Material Impact on Signal Phi Asymmetry

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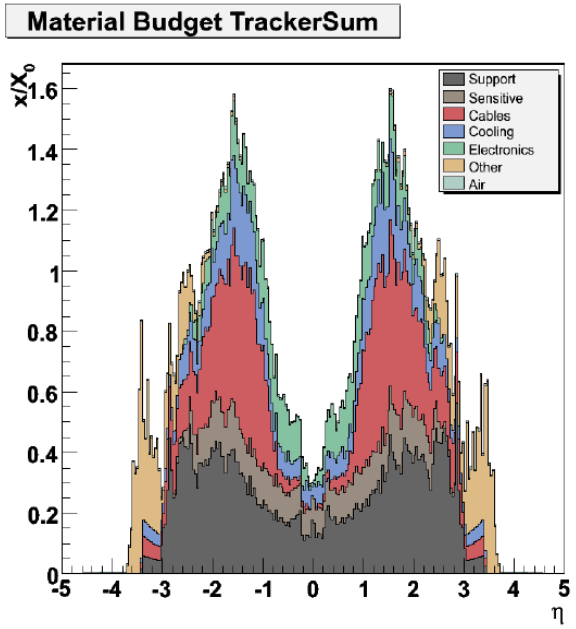
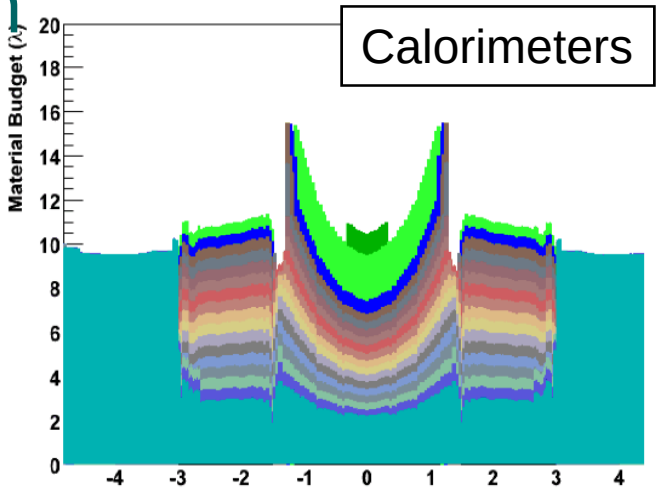
HCAL DPG Meeting
December 4, 2008

Preamble

- Significant amount of material in front of HCAL
  - Non-uniform both in ϕ and η
  - ~0.3 λ (mean) of material in between ECAL and HCAL
- HCAL itself is not quite uniform
  - 18-fold ϕ symmetry
- May affect single-pion calibration of HCAL (MIP in ECAL)

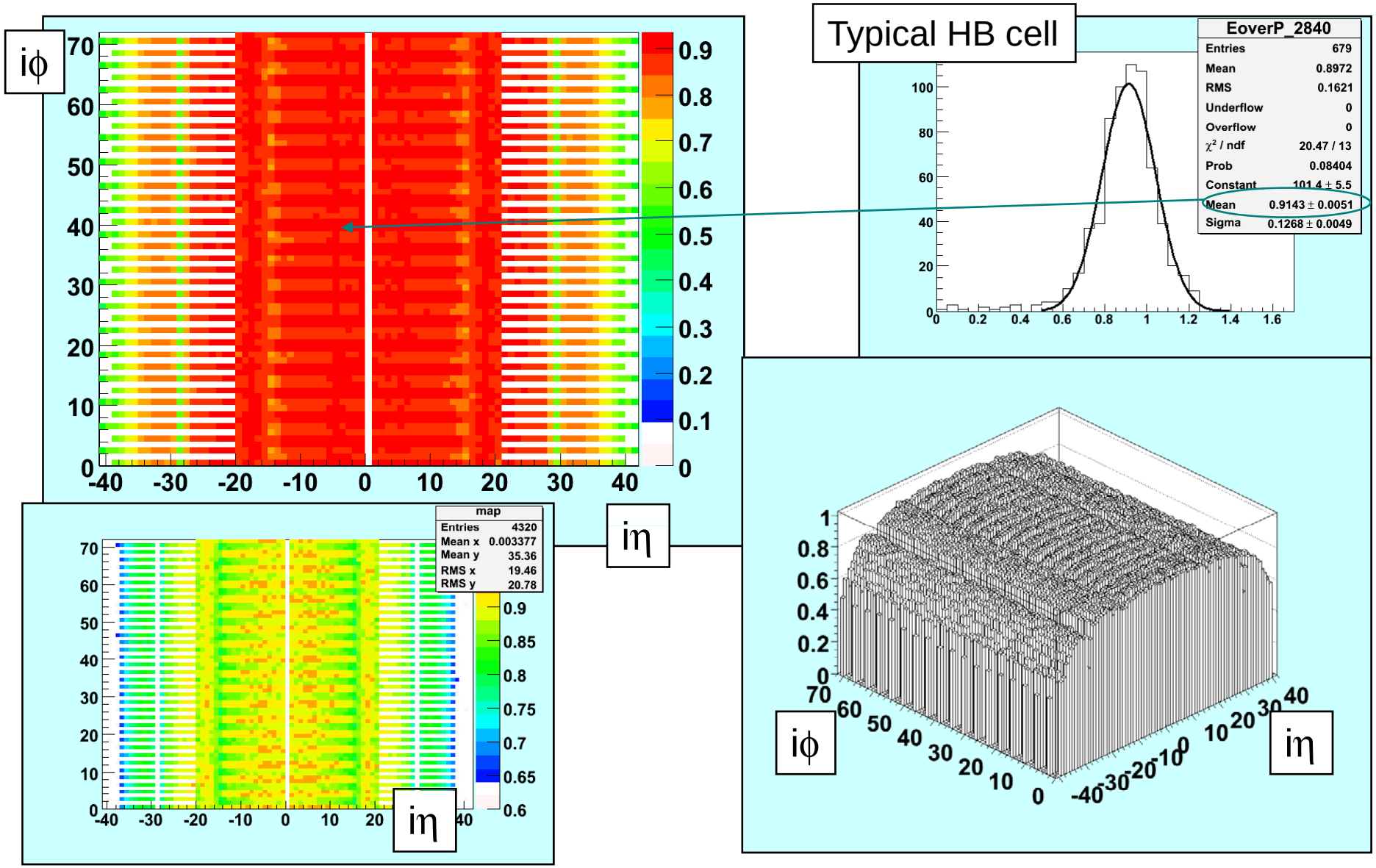




Single-pion “Probe”

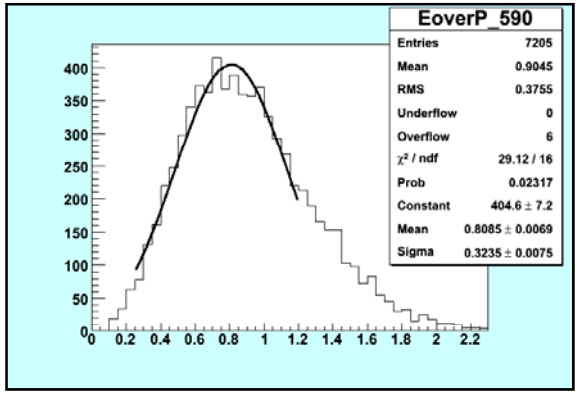
- Two different (not extreme) cases
  - “Ideal” single pi+ 50 GeV (20 mln in entire Calo)
    - no noise
    - no ZS
    - no field (straight line trajectory)
    - no vertex smearing
    - MIP in ECAL (< 1 GeV in R=0.2)
    - 3x3 or 5x3 Towers (sum in depth, except HO)
  - “Ideal” single pi+ 10 GeV
    - field on (curly trajectory)
- Full CMS “start up” geometry (no Preshower)
  - Also: Ideal_V9 Global tag for conditions

π+ 50 GeV in 3x3 (I)

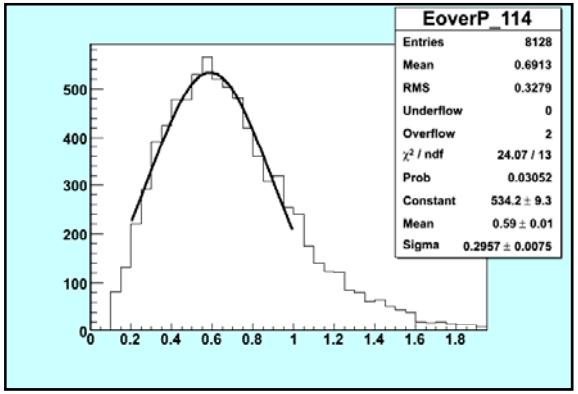


π+ 50 GeV in 3x3 (II)

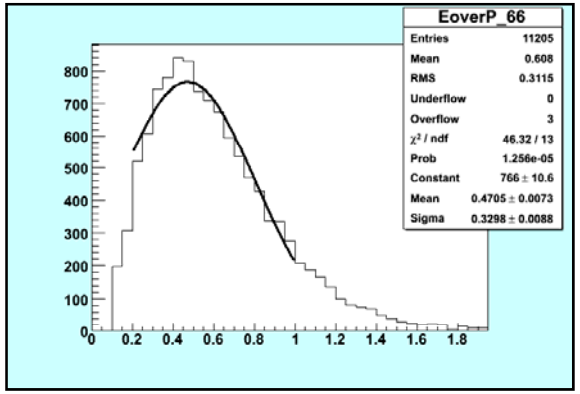
- Caveat: HF E/p shape



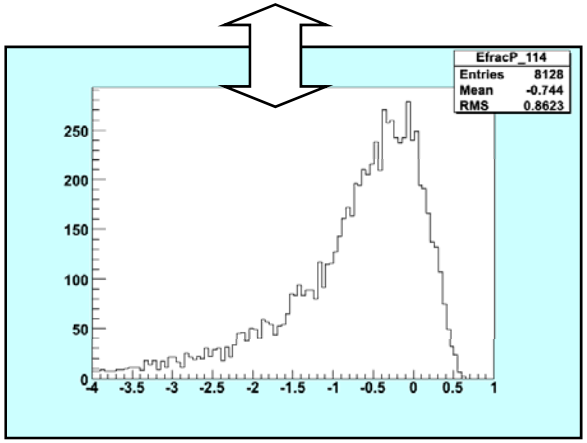
(iη,iϕ) = (33,15)



(iη,iϕ) = (40,43)

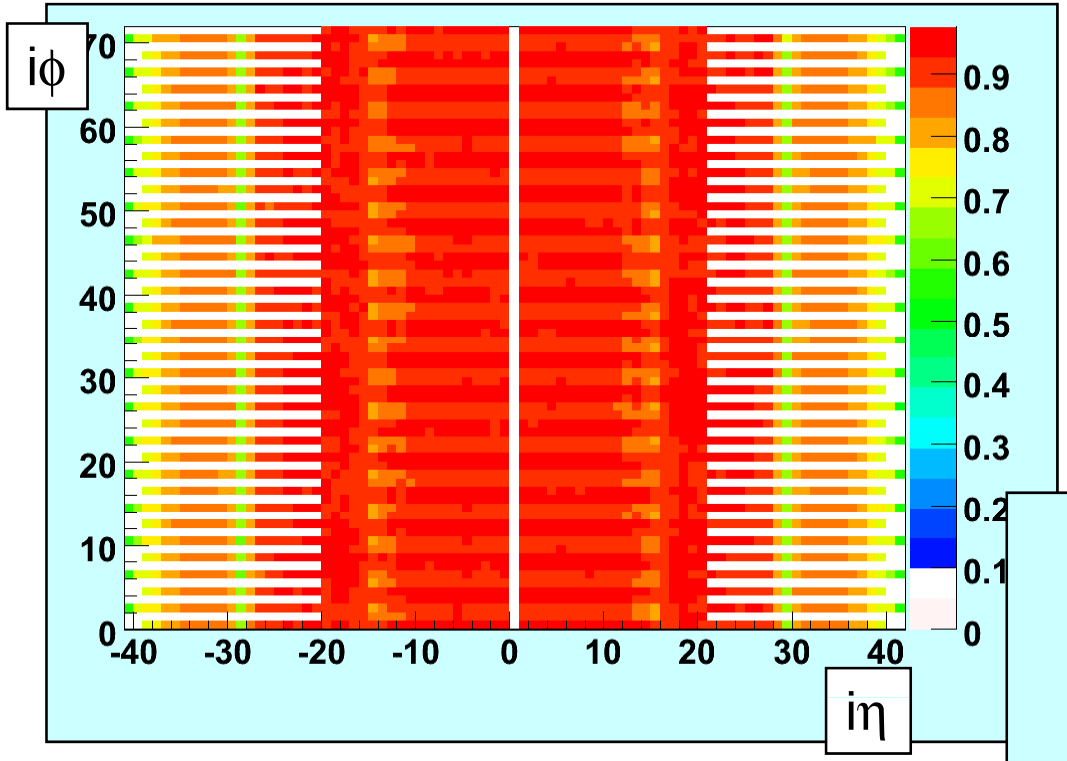


(iη,iϕ) = (41,67)

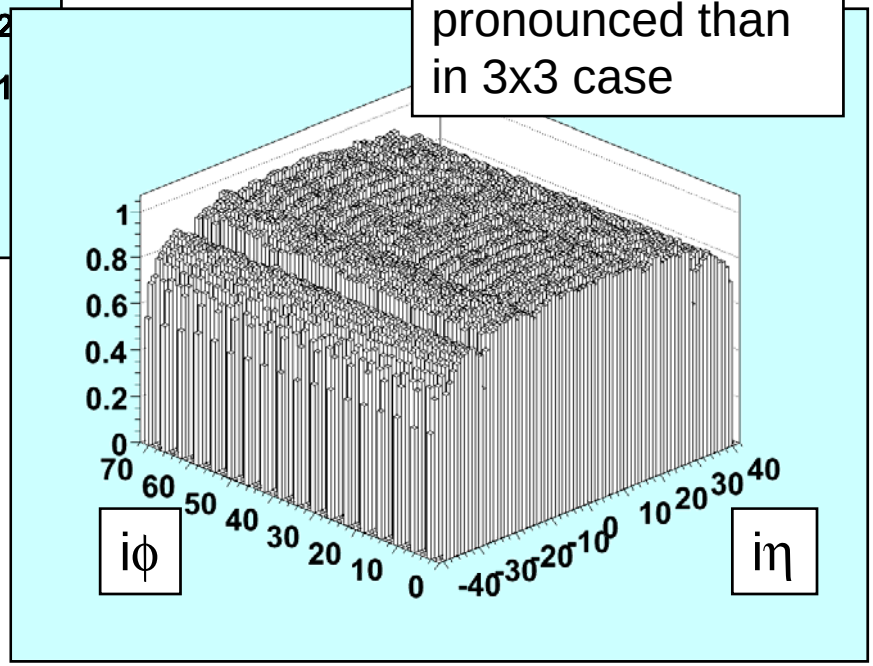


☞ (E-p/)E
doesn't look better

π+ 50 GeV in 5x5

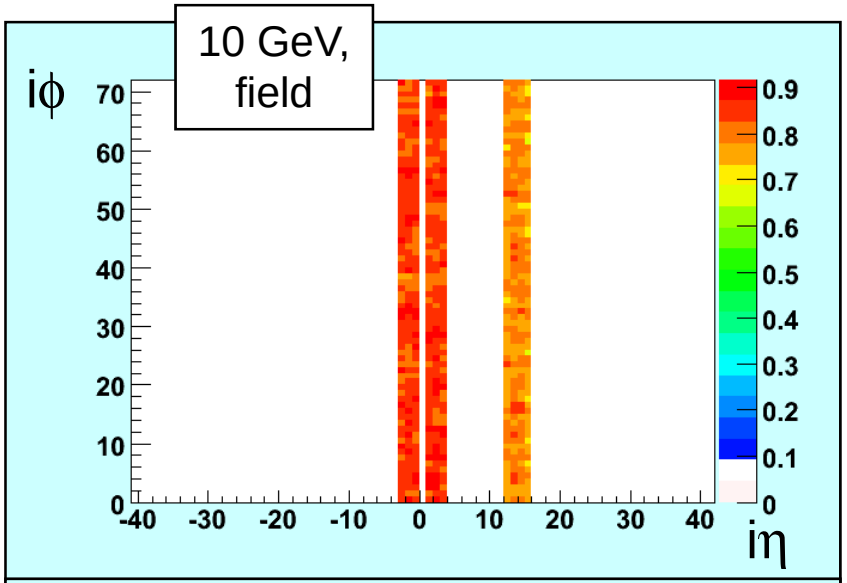


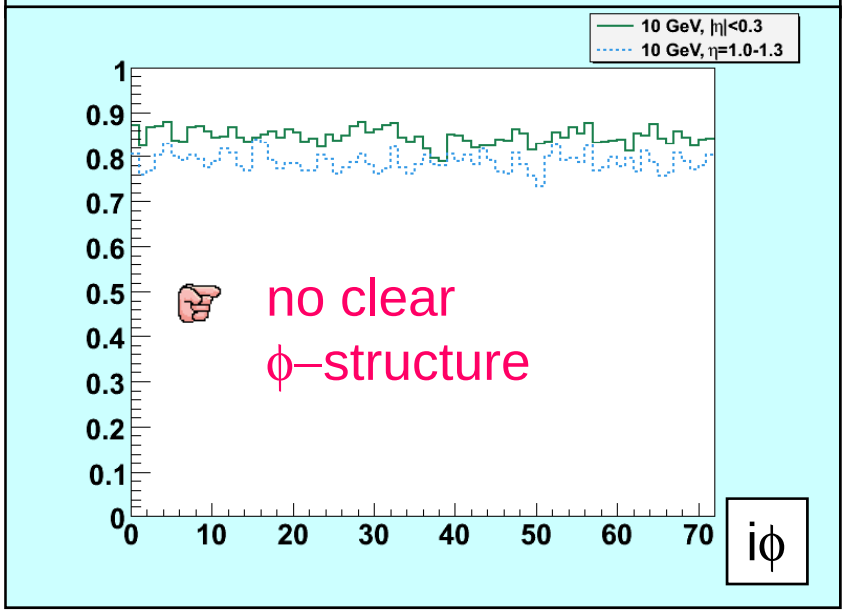
18-fold (wedges) ϕ–structure is less pronounced than in 3x3 case



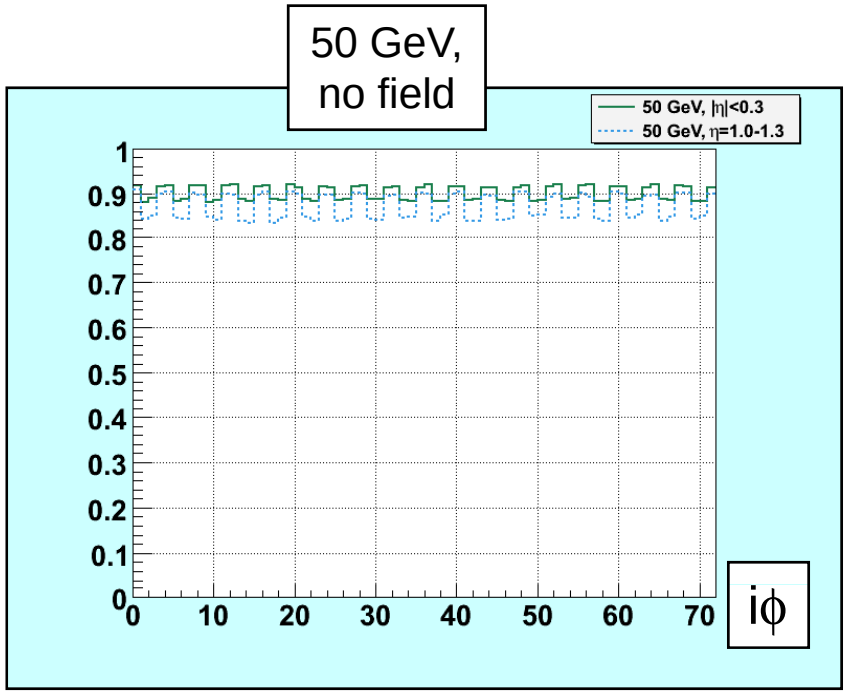
Absolute scale do depend on the window size (3x3 ot 5x5)

π+ 10 GeV in 3x3





- 1 mln. ev. in |η|<0.2 +
  1 mln. ev. in 1<η<1.3



Summary

- Large statistics is required
- ϕ structure is visible with straight-line tracks
- Caveats:
  - absolute scale depend on the window size
  - difficult to keep this size the same across the entire calo w.r.t. actual pion shower size
  - various "transition" regions
    - HB/HE; HES/HED; HE/HF; HFS/HFD
  - in jets (both signs low-to-middle-pt particles) material non-uniformity effects will be spoiled

☞ http://cmsdoc.cern.ch/~abdullin/material_effects/