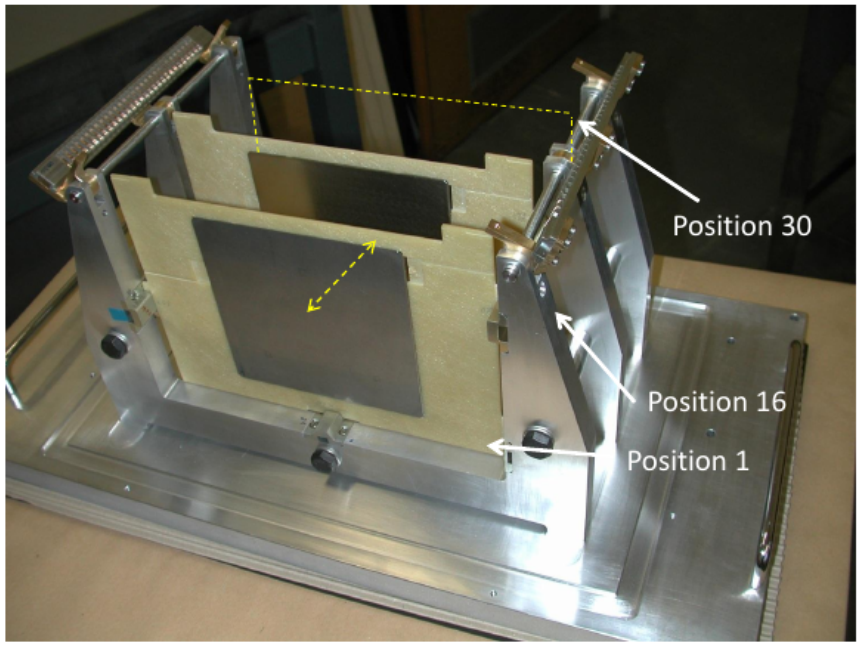
- what should we adopt from it ?
- **it does not allow to access the planes from side !?**
- brass bars for positioning of tungsten (and sensor?) planes

$\Rightarrow$ can similar bars be used for horizontal sensor (envelope) positioning?

- any documentation of the existing prototype (.STEP format ?)

AIDA prototype





- openwork style: more flexible solution
- better options for vertical and horizontal positioning
- changing the pattern of combs to adopt different number of layers
- ... and/or different layer thickness

Critical issues to start new design

- openwork or “solid” frame ?
- stainless steel or duralumin (?)
- number and size of tungsten planes (20 ? 3.5mm ? 9*54cm2 ?)
- **access to the planes form side (?)**
- separate or glued sensors and tungsten plates (?)
- if sensors in ’envelopes’ : what size of the structure ?
  the same as tungsten plates ?

- time scale for:
  - design
  - mockup prototype (1:1 scale, looser tolerances to verify the plates fixture)
  - final version