# ECAL resolution studies with FCCSW

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Intro to resolution studies

▶ Samples generated and reconstructed with 1000 events per E bin from 5 to 170 GeV
▶ Study cases with & without noise and drift chamber (DCH)
▶ Shooting particles to ECAL barrel, $55^o < \theta < 125^o$
▶ Using FCCSW "nightly build" from December 2024
▶ Resolution measured from Gaussian fit to response histo
  • Fit range = Mean $\pm$ 2×RMS
  • Relative resolution defined as $\frac{\sigma}{\mu}$
    (i.e. dividing with E_{reco}, not E_{gen})
▶ Fitting the resolution points with a quadratic fit
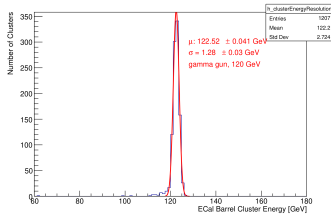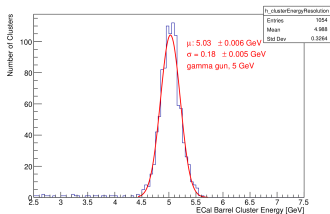
All "relevant" particles

ALLEGRO full-sim ECAL cluster resolution
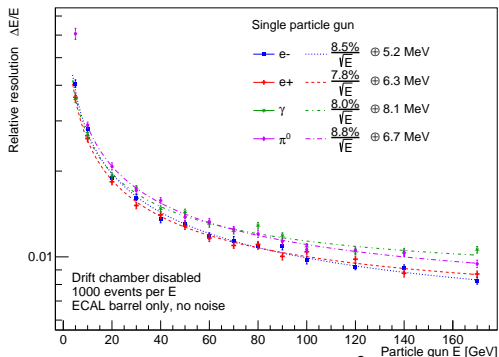
- ▶ Resolution studied for e^-, e^+, γ and π^0
- ▶ Drift chamber disabled (very low impact, 5% of X_0)
- ▶ Sampling term 7.8% – 8.8%, constant term 5.2 – 6.7 MeV
- ▶ Better resolution for positrons than electrons - inclination?
- ▶ Photon resolution worsening at high-E; punch-throughs?
- ▶ A systematic bump at 80 GeV? (using same random seed)

Electrons with and without noise
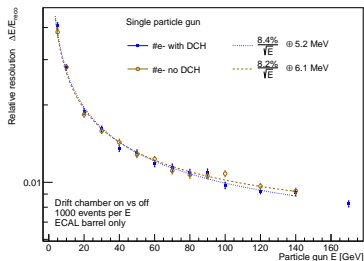

ALLEGRO full-sim ECAL cluster resolution
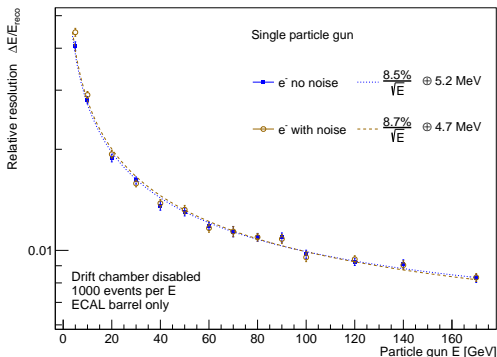
- ► e^- resolution with and without noise (no x-talk!)
- ► Noise seems to have very small impact
  - • But has huge (10x) impact on reco time and disk usage!
- ► According to Brieuc, low impact of noise is expected – simulation assumes 200 ns shaping and thus low level of noise

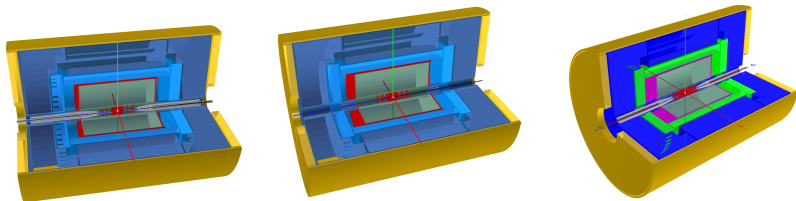# Photons and electrons with and without DCH
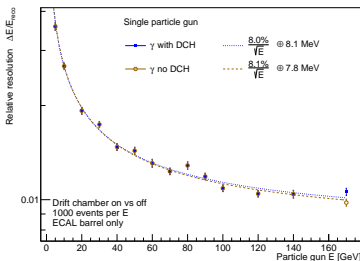
- ▶ γ and $e-$ resolution, drift chamber on and off
- ▶ No signs of the "DCH bug"
- ▶ Small impact, as expected; "DCH is 5% of X_0"
- ▶ e^- resolution slightly better without DCH
  - • For γ no difference
- ▶ Studies limited by modest statistics
- ▶ 170 GeV point missing for no-DCH e^-; fit limited to 140

Conclusions

▶ My first look to ECAL resolution studies with FCCSW and ALLEGRO full-sim

▶ No warranty; still learning my ways with FCCSW

▶ Next step: study material and geometry choises
  - Active medium, absorber material, thickness of ECAL, ...
  - What else?

FullSim renders done with Giovanni's "calovision" tool:
`https://github.com/giovannimarchiori/calodisplay`