Phi symmetry workflow

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Phy symmetry: goal and data stream choice

- Goal is to install the relative scale within each eta-ring.
  - using the phi-symmetric events equalize the response of HCAL readouts
  - choice of data stream may be different for the different eta regions: HB/HE/HF
- Current data stream choices:
  - minbias events
  - low momentum isolated tracks (10-15-25 GeV)
- Both choices have + and - features

Phy symmetry: minbias events

Method:

- use runs without zero suppression
- estimate variance of noise for each readout
- subtract variance of "noise" from the variance of "signal"
  Residual_readout = Var_sig_readout - Var_ns_readout
- estimate the mean (or most probable) value over ring for residuals
- get corrections: Residual_readout/Residual_ring

Problem for HB:

Signal is much lower then noise in HB.

During CSA08 it works well for high-eta region but reveals problem with low signal in the most central part of HB (|ieta|<5).

But: in CSA08 we do not have enough amount of noise events to make the strong conclusion about central part of HB. New simulation was ordered. Also the study is on going with CRAFT.

Phi symmetry: Workflow description at CRAFT

- L1 trigger : EG and Muon

- AlCaRAW is created at HLT step to be sent to Tier0
  only HCAL RAW data

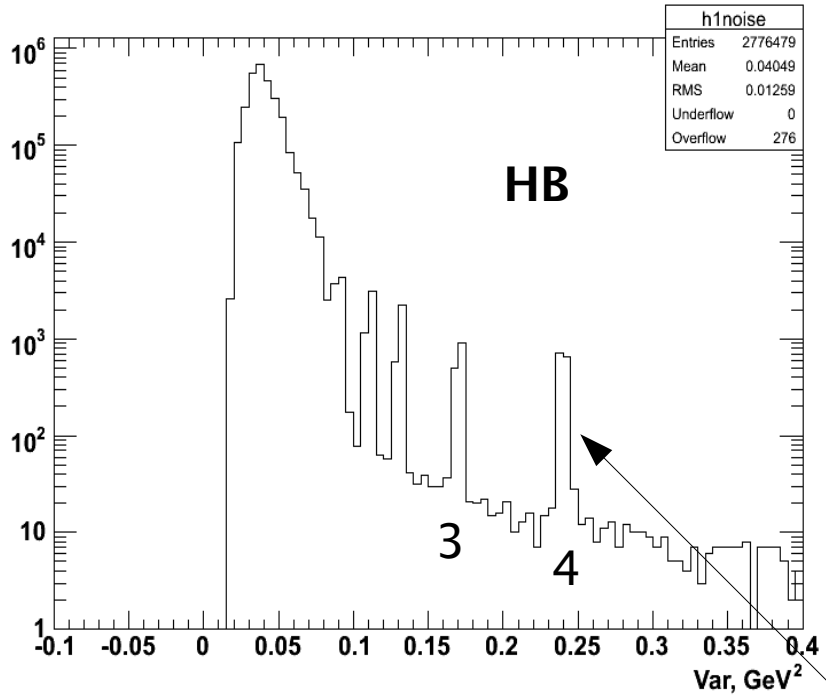
- Special reconstruction at Tier0 followed by
  AlCARECO production

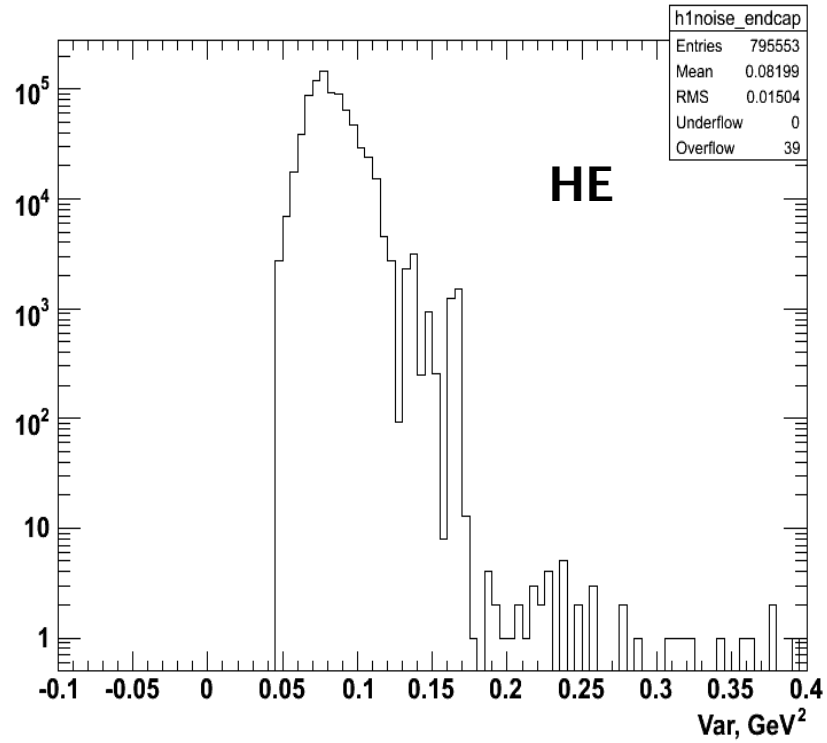
  Time slices 1-4 for noise reconstruction
  Time slices 5-8 for signal reconstruction

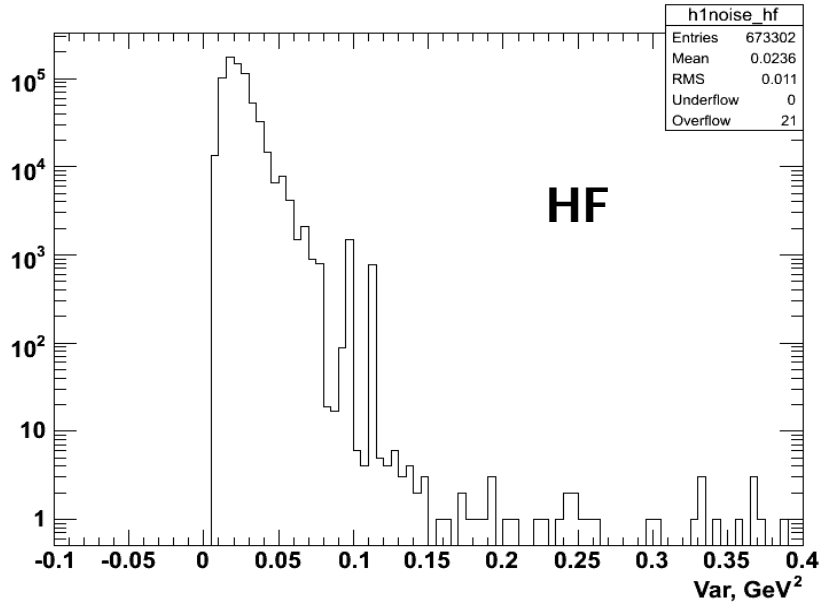
160 mlns events are at CAF: same amount for noise and signal events.

50 mlns were analyzed:
4 days of data collected from 29st of Oct to 1st of Nov.
~2 days with HF on.

Variance distributions in HB/HE/HF

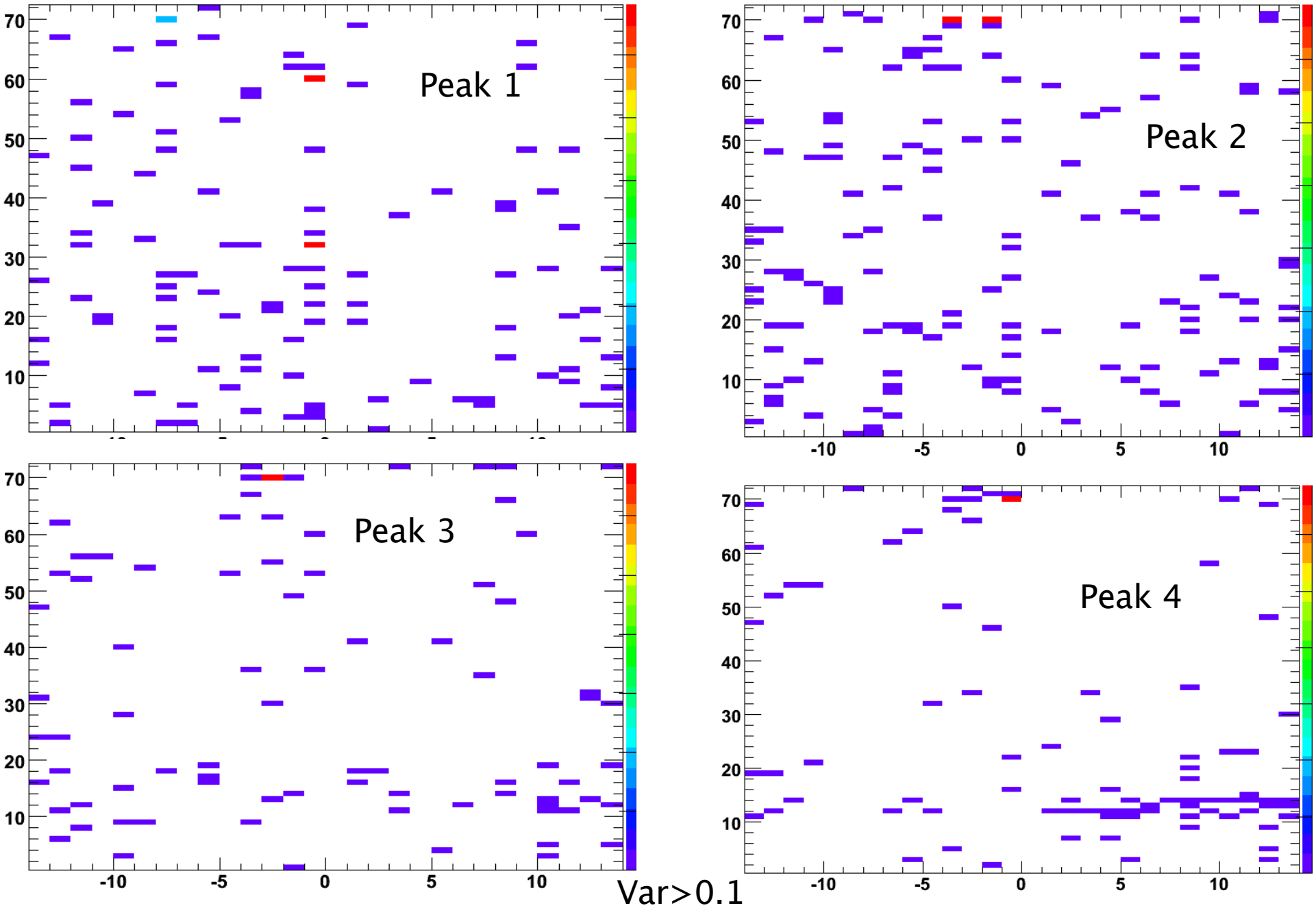




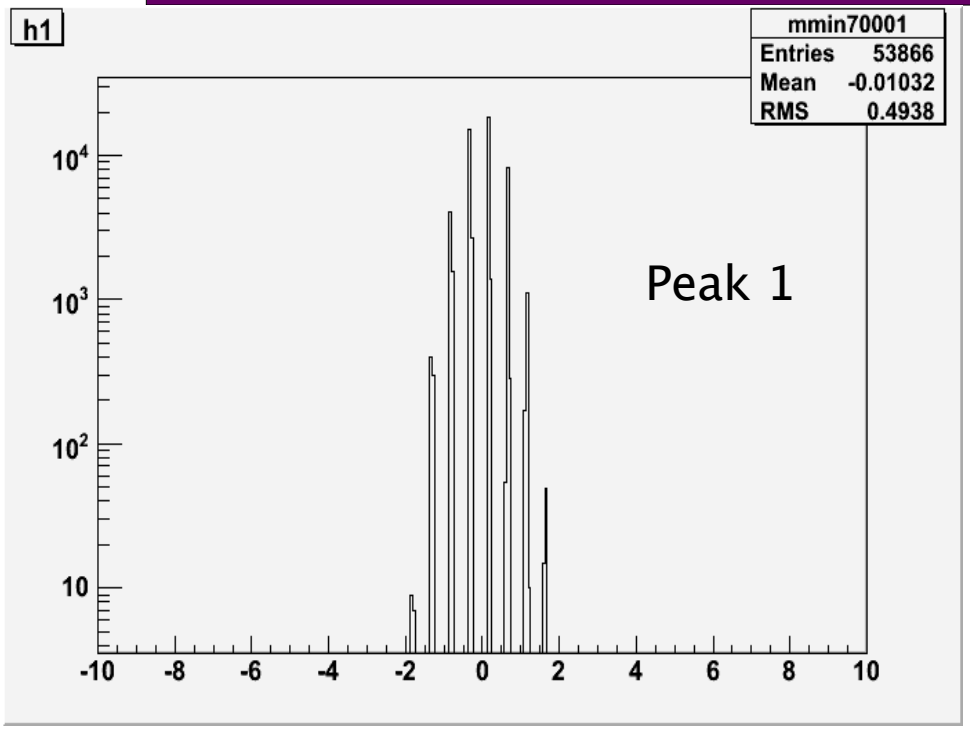


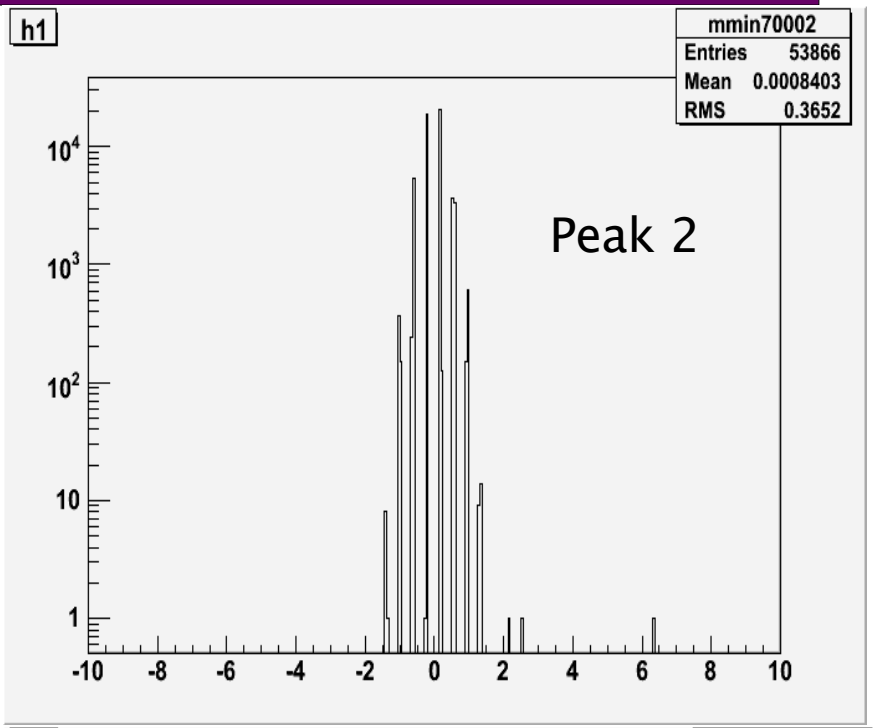
More about peaks on the next slide

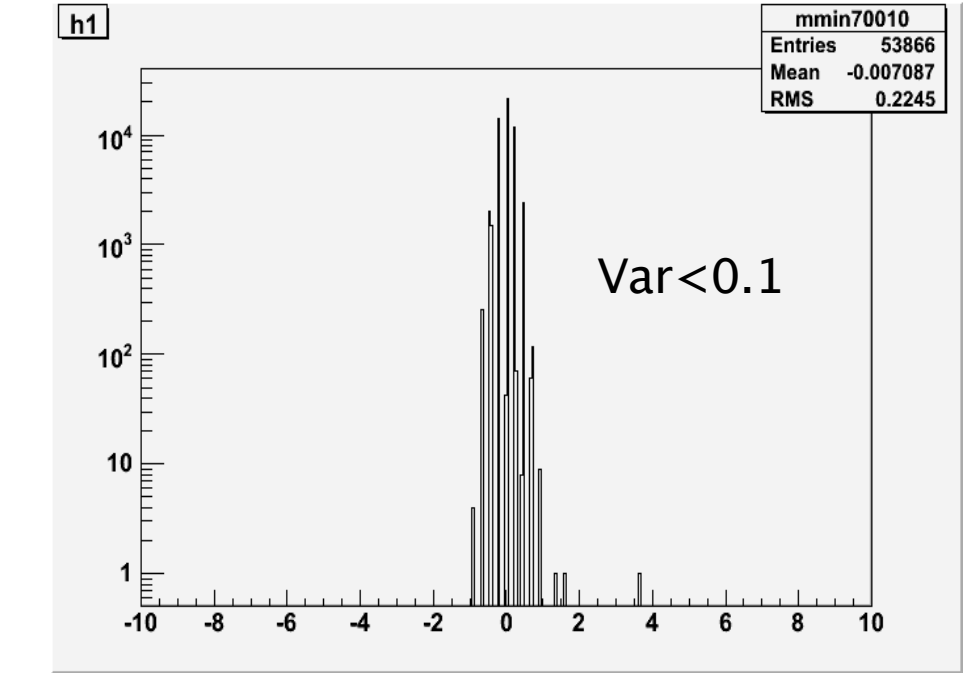
Peaks origin (example with HB)

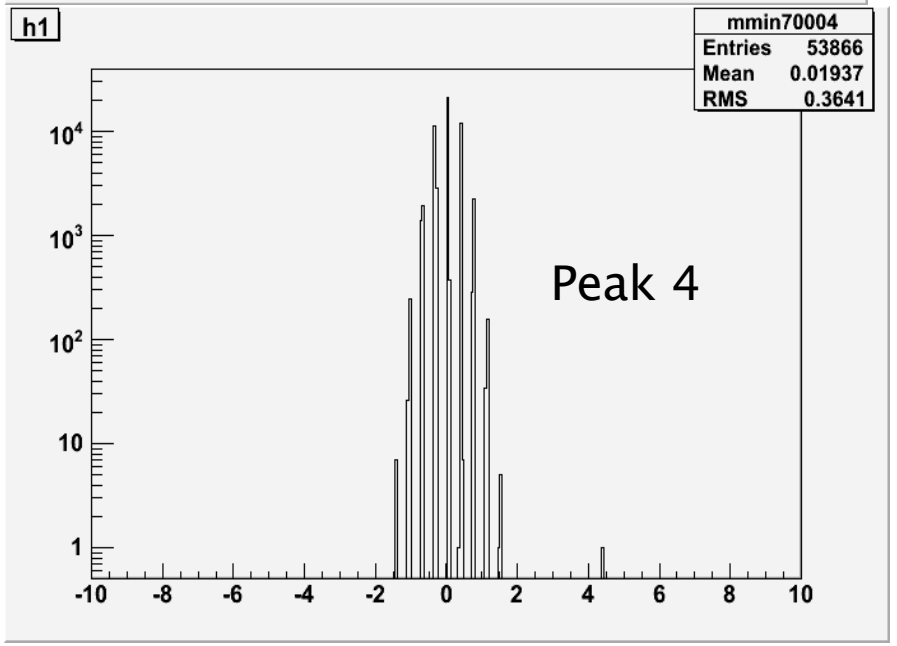


Mean noise

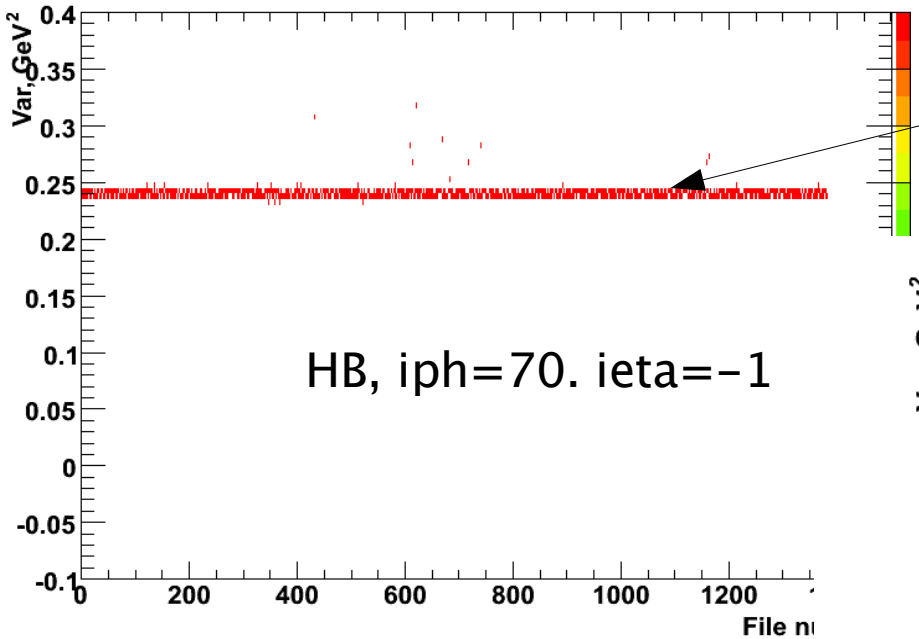

h1
mmin70001
Entries 53866
Mean -0.01032
RMS 0.4938
Peak 1


h1
mmin70002
Entries 53866
Mean 0.0008403
RMS 0.3652
Peak 2


h1
mmin70010
Entries 53866
Mean -0.007087
RMS 0.2245
Var<0.1

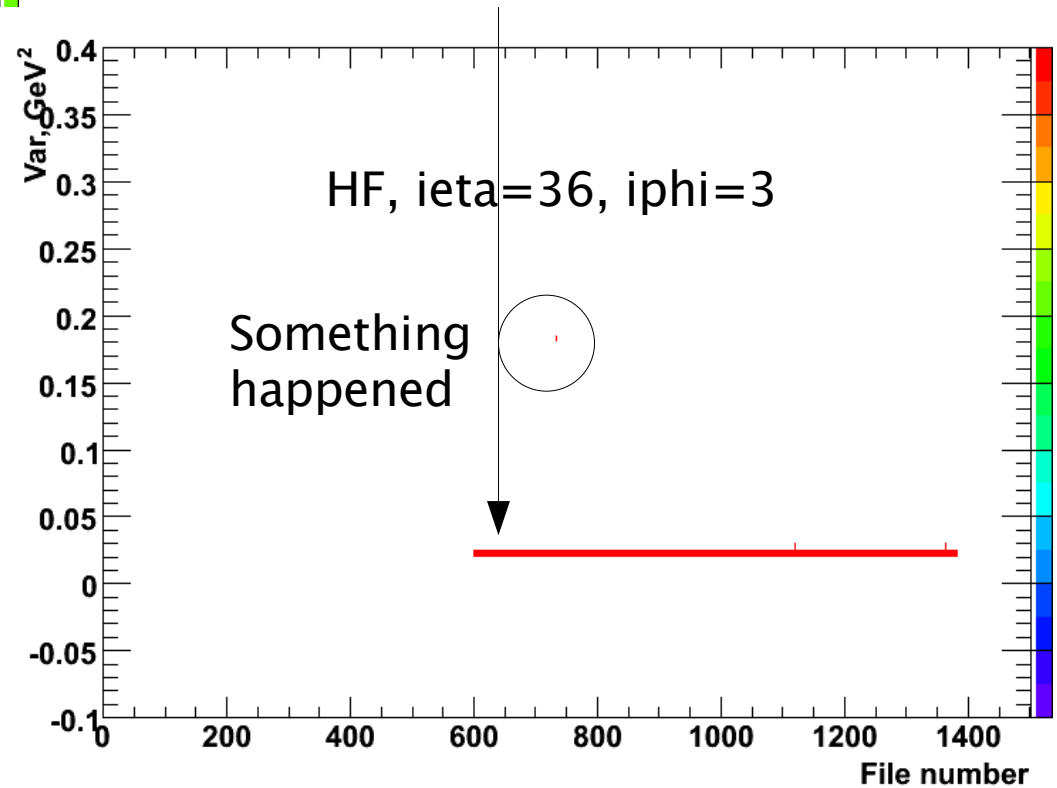

h1
mmin70004
Entries 53866
Mean 0.01937
RMS 0.3641
Peak 4

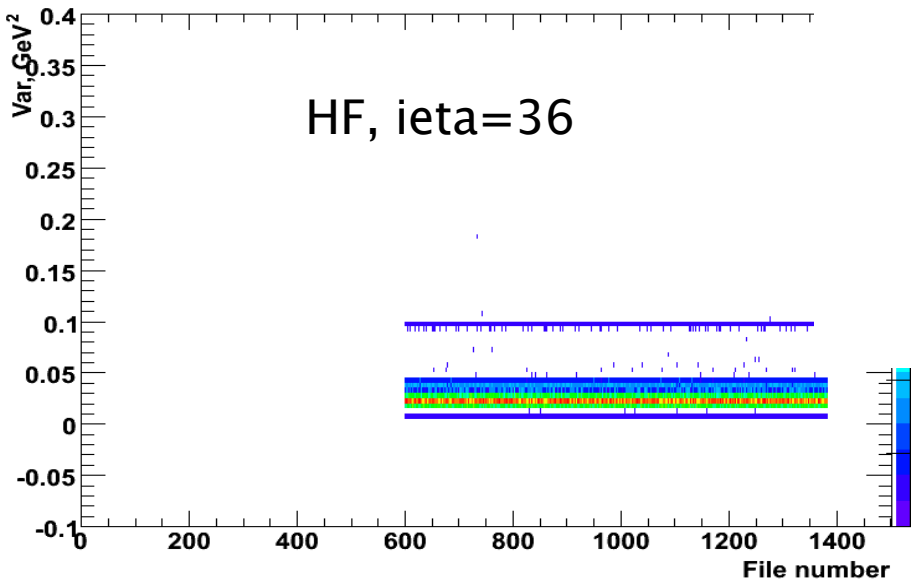
Variance stability



From 29th Oct to 1st of Nov

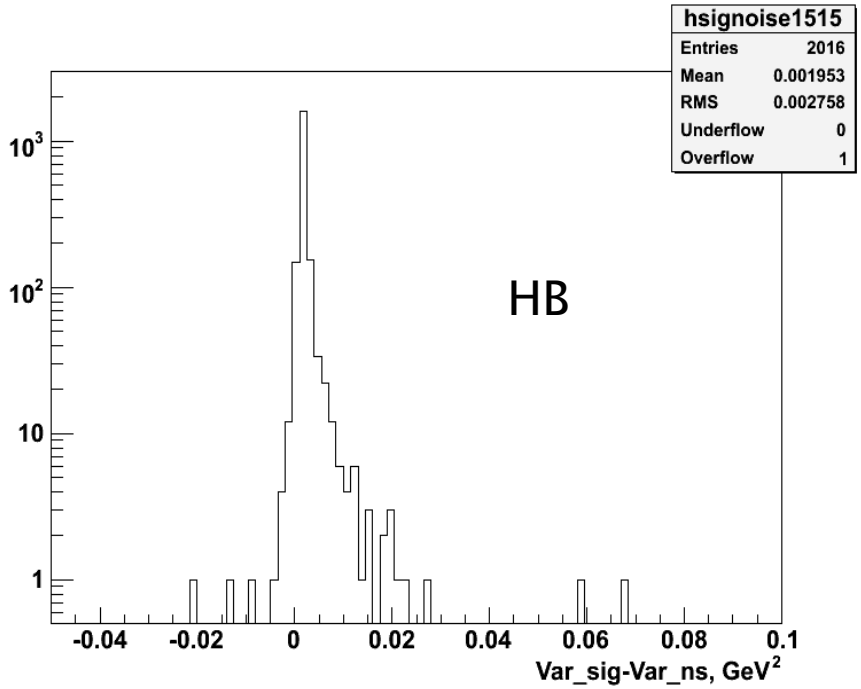
HF was on later (on 30th Oct?)

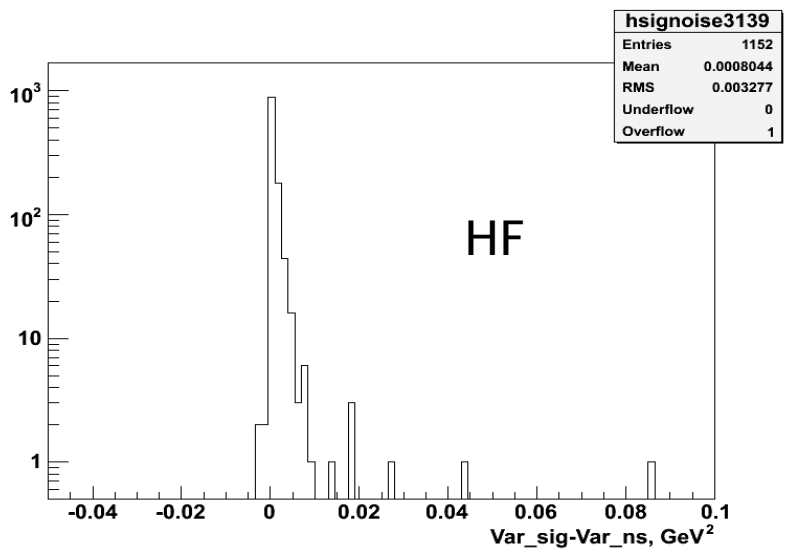




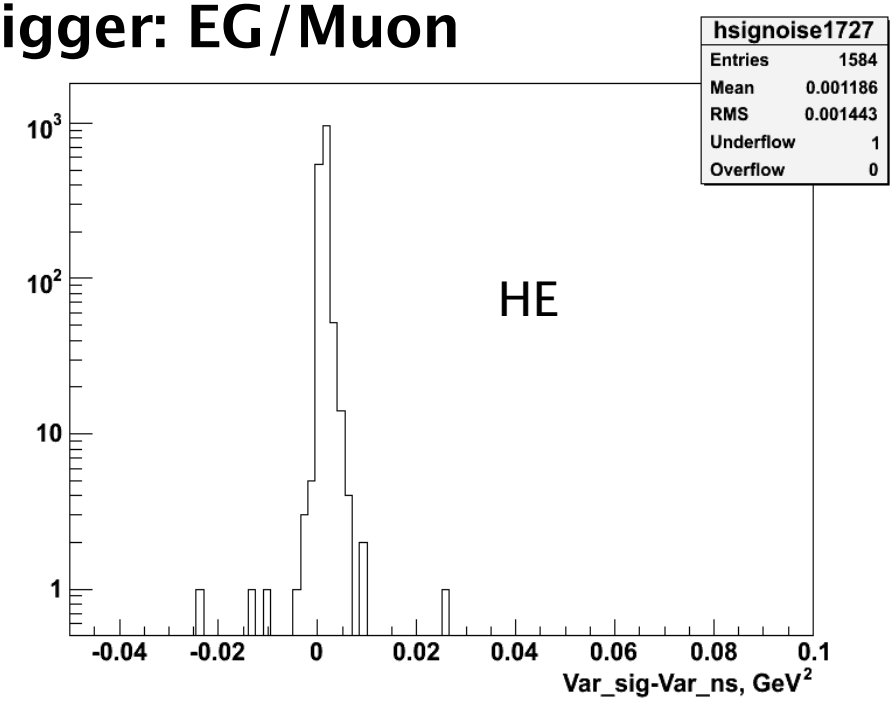
Variances are stable, but sometimes we observe fluctuations that required the additional study.

Difference of Signal and Noise variances





CRAFT
Trigger: EG/Muon



Note: non-symmetric events in CRAFT
Variance of noise CRAFT < CSA08

From CSA08 (GeV ^{2}):

HB, ieta,iphi=1,1	0.0007
HB, ieta,iphi=10,1	0.0014
HE, ieta,iphi=21,23	0.011
HF, ieta,iphi=35,5	3

Phi symmetry with Isotracks

Method:

cell-by-cell calibration with isotracks

Problems:

- **statistics for tracks with P>15 GeV/c**

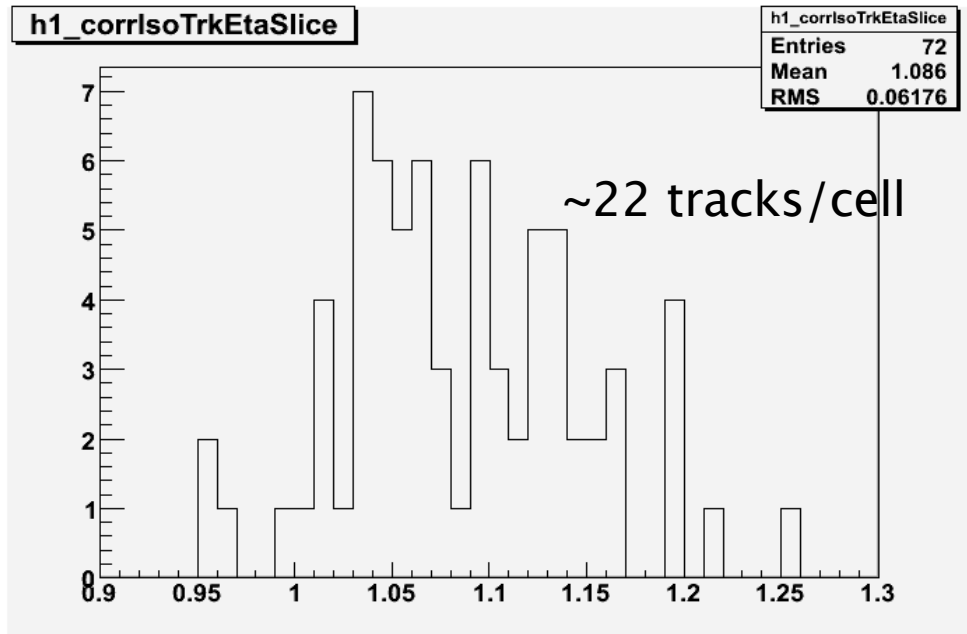
  we need a few hundreds MIP tracks per cell

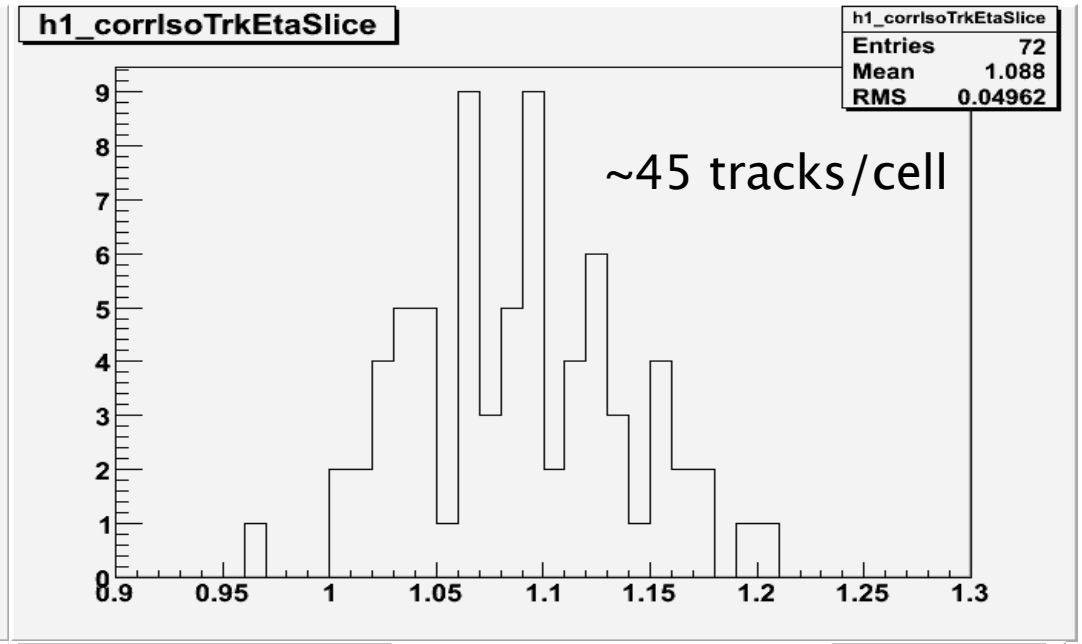
- **material effects which depend on track energy**

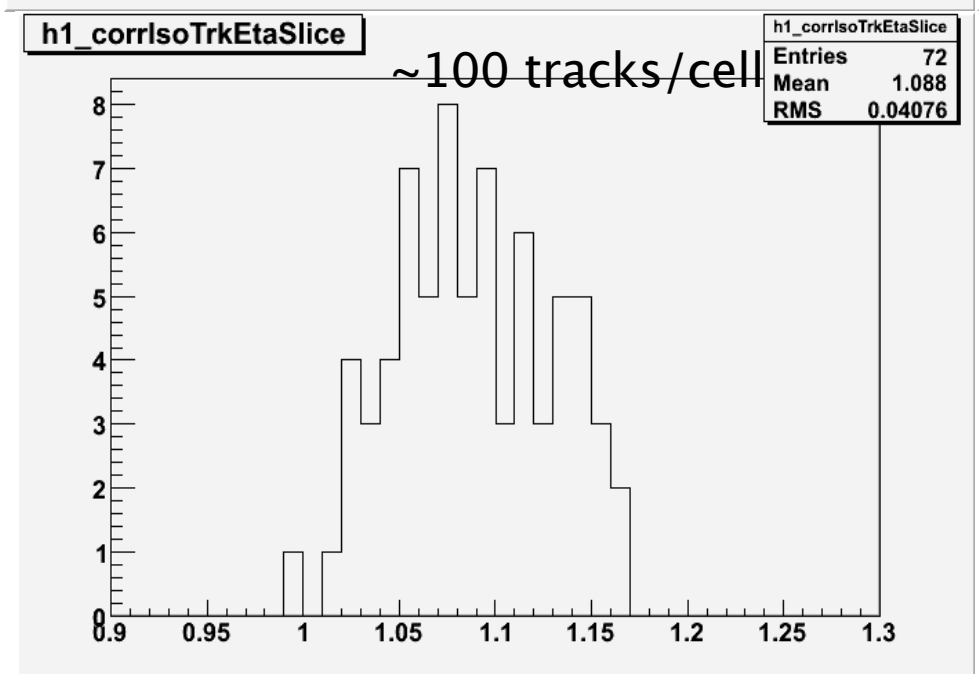
- **shower profile vs energy ?**
  We will use the interval from 15 to 25 GeV or from 10 to 25 GeV

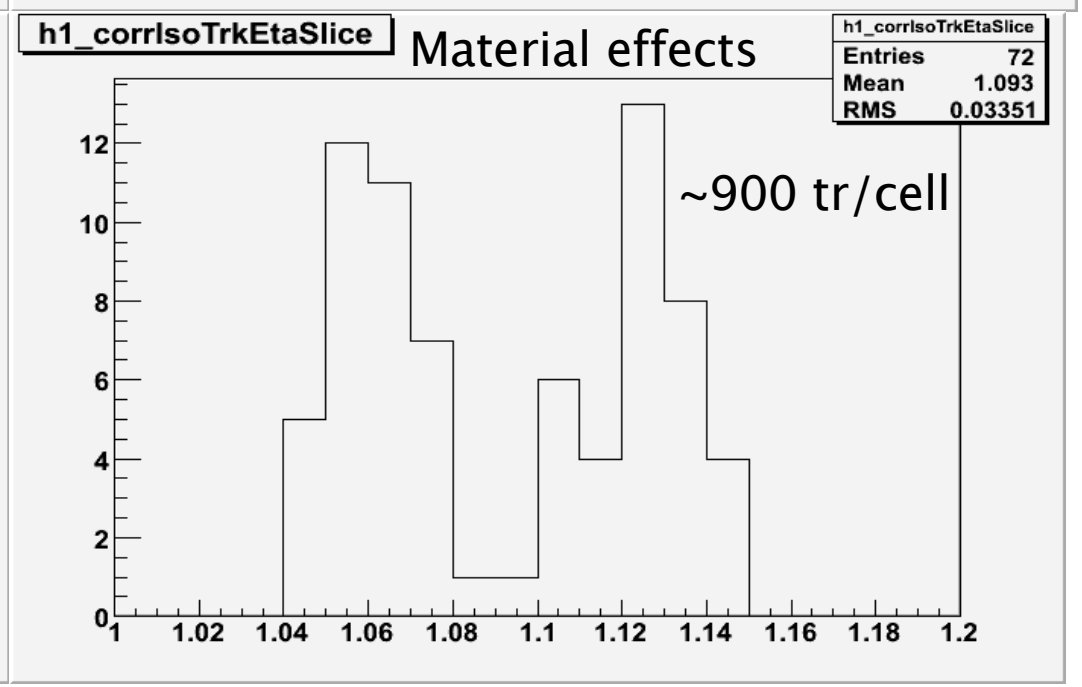
- **Zero suppression affects low momentum tracks ?**

Cell by cell calibration with 50 GeV









Summary

Phi symmetry in high -eta region (outside tracker) can be done with minbias data with accuracy less than 1 %. The possibility was checked with CSA07/CSA08.

Phi symmetry in HB can be done with minbias events and/or isolated tracks sample. However both possibilities need some additional study.
The critical region is for |ieta|<5.

- **minbias sample was already ordered and is in production queue**
- **low p (10-25 GeV) single pion (and isolated tracks) sample need to be generated with new HLT.**