Status of the ND ECAL.

CALICE Satellite Physics discussion

Eldwan Brianne
DESY
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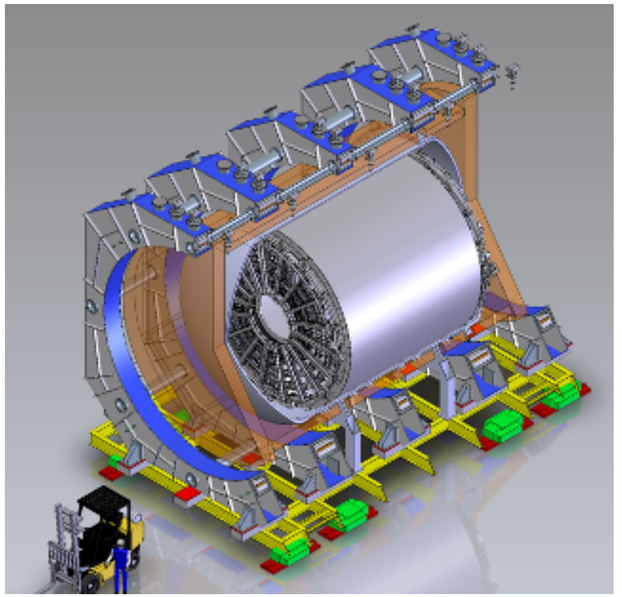
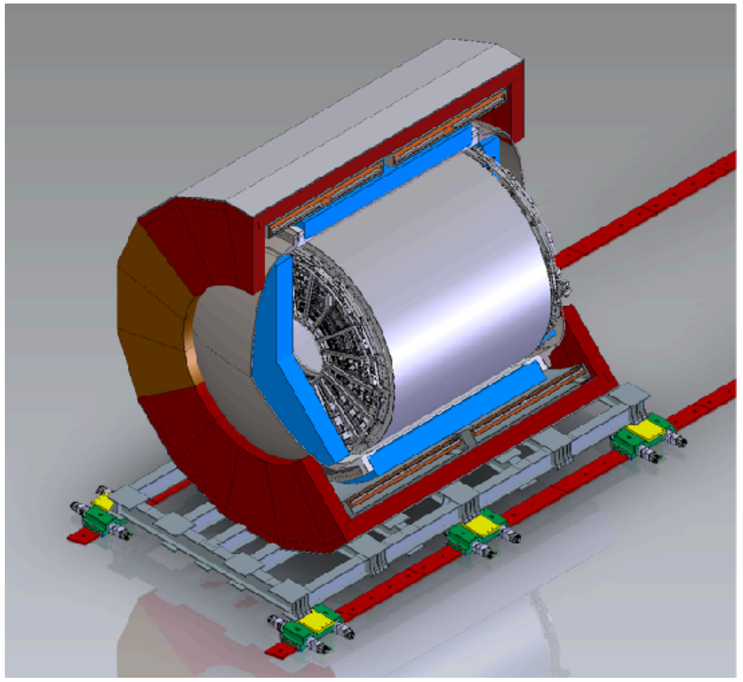
Current status of the ND-GAr design.

What is that thing?

- Goal of the ND ECAL: NC background ID (neutral pions)
- The design of the ND-GAr evolved quite a bit from the last few months (especially the magnet)
  - Initial design: Helmholtz-coils
    - ECAL was outside of the pressure vessel entirely
    - Quite large surface to cover: ~ 7 m in length for the barrel, ~3 m radius of the endcaps, 300 t total weight
  - Revised design: Solenoid magnet with partial return yoke
    - Change in the ECAL design: Barrel outside the PV, Endcap inside
    - Much smaller: ~5 m length, 2.7 m radius endcaps, 200t total weight
  - Space for barrel limited to around 76 cm (practically depends on barrel geometry)

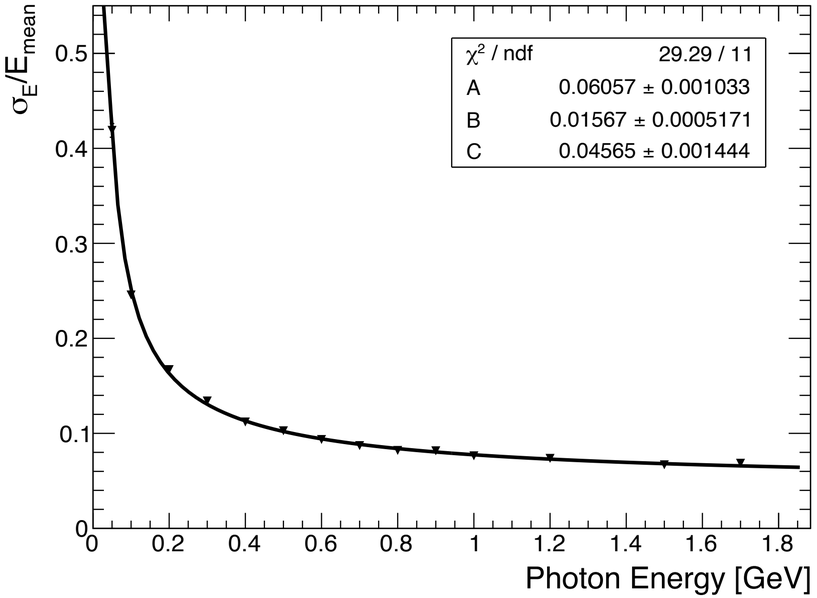


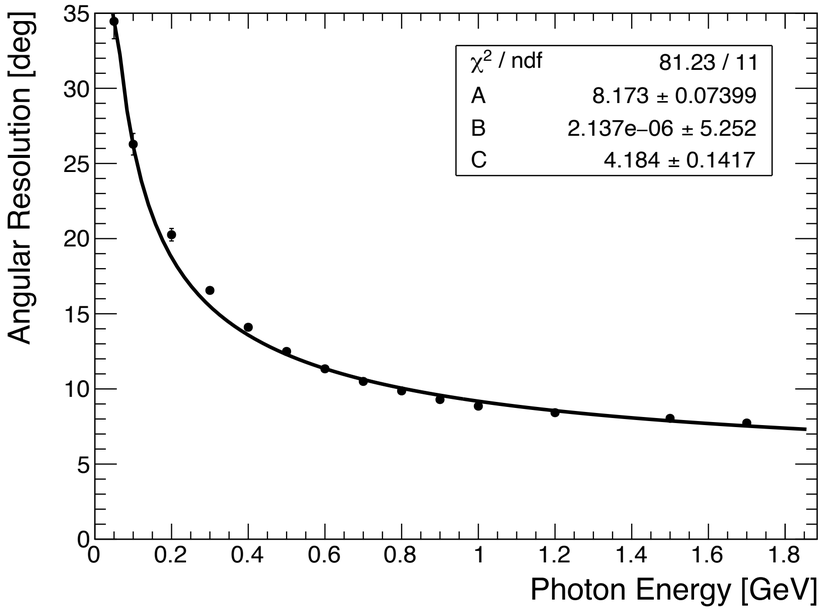


Current layer design.

So far on optimisation

- Optimisation of the ECAL has been ongoing since some time already
  - Starting with Lorenz's master (https://arxiv.org/pdf/1810.03677)
  - Ongoing with implementation in the ND Software framework
- Current design
  - 2 mm Cu absorber with 5 mm Sc (60 layers)
  - Using a mix of tiles (2.5x2.5 cm^2) and strips (4 cm width)
  - 8 tiled layers in the front / 52 stripped in the back
- Still place of improvement in the optimisation
  - How to place tiled/stripped layers?
  - Absorber material / thickness (optimise Eres for low photon energies)
  - Particle identification
  - Strip width
  - Upstream/Downstream
  - Neutrons (ToF)





Current issues.

Open questions

- Main current roadblock
  - An engineering design of the ECAL is needed now
  - Design of services/dead zones and impact on performance
- Input from the physics side
  - Have been in talks with the BSM group and few others peoples
  - Would be great to have more input from the physics side to further guide the optimisation
- Timing
  - What type of plastic? Fiberless? What time resolution needed/ achievable?
- Proof of concept
  - Need for prototyping: layers, strips, daq… (ideally a full prototype of few layers)

Backup Slides.