# First ideas towards BIB subtraction

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Detector meeting, 13/07/2023



#### From my talk at IMCC week

0.07

0.06

0.05

0.04

0.03

0.02

0.0

10

Energy deposit per layer

#### **Photon reconstruction**

Changes to EM calorimeter:

- Kept same Si-W technology
- $40 \rightarrow 50$  layers
- Tungsten absorber  $1.9 \rightarrow 2.20 \text{ mm}$

### Studied photon reconstruction efficiency and energy resolution



Photon particle gun — 10 GeV

50 GeV

100 GeV

500 GeV 1000 GeV

5000 GeV 3.32 X<sub>0</sub> before calorimeter

> Digitised hits Cell threshold 50 keV

35

30

20

40

Calorimeter layer [0.6 X]

45

50

#### **Quick fix?**





30% energy resolution for 50 GeV photons is not what we'd like to be remembered for (nor for being unable to tell hadronic Zs and Higgses apart)

Most likely culprit: very high calo cell thresholds (2 MeV) used in calo digitisation

Trying to just lower the threshold back to 50 keV results in Pandora reco needing days to process one event (and returning ~bogus results)

Can we do something smarter?



E {isECAL==1 && layer==0 && E < 0.1}





je 4

#### **Bonus: BIB and calo cracks?**

0.1

To be investigated further.

Most BIB in "deep" ECAL layers (and HCAL) localised in crack region

- Left too much space in • geometry?
- Could also be correct like this... ٠

E:theta {isECAL==0 && layer==0 && E < 0.1}



Page 5



#### **Dynamical thresholds and BIB subtraction**

- 1. Digitise hits with 50 keV cell energy thresholds
- 2. Build histograms of the digitised cell energies vs theta, calo layer Theta binning (0., 30., 40., 50., 60., 70., 90., 110., 120., 130., 140., 150., 180.)
- 3. For each layer, theta bin, select cells with  $E_{digi} > \langle E \rangle + 3$  sigma
- 4. Subtract <E> to the  $E_{diai}$
- 5. Proceed with pandora reconstruction as usual

Implemented steps 2-4 in a dedicated Marlin processor

#### **Results**

Applied calo cluster selection and BIB subtraction to single photon particle gun samples (iso\_photonGun\_50, i.e. fixed energy, uniform in theta)

- Can use Pandora reconstruction without setting cell thresholds to 2 MeV
- Drastic improvement in energy resolution
- TODO: add line to compare with "no BIB" resolutions



## Thank you!