

Recent Work in Electron Id with a segmented HCAL

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General Information

Software: CMSSW 2_2_5 + patches for simulation
CMSSW 2_2_11 for analysis

Focus: Barrel region of detector

Signal: Electron gun (flat energy 20-120 GeV)

Background: QCD dijets (2 bins: 40-180 pT and
180-400 pT)

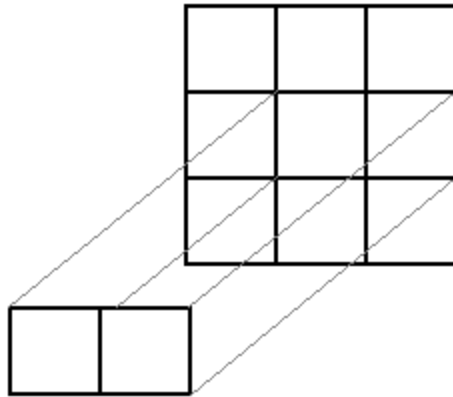
Minimum bias interactions

In-time + out-of-time (+/- 2 b/c) for
<n>=(2, 20, 30, 40, 50, 60)

Using HPD (no SiPM) and no electrical noise

Level 1 analysis - focusing on trigger towers

Cluster Geometries



2x3 cluster geometry

$$Cut : \frac{E}{E + H}$$

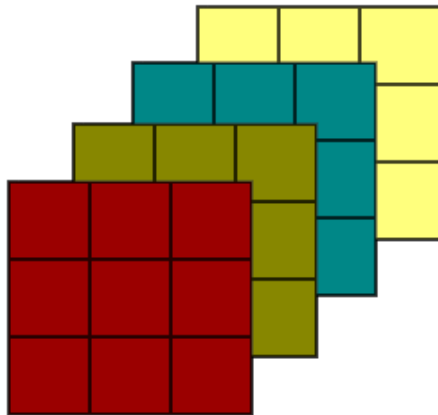
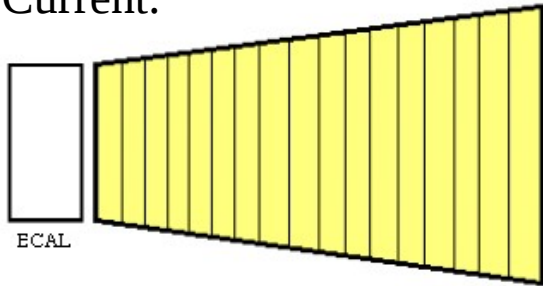
2 towers in ECAL: seed tower and highest-energy neighbor.

3x3 array in HCAL.

Mainly working with 2x3 and 2x5 cases. Other geometries will be explored in the future.

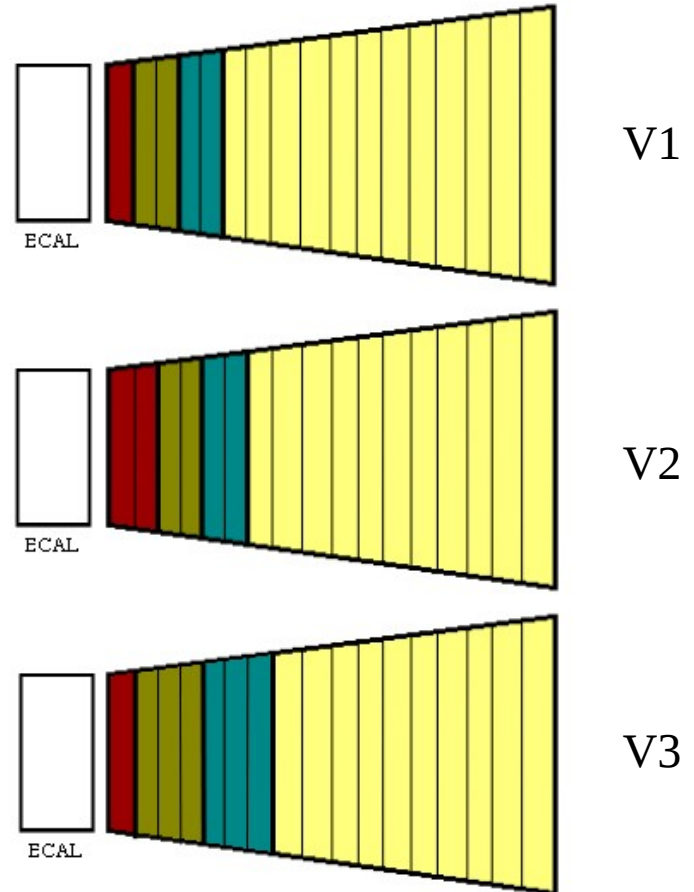
HCAL Segmentation

Current:



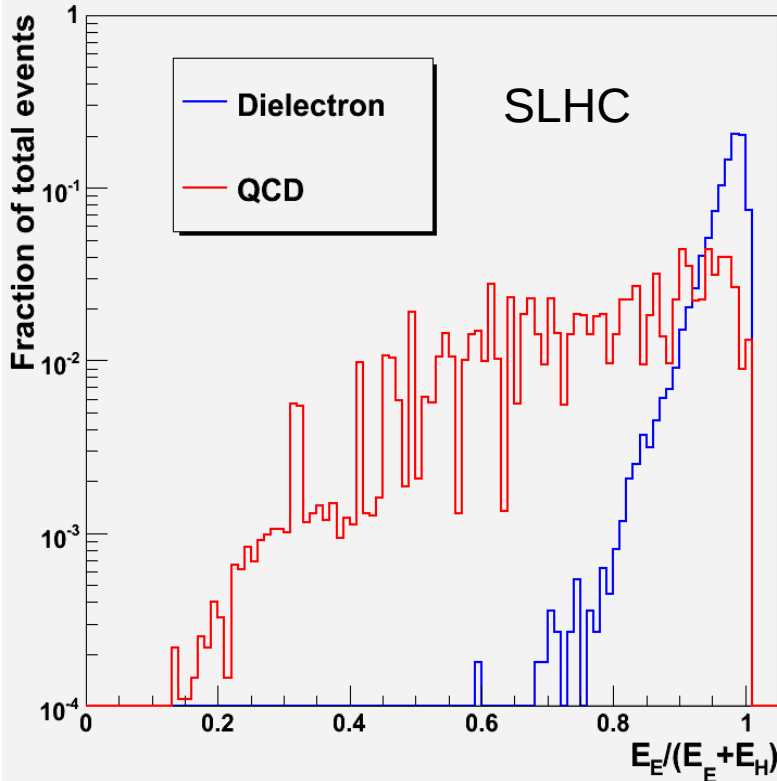
4 depths of HCAL

With SLHC upgrade, we can split HCAL into 4 depths:



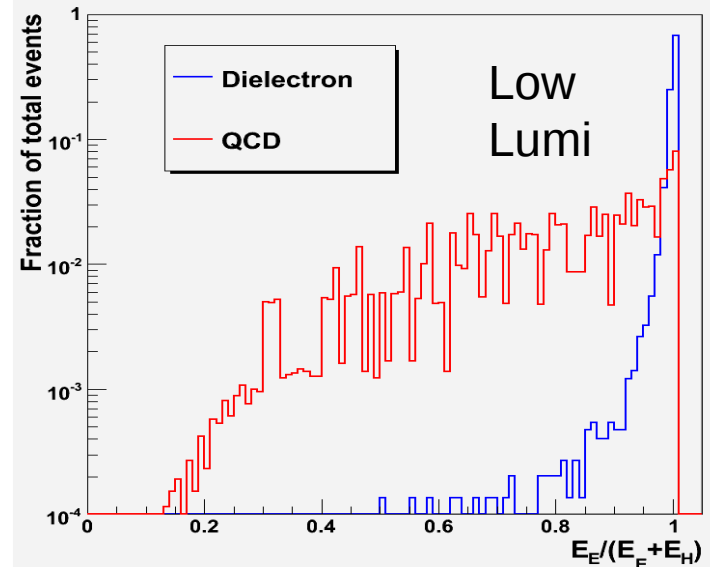
No-Segmentation Case

PU40 V1 2x5 Cluster HCAL Depths all (30 GeV cut)

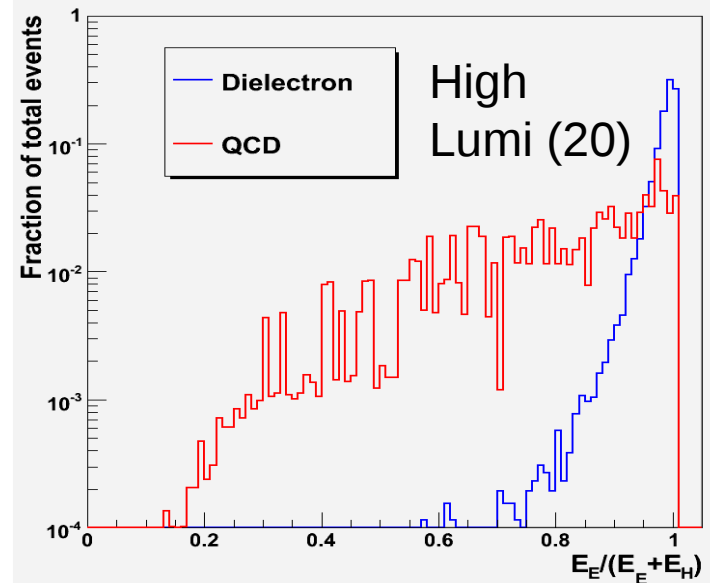


Note: Reduced HCAL noise still applied

PU2 V1 2x5 Cluster HCAL Depths all (30 GeV cut)

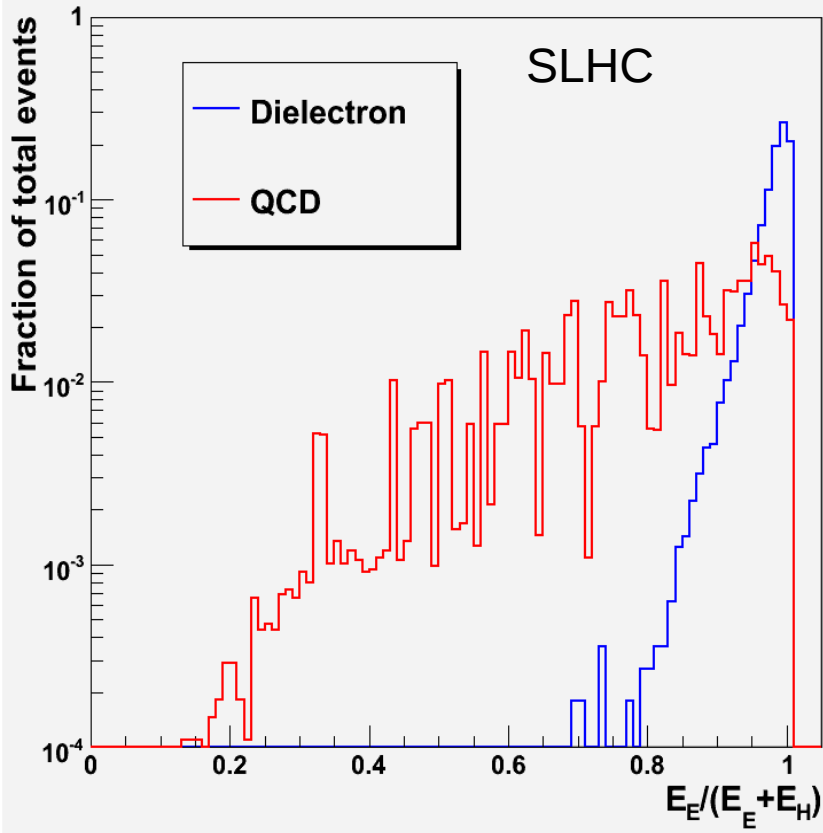


PU20 V1 2x5 Cluster HCAL Depths all (30 GeV cut)

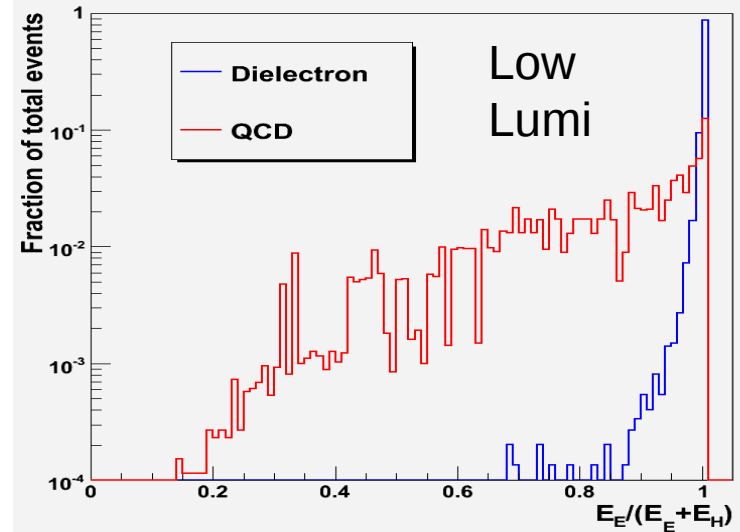


Segmentation V1, H=Depths 2-4

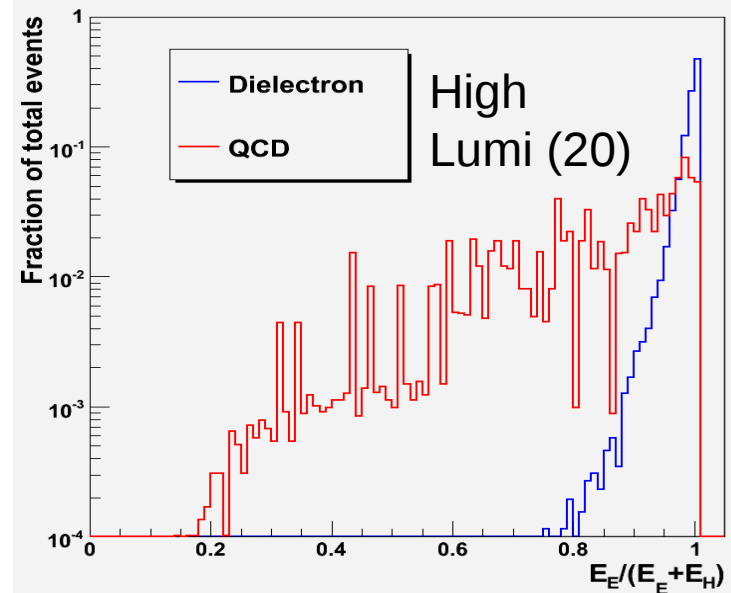
PU40 V1 2x5 Cluster HCAL Depths 234 (30 GeV cut)



PU2 V1 2x5 Cluster HCAL Depths 234 (30 GeV cut)



PU20 V1 2x5 Cluster HCAL Depths 234 (30 GeV cut)



Comparison of Different Segmentations/Cluster Definitions

- No strong difference between segmentation options when considering relative survival rates (normalized to maximum rejection/survival)

