

Backward Hadronic Calorimeter update

Diffractive dijet study

Leszek Kosarzewski

The Ohio State University

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THE OHIO STATE UNIVERSITY

- 1 Diffractive dijets with nHCal
 - Simulation setup
 - Events
 - Acceptance
 - Particle distributions in nHCal
 - Jets
 - Jets measured

- 2 Summary

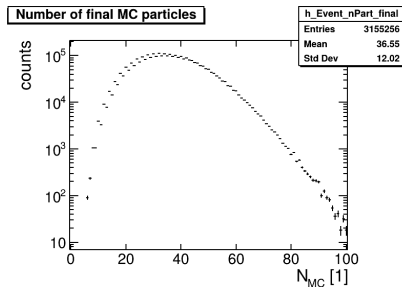
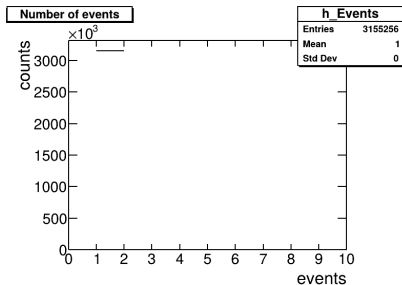
Diffractive dijet - simulation setup

- Simulation setup for diffractive dijets
- PYTHIA version 8.311 simulation from EIC container:
 - 18×275 GeV $e + p$ collisions, $0 < Q^2 < 1$ GeV²
 - 3.1M events
- Run at Ohio Supercomputing Center (OSC) to use local computing resources
- Required Diffraction A or B or HardDiffraction A or B
 - All events are HardDiffraction on B - photon on proton

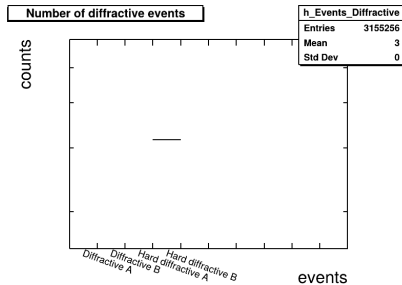
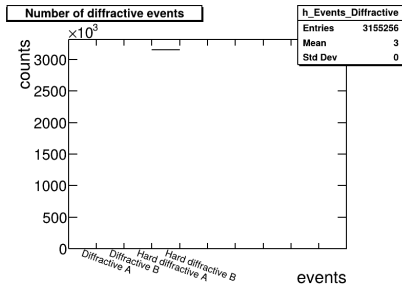
Listing: Simulation settings

```
pythia8->ReadString("Beams:frameType=2");
pythia8->ReadString("Beams:idA=2212");
pythia8->ReadString("Beams:idB=11");
pythia8->ReadString("275.");
pythia8->ReadString("18.");
//according to main342 for H1 dijets
pythia8->ReadString("PDF:lepton2gamma = on"); // Allow for photon-from lepton
pythia8->ReadString("Photon:ProcessType = 0"); // Allow all photon processes
pythia8->ReadString("Photon:Q2max = 1."); // Maximal Q2
pythia8->ReadString("HardQCD:all = on"); // All dijet MEs
pythia8->ReadString("PhotonParton:all = on"); // All dijet MEs with photons
pythia8->ReadString("PhaseSpace:pThatMin = 4."); // Minimal pT cut
pythia8->ReadString("MultipartonInteractions:pT0Ref = 3."); // Tuned ep value

// Setup of diffractive framework.
pythia8->ReadString("Diffraction:doHard = on");
pythia8->ReadString("Diffraction:sampleType = 1"); // 'PDF' sample
pythia8->ReadString("Diffraction:hardDiffSide = 2"); // Diff. on photon side
pythia8->ReadString("SigmaDiffraction:PomFlux = 7"); // H1 Fit B LO
pythia8->ReadString("PDF:PomSet = 6"); // H1 Fit B LO
```



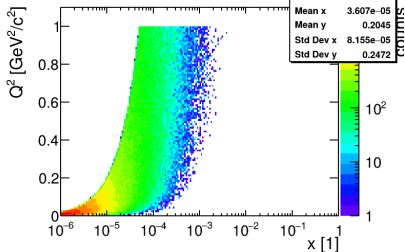
- First look at diffractive dijet events
- 36 final state particles on average



- All events are HardDiffraction on B - photon on proton

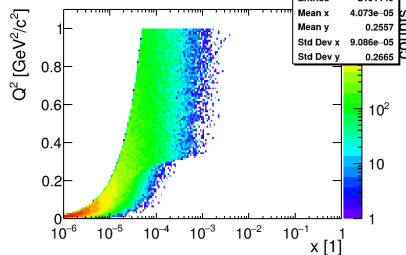
All events

Event Q^2 vs. x

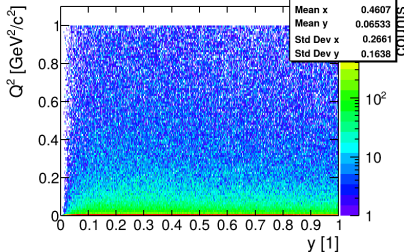


With activity in nHCal

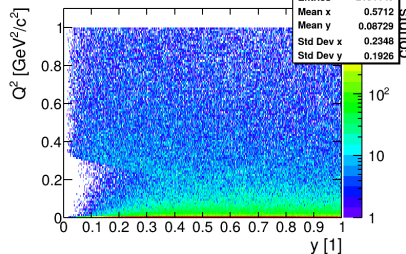
Event with nHCal activity Q^2 vs. x



Event Q^2 vs. inelasticity y



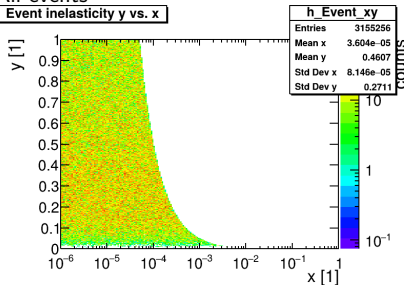
Event with nHCal activity Q^2 vs. inelasticity y



- 2.1M out of 3.1M (68%) events with activity in nHCal
- First look at diffractive dijet events

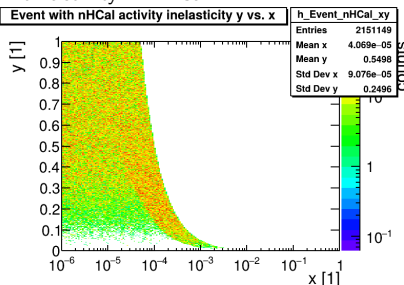
All events

Event inelasticity y vs. x

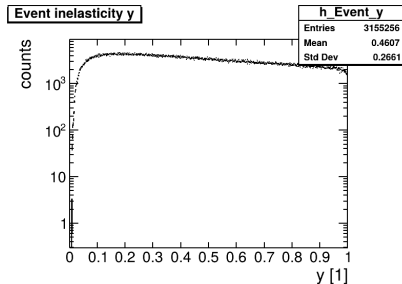
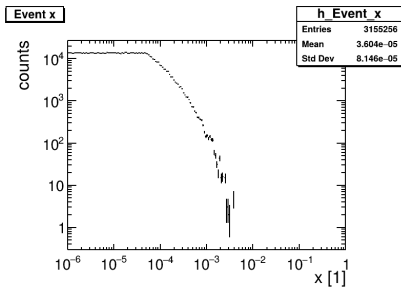
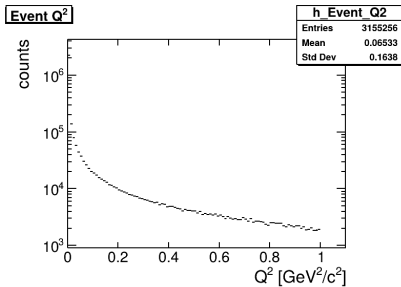


With activity in nHCal

Event with nHCal activity inelasticity y vs. x



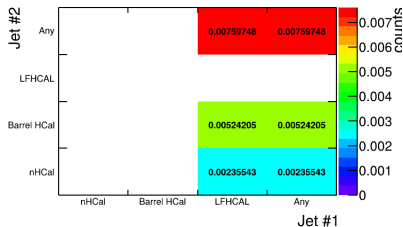
- 3.2M out of 4.7M (68%) events with activity in nHCal
- Includes scattered electron
- First look at diffractive dijet events



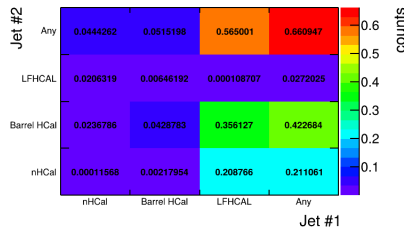
- All events

- Final state particles
- Beam particles not excluded
- Generalized ee k_T algorithm seems to work well, IR and collinear safe
- $R = 1$
- $p = -1$
- Jet $E > 4 \text{ GeV}/c$

Event with dijets in HCals

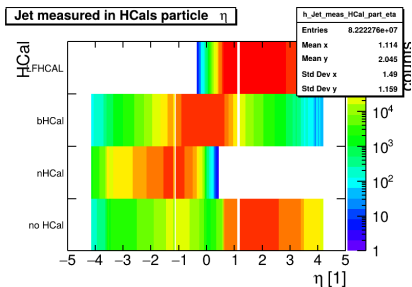
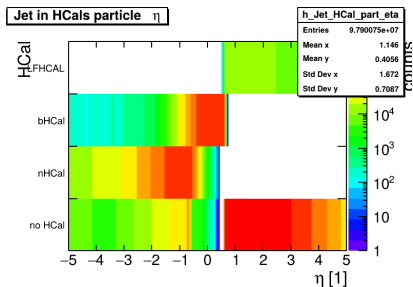
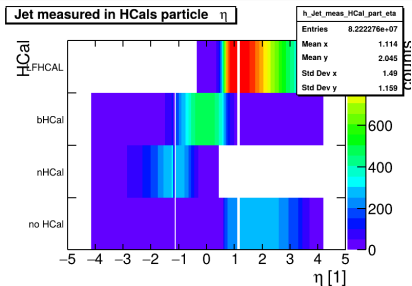
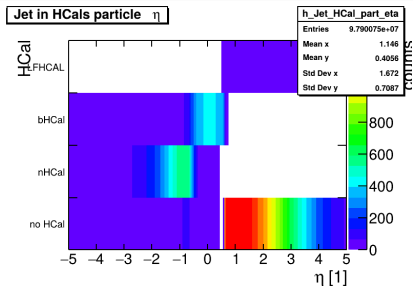


Event with measured dijets in HCals

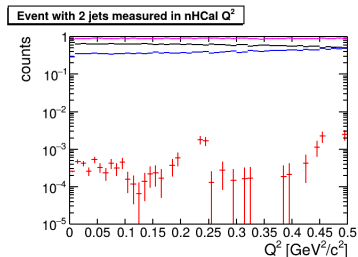
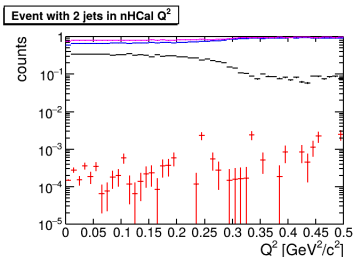
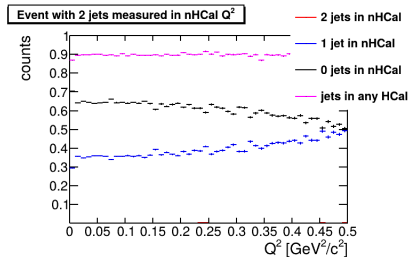
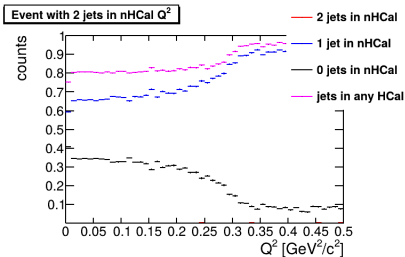


- Fractions of events with jets in HCals
- Fraction of all events, even those with 0 – 1 jets
- Maybe it's better to scale by the events with 2 or more jets rather than all events

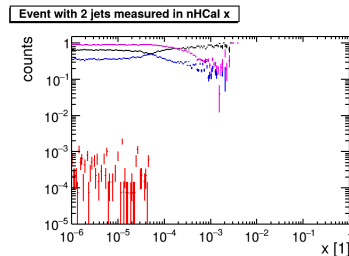
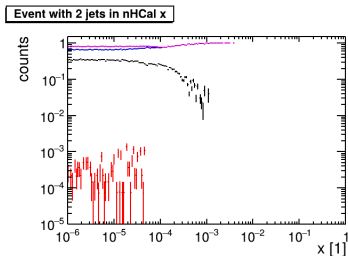
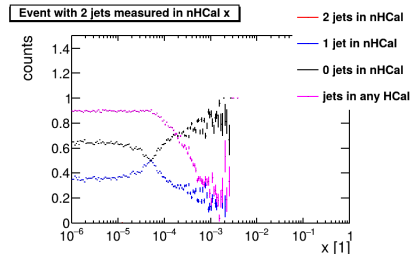
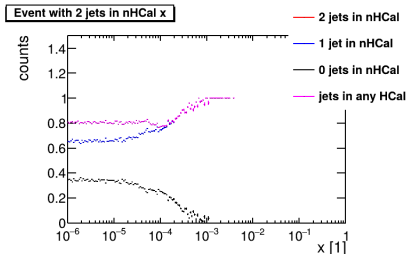
Jets in HCals vs. constituent η



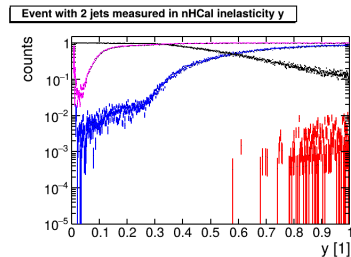
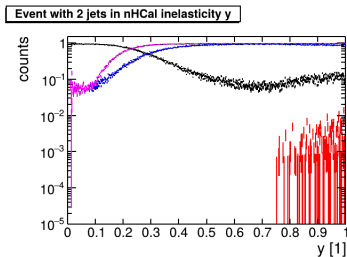
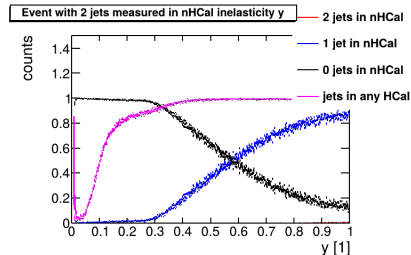
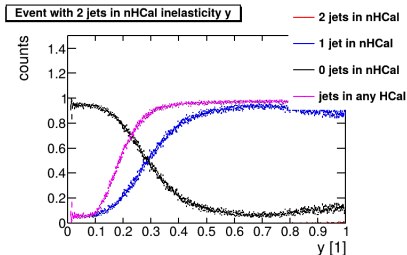
- η distributions for constituents of jets in HCals



- Fractions of events with jets in HCal



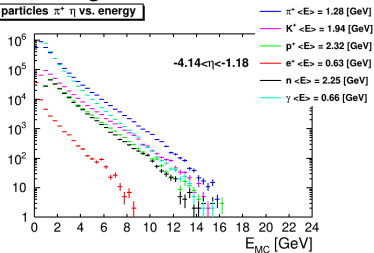
- Fractions of events with jets in HCals



- Fractions of events with jets in HCals

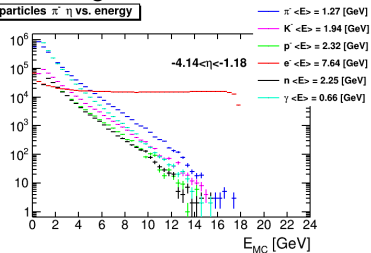
positive charge

MC particles π^+ η vs. energy

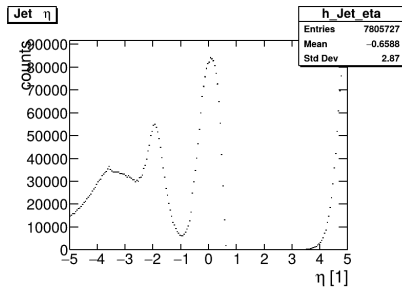
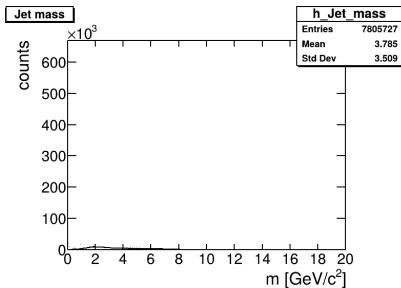
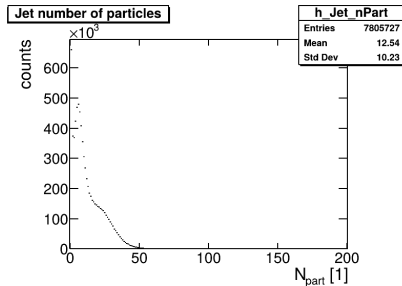
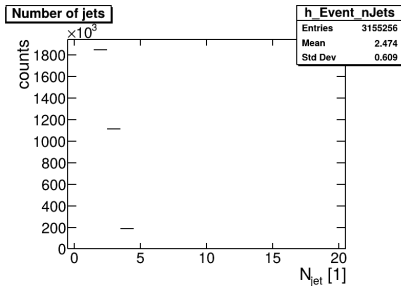


negative charge

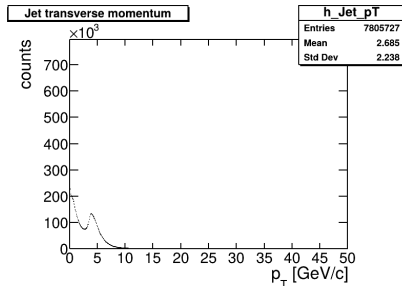
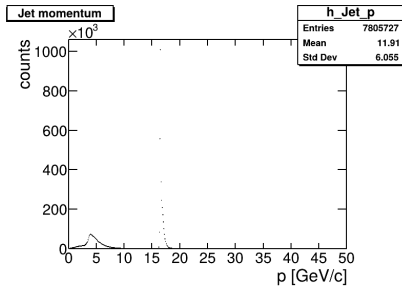
MC particles π^- η vs. energy



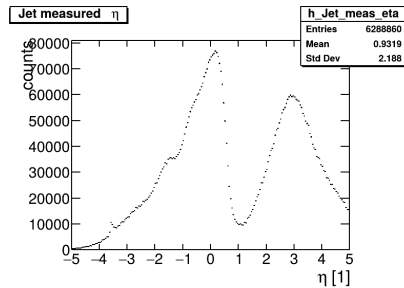
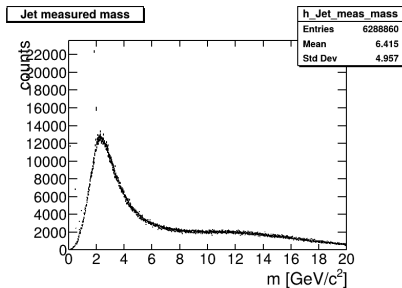
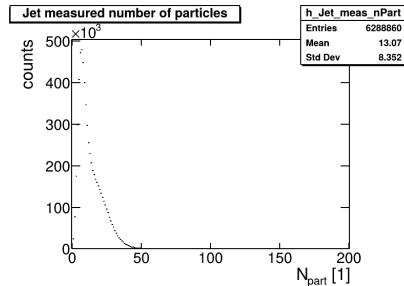
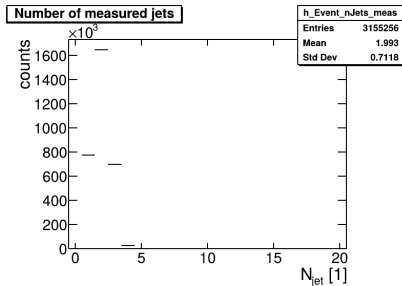
- Total energy distributions vs. η
 - Average neutron energy similar to inclusive events
- Kinetic energy is measured in nHCal



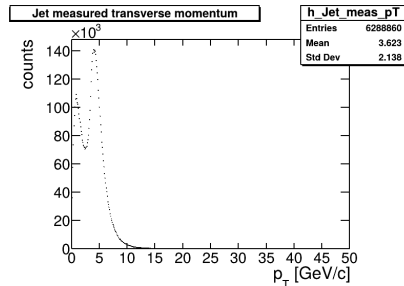
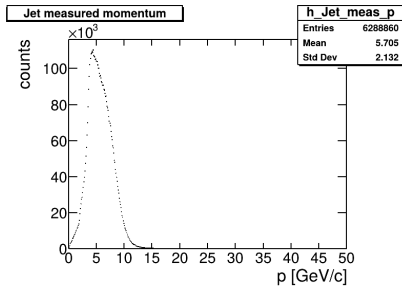
- All jets



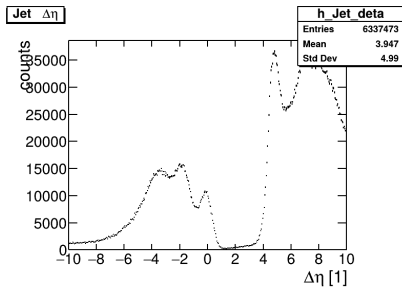
- All jets



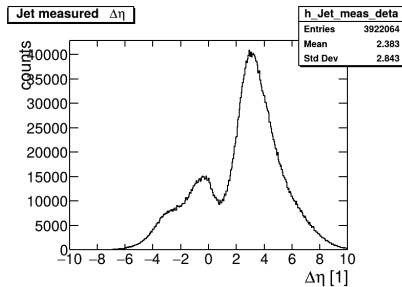
- All jets



- All jets



- All jets

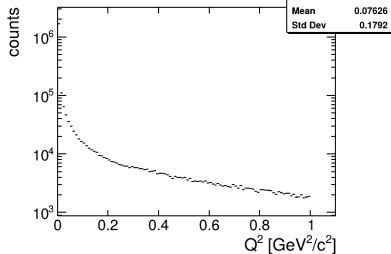


Conclusions

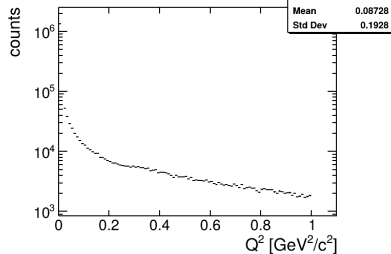
- Implemented FastJet
- First look at jets

BACKUP

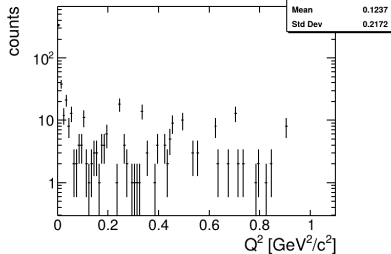
Event with jets in any HCal Q^2



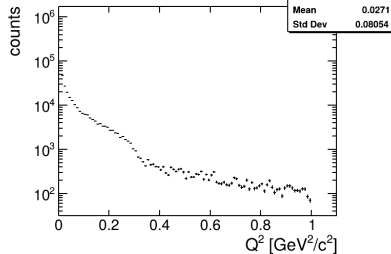
Event with 1 jet in nHCal Q^2



Event with 2 jets in nHCal Q^2

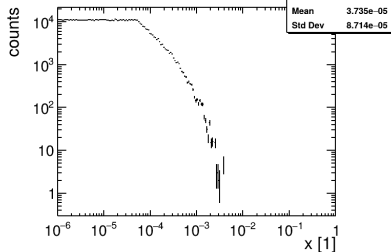


Event with 0 jets in nHCal Q^2

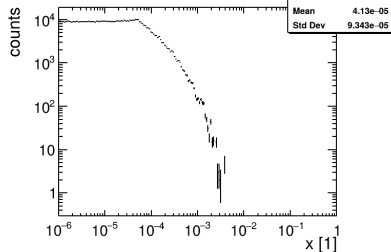


- All events

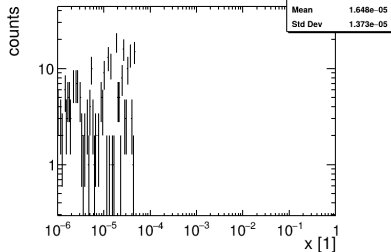
Event with jets in any HCal x



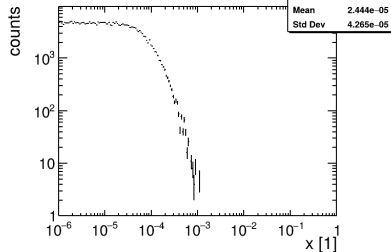
Event with 1 jet in nHCal x



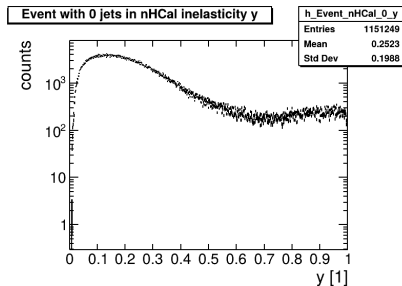
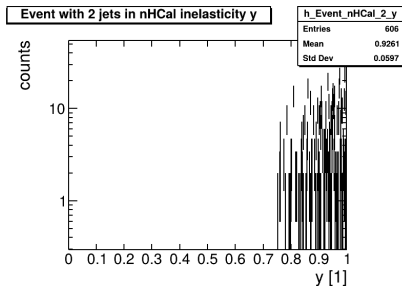
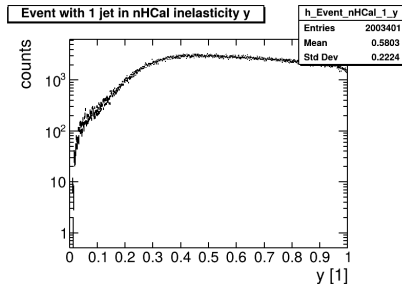
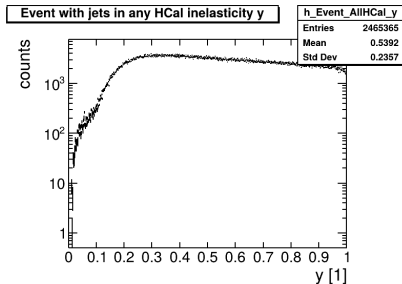
Event with 2 jets in nHCal x



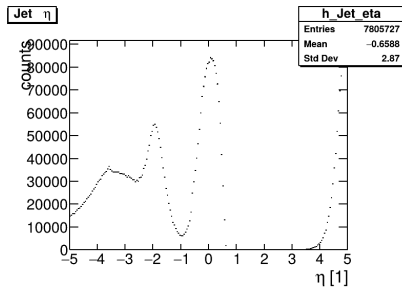
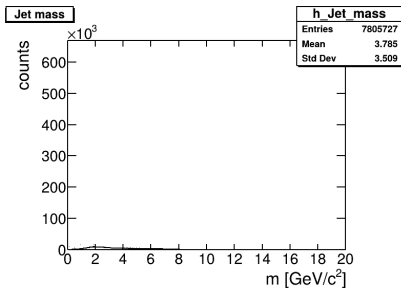
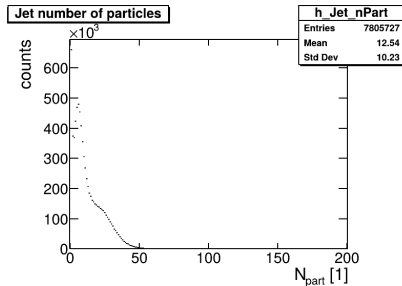
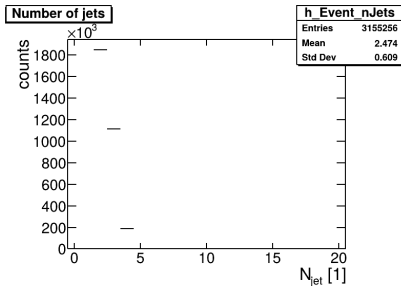
Event with 0 jets in nHCal x



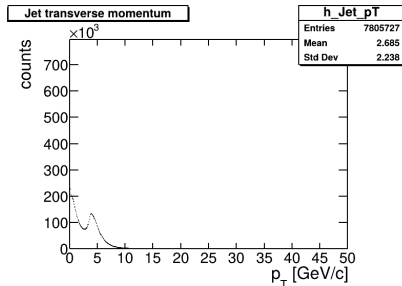
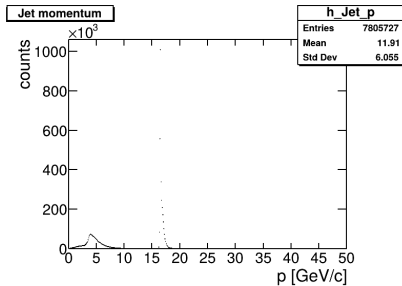
- All events



- All events

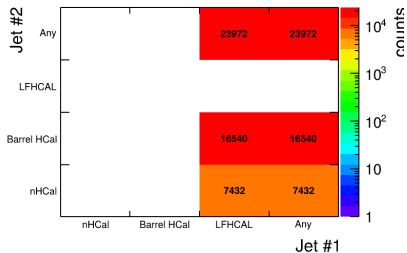


- All jets

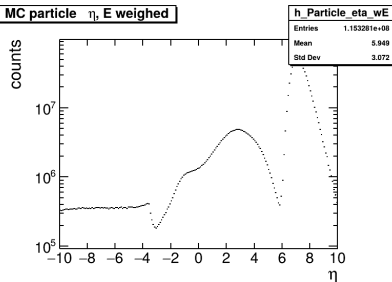


- All jets

Event with dijets in HCals



MC particle η , E weighed



- Calculated average energy in acceptance of HCals