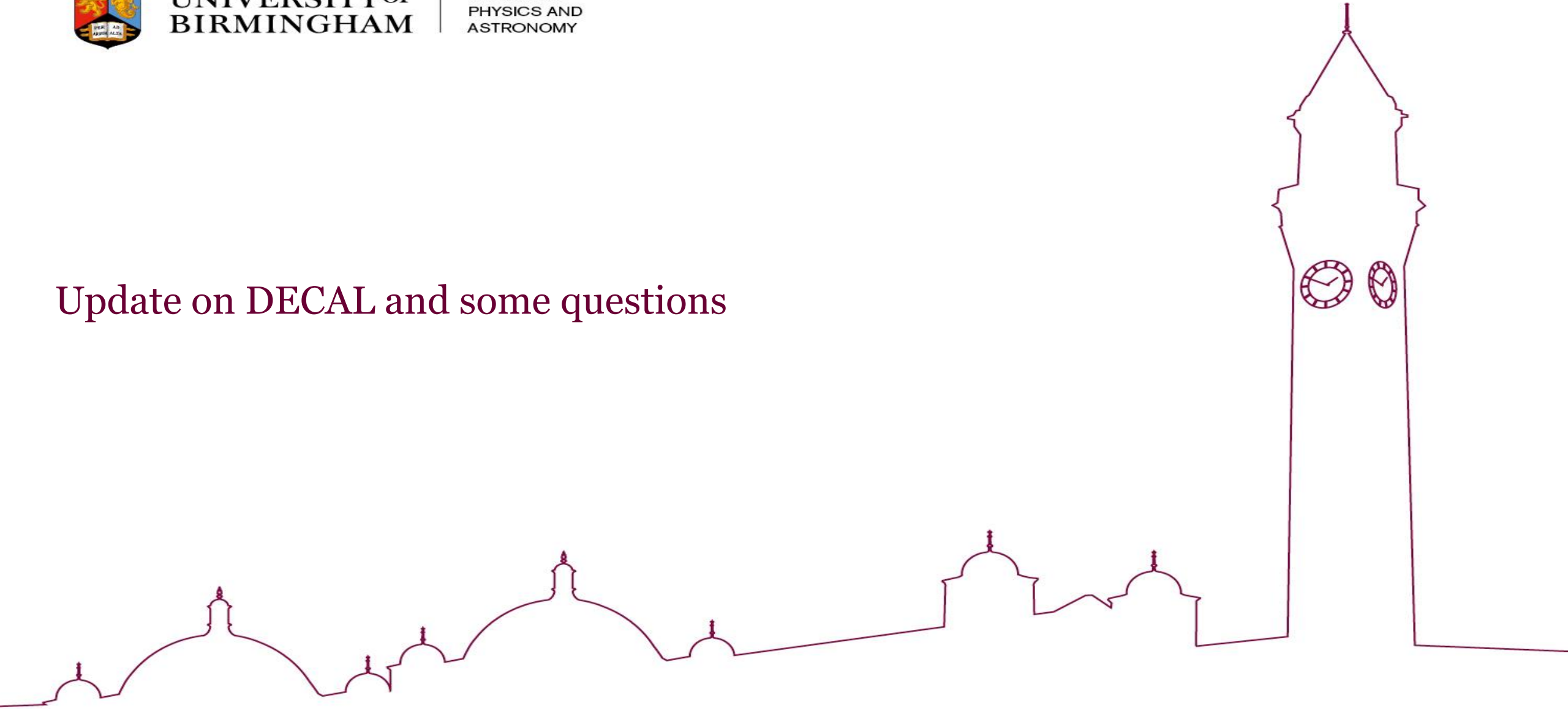




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## Update on DECAL and some questions

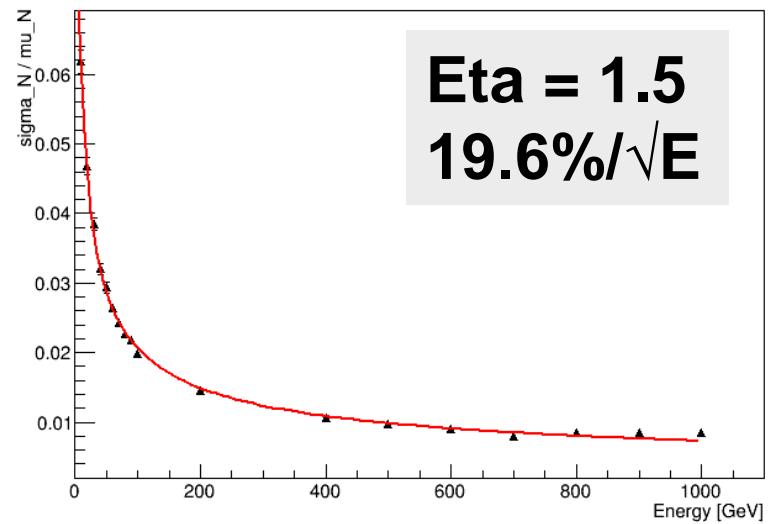
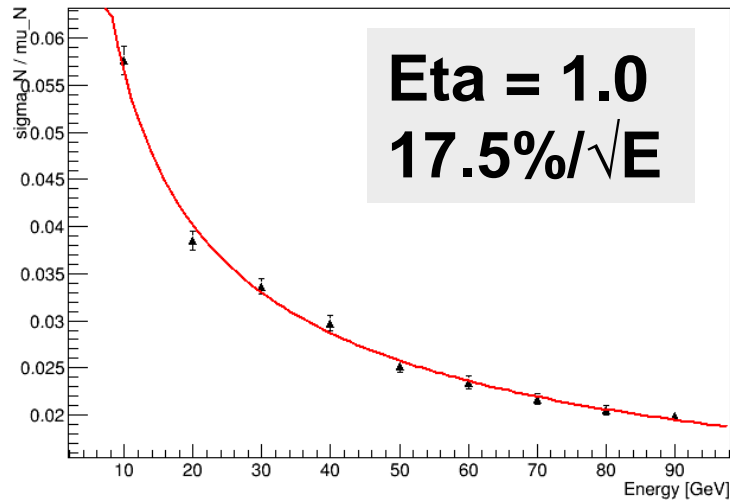
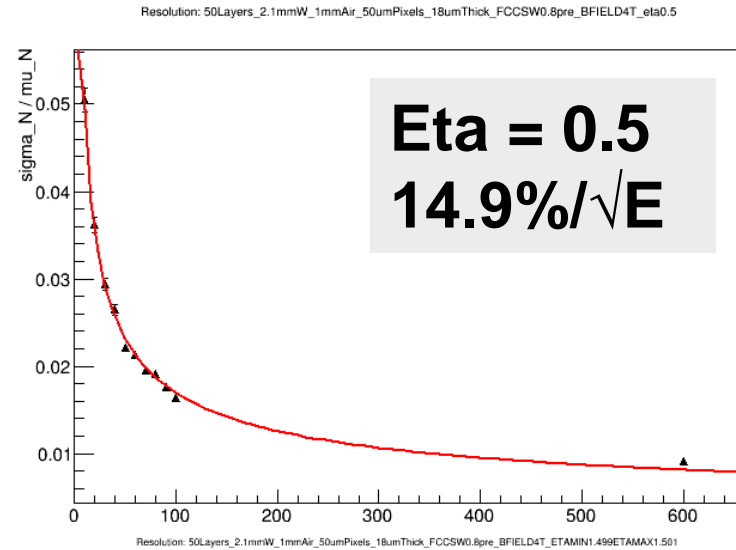
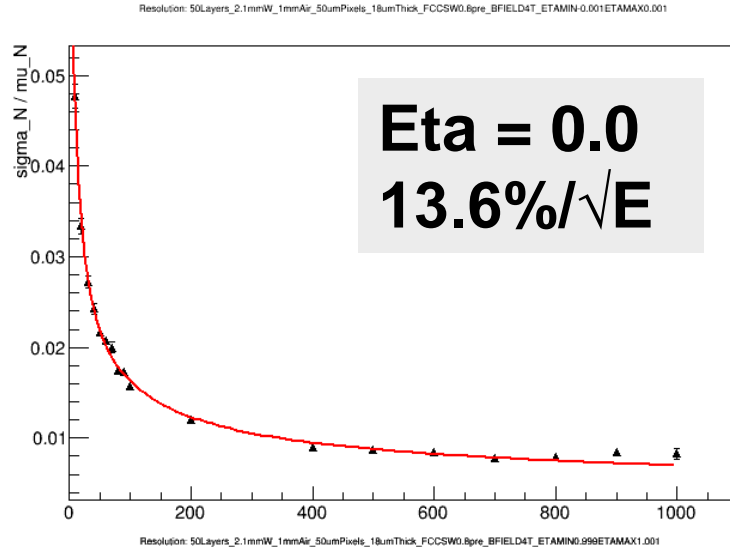


## Eta Dependency

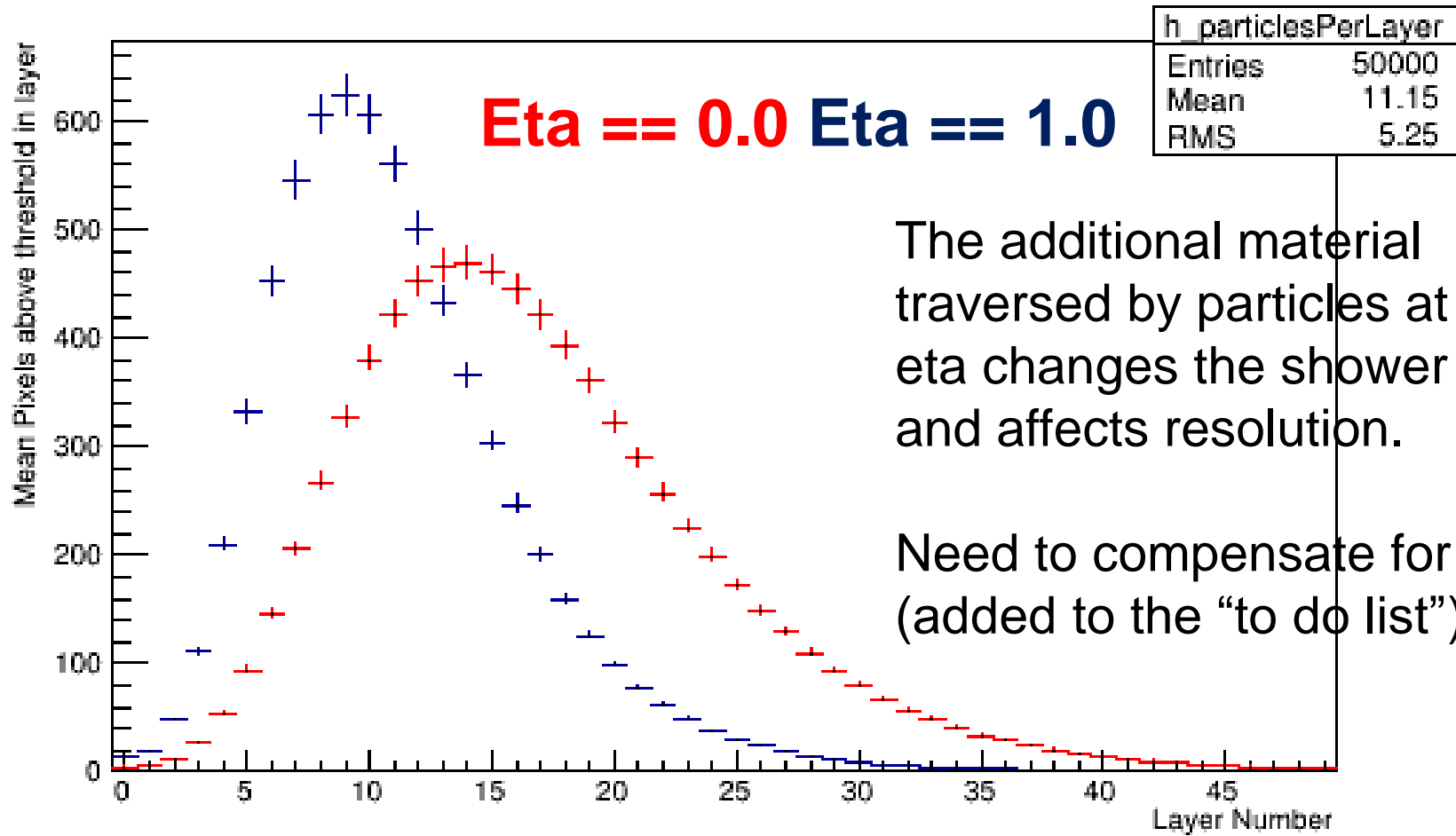
- For these studies I used the following in the barrel region
  - 50 Layers
  - 2.1mm W per later
  - 18um epitaxial thickness (sensitive region)
  - 1mm Air Gap
  - XYZ segmentation of 50x50x50 um
  - FCCSW 0.8pre
- Varied the eta to 0, 0.5, 1.0, 1.5



# Eta Dependency

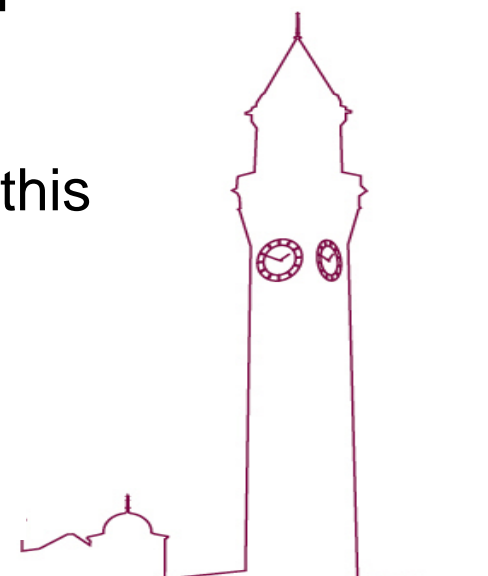


# Eta Dependency



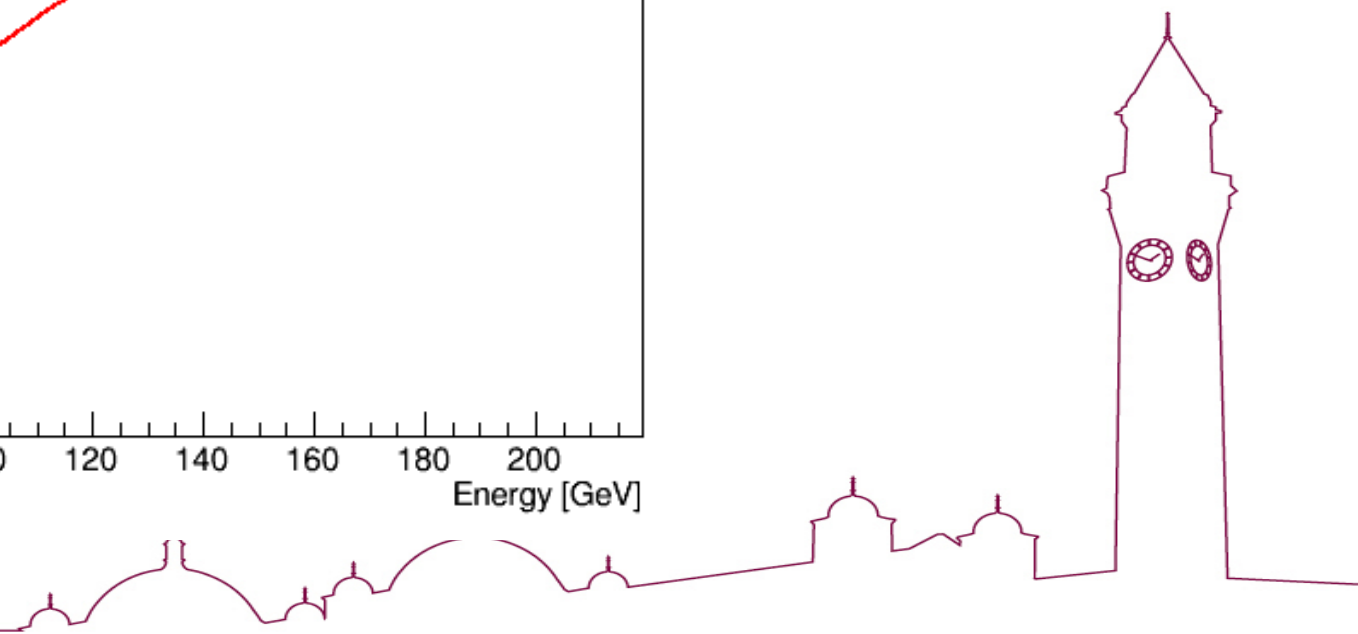
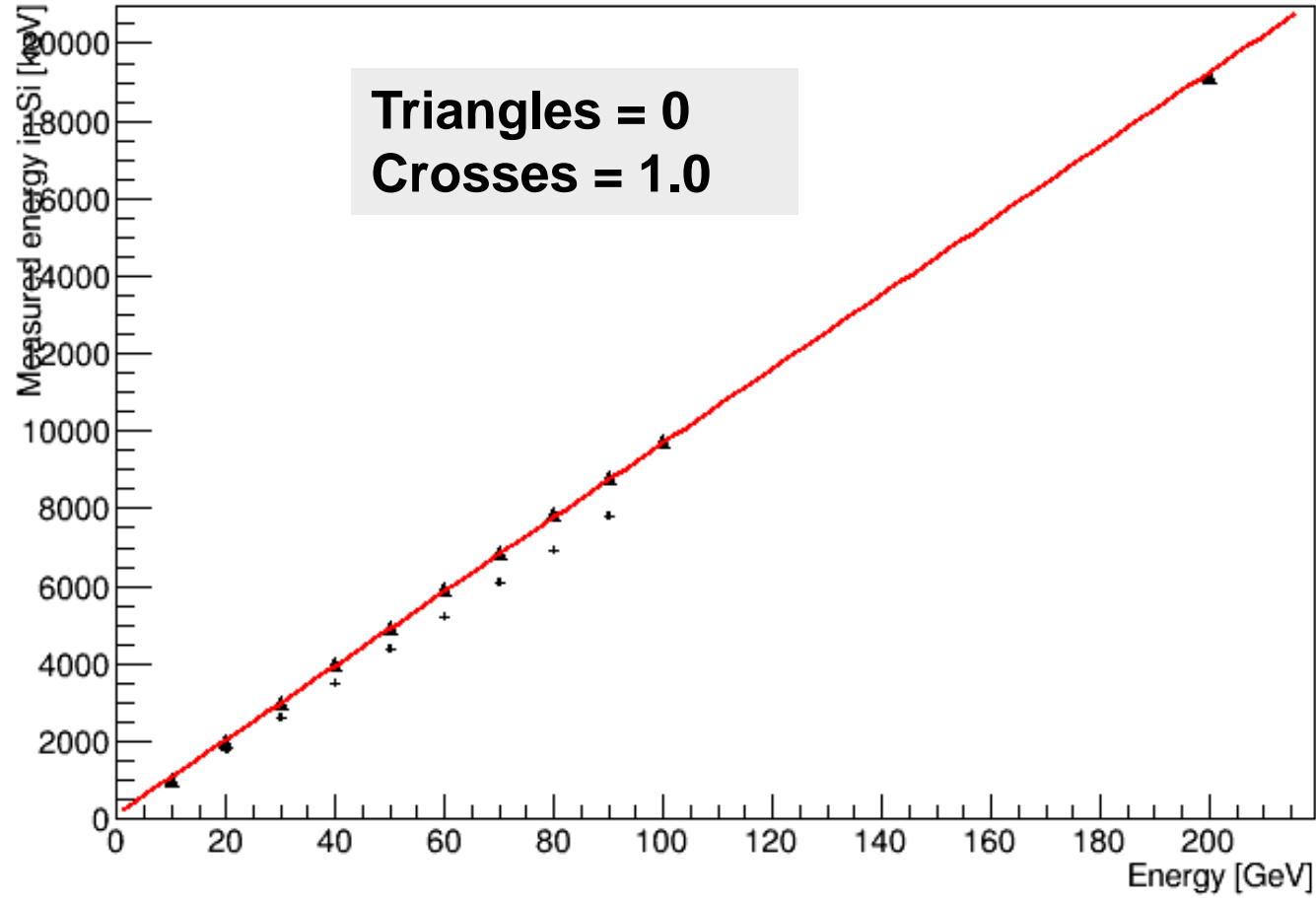
The additional material traversed by particles at larger eta changes the shower profile and affects resolution.

Need to compensate for this (added to the "to do list")



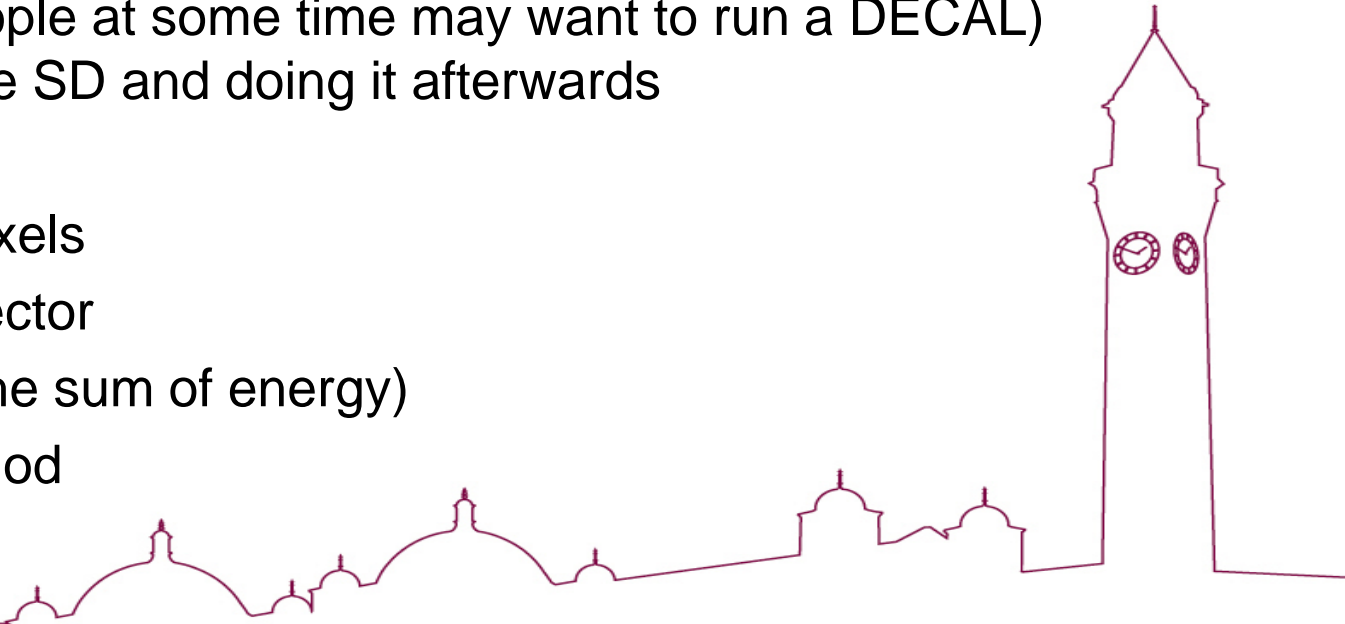
# Eta Dependency

Linearity: Compare eta



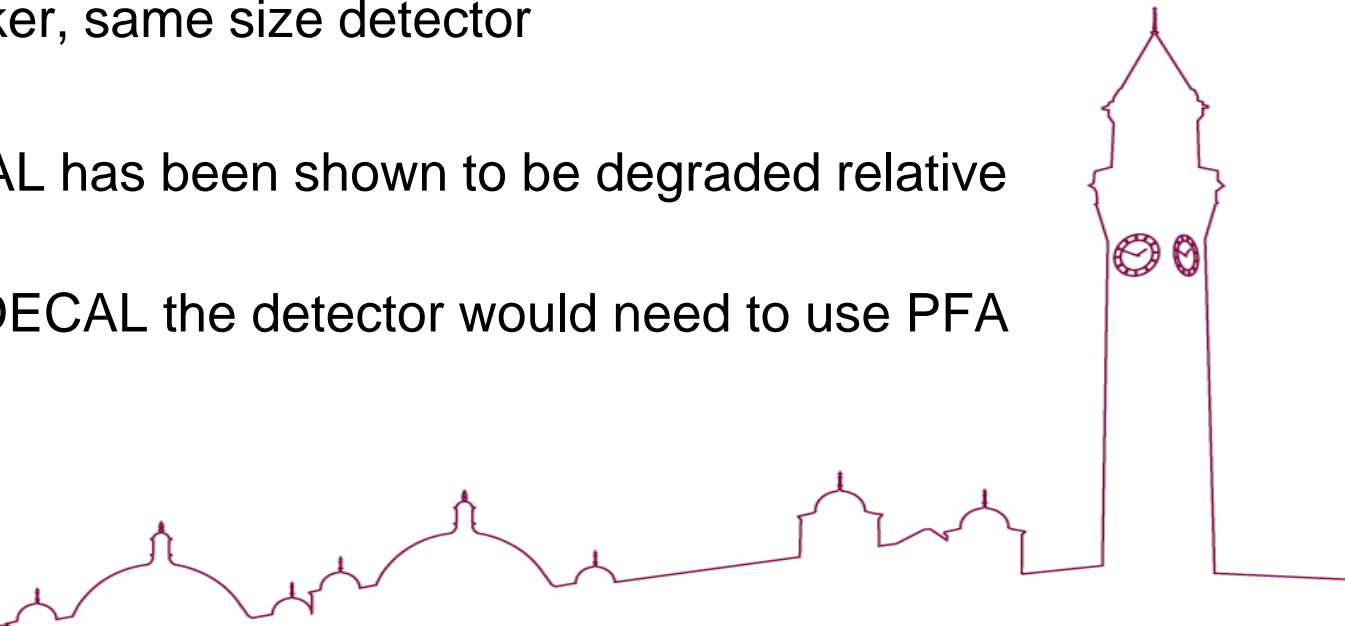
## Reconfigurableness

- Mentioned at previous meetings that we are also designing a DECAL sensor with  $50 \times 50 \mu\text{m}^2$  pixels which will be read out as a  $5 \times 5 \text{mm}^2$  pad
- The value returned from the pad is the number of pixels fired in that pad
- Thus far in FCCSW I have written the code to do this as part of the DigitalCalorimeterSD class
- As this is specific to only us (and some people at some time may want to run a DECAL) I am now working on removing this from the SD and doing it afterwards
- With thanks to Anna I can now
  - Simulate the DECAL with  $50 \times 50 \mu\text{m}^2$  pixels
  - Read in off line and resegment the detector
  - Store the number of hits in a pad (not the sum of energy)
- Results are in agreement with the SD method



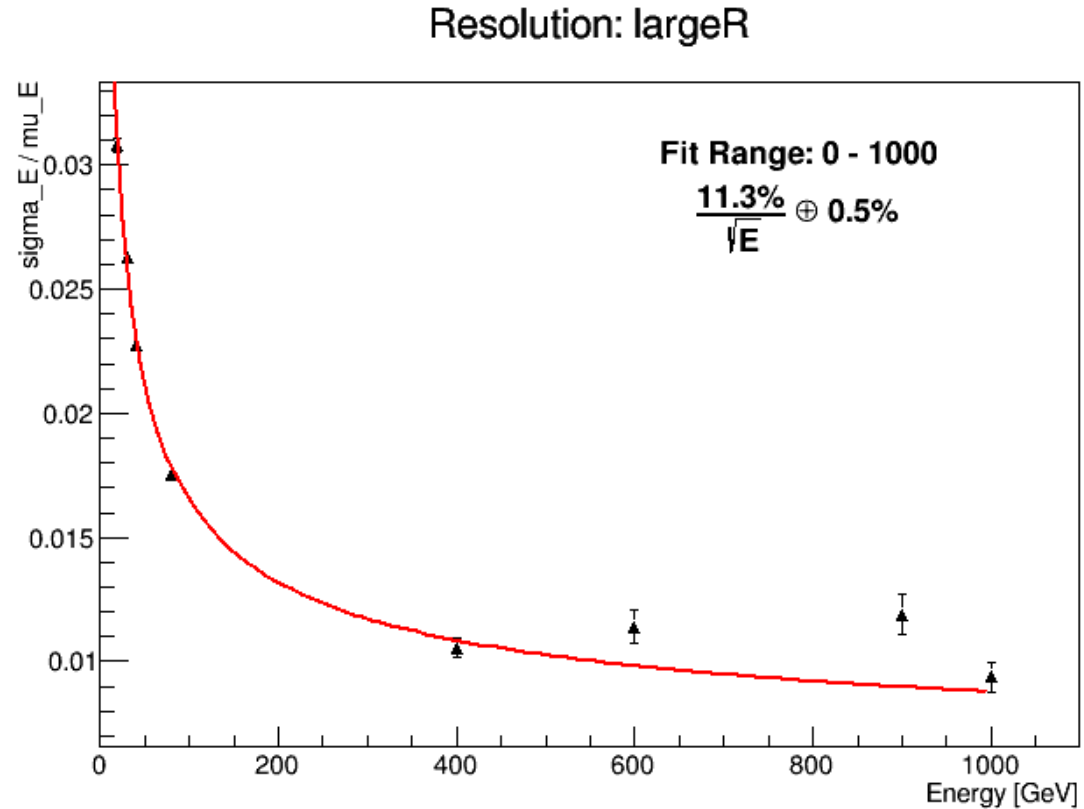
## Options for detector other than FCChBaseline

- SiW DECAL be approx. 30cm deep (allowing for air gaps etc) 50cm allowing for volumes around it.
- This could allow some alternative designs for the detector
  - Fixed outer tracker radius, smaller ECAL outer radius, smaller detector as a whole, much reduced costs
  - Fixed outer radius of ECAL, larger tracker, same size detector
- The resolution of a pure pixel counting ECAL has been shown to be degraded relative to LArPb (as expected)
- However, to harness the full power of the DECAL the detector would need to use PFA
- Larger tracker could help to facilitate this.



## Effect of larger inner Radius of ECAL

- Area to cover for the ECAL in MAPS increases due to radius
- So does the number of channels
- However, preliminary results show that the energy resolution of a DECAL is not degraded
- Note: 0mm air used in this simulation, the resolution has not improved from previous slides
- **Question 1:** What would the impact be on the tracker to extend its outer radius to 2.4m?





# Particle Flow Algorithms

- ❑ Current layout of the FCC-hh detector would not allow PFAs
- ❑ Work in CLIC has demonstrated that above  $\sim 400$  GeV jets, a conventional detector has better performance compared to PFA
- ❑ I hope to talk to some PandoraPFA developers at AIDA-2020 this week for an update on this as study I found was from 2013.
- ❑ **Question 2:** Are there any CLIC/PFA experts that could update this number for me?
- ❑ **Question 3:** If the limit of PFA is 400 GeV then how often do we get jets with energies higher than this at FCC-hh from important physics channels?
- ❑ PFA (for good reason) is not implemented within FCCSW so we cannot directly study the impact for the DECAL
- ❑ However, our resolutions are very similar to those achieved within iLCSoft for pixel counting DECAL. We will study the effect of PFA on both the DECAL and analogue SiW calorimeter in iLCSoft as feasibility study

