

A Brief DECAL Update

Tony Price

University of Birmingham

14/12/2016

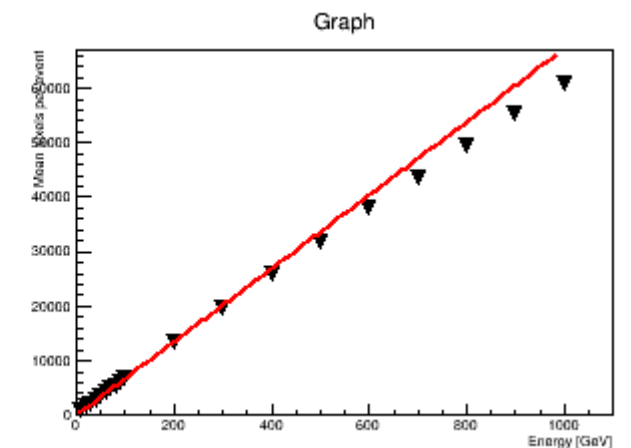
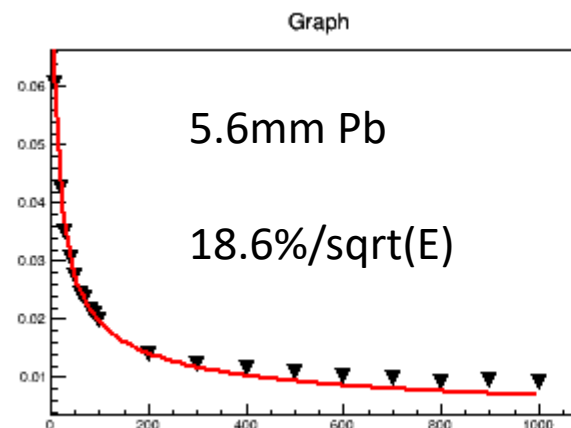
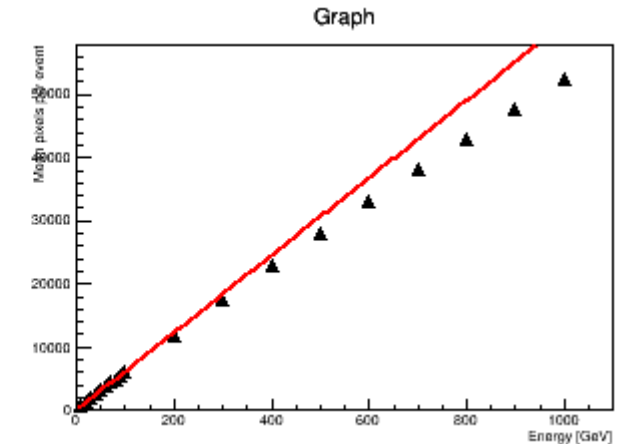
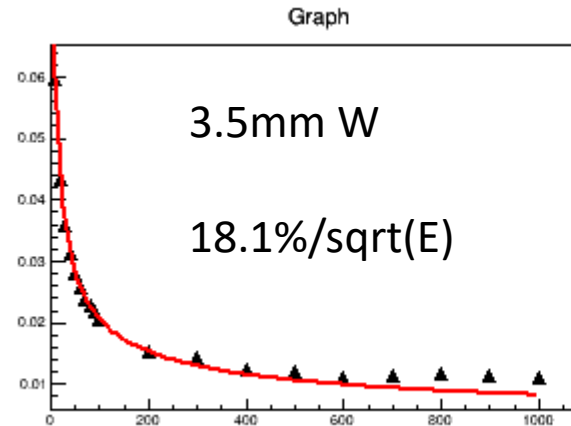
General Overview

- Have updated to FCCSW0.8pre to make use of new features
 - Thank you to Joschka for all his help with this
- EtaPhi Segmentation now available and tested (results not heavily analysed but it works!)
 - Thank you to Anna and Jana for their help with this
- Investigated effect of changing W to Pb and adding in air gaps
- Used results from FCCSW to influence design choices in our sensor development. Pixel pitch, epi thickness, dead time, threshold, noise etc.
- Started to investigate pile-up

Questions from previous FCC-hh detector meeting

- **Why do we use W as the absorber?**
- A: historically used for the SiW calorimeter for very compact showers and calorimeters in ILD

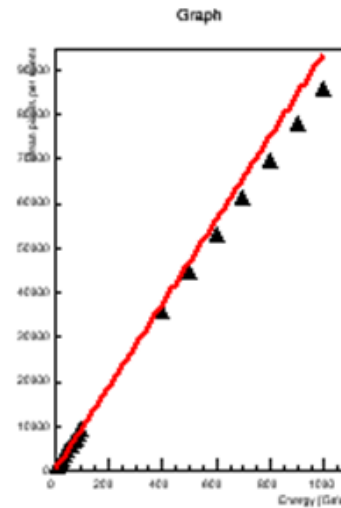
30 Layers. Each layer = 1X0
18 um epi layer
450 um substrate
0 mm air gap



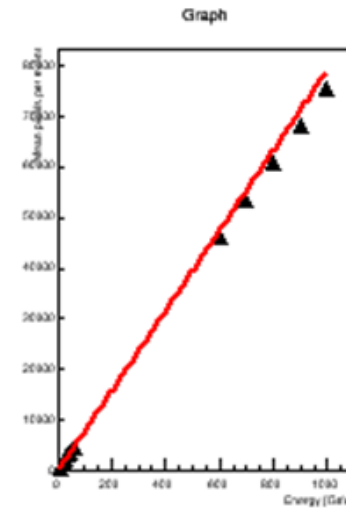
Improved linearity due to wider showers in Pb

Questions from Previous FCC-hh detector meeting

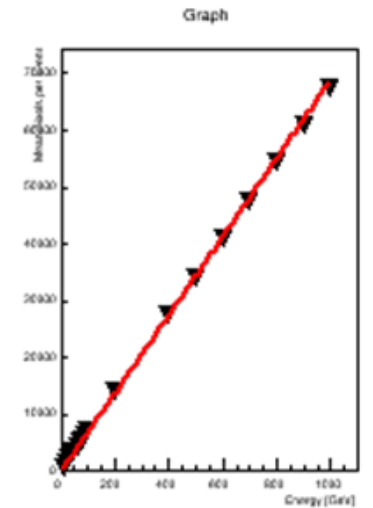
- **You have no air gap in place. How big will this be and what is the effect on the resolution?**
- 50 Layers, 2.1mm W, 18um epi, 450um substrate
- As the air gap increases the linear response improves as the shower develops over a wider area



1 mm Air



3mm Air



5mm Air

Questions from Previous FCC-hh detector meeting

- **You have no air gap in place. How big will this be and what is the effect on the resolution?**
- 50 Layers, 2.1mm W, 18um epi, 450um substrate
- As the air gap increases the linear response improves as the shower develops over a wider area
- However, we currently see that the energy resolution degrades (which is counter intuitive since linearity improves) so we are investigating this
 - Shower does not penetrate as deep in calorimeter
 - Counts in calorimeter reduced

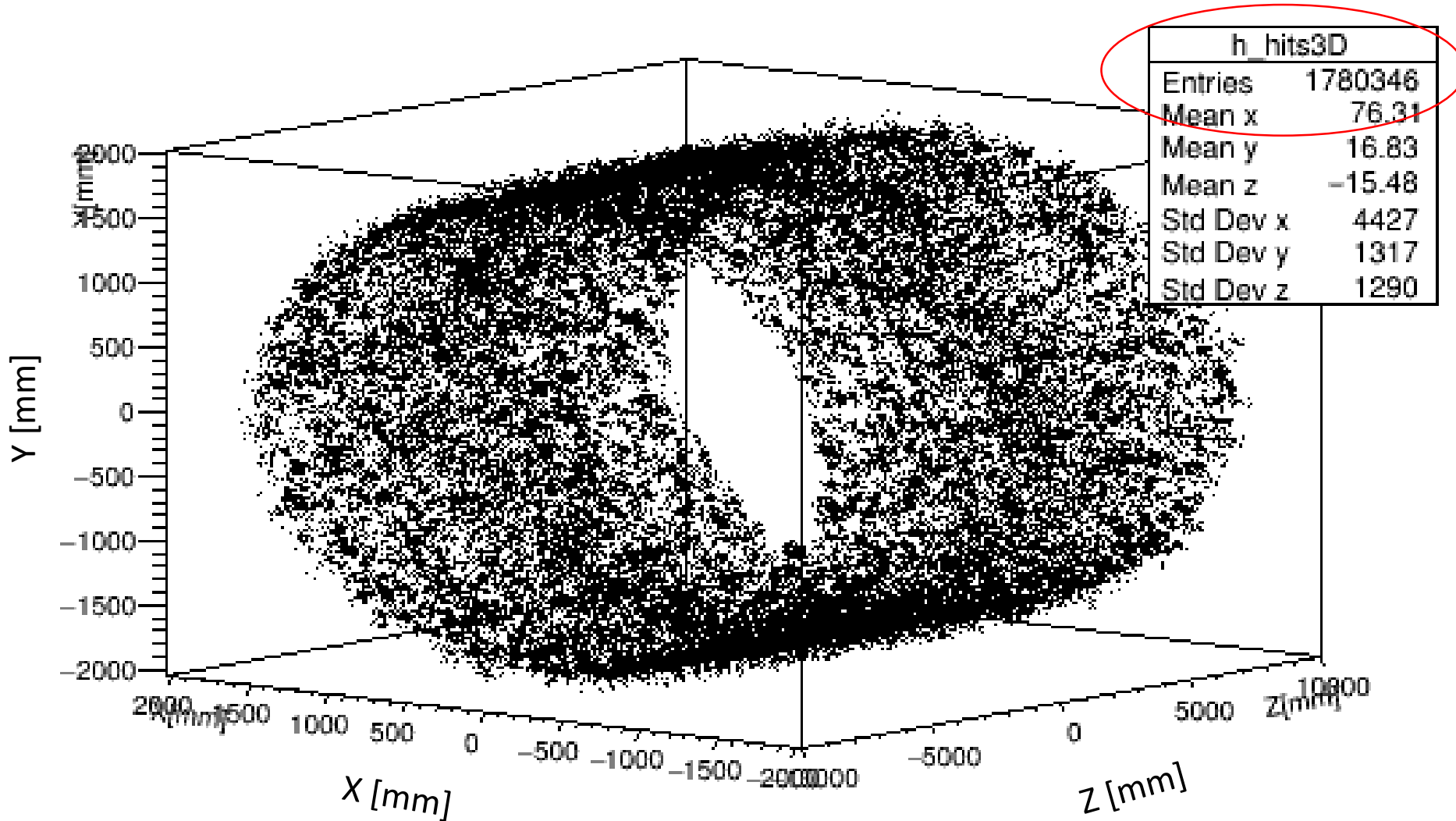
These 2 effect seem to be B-Field related

Pile-Up

- Optimised parameters in the segmentation such that can now make entire ECAL barrel sensitive.
 - Max 56 layers allowed
 - Minimum 40um pixel pitch
 - Max barrel length 18m
 - Max barrel radius 2.4m
- Thank you to Joschka again for help with this
- Cannot use same pile-up as LArPb or SiW due to granularity
- On lxbatch running simulations with 100 events with 1,10,50,100 pile-up to see response of DECAL (50 and 100 pile-up events still running 3 days later...)

100 pile-up

Approx 1.8M pixels above threshold for 100 min bias events



Next:

- 1) Improve stats over Christmas
- 2) Investigate hit density not total hits
- 3) Understand the effect on small region where E/M shower occurs
- 4) Find ways to remove these hits if possible

Any Questions?

