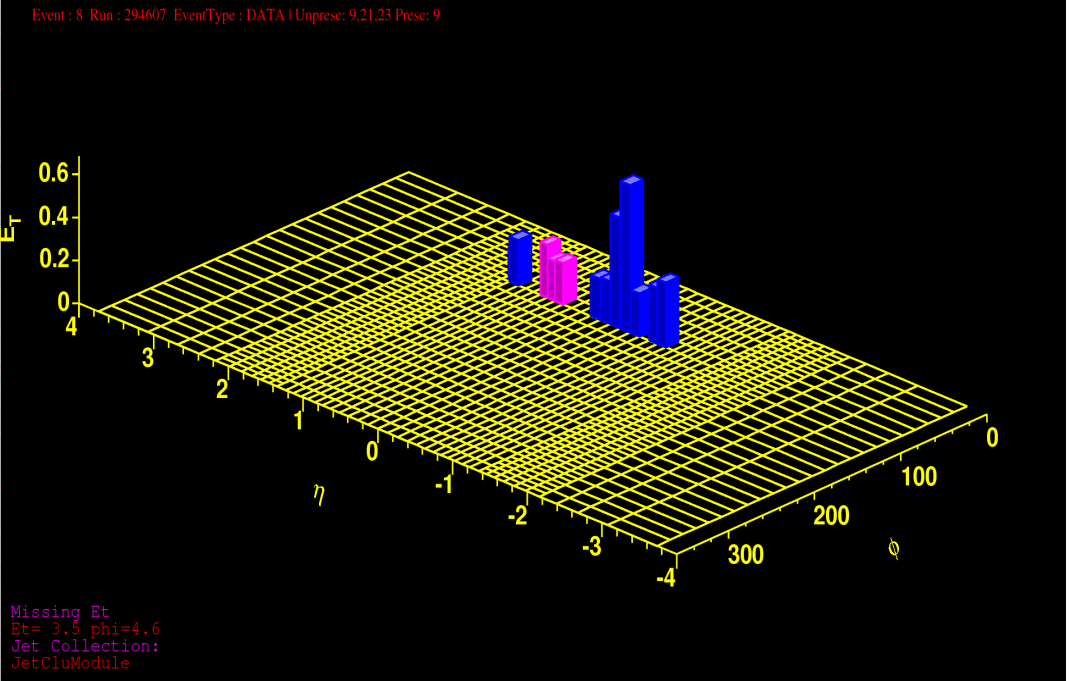
Gap-X-Gap update

1) Artur Święch:
    1) Beam Halo and Cosmics
2) Dominik Wrana:
    1) Cleaning the central calorimeter
    2) Some Evd images
3) Maria Żurek:
    1) Pi+Pi- Invariant mass
    2) Antideuterons

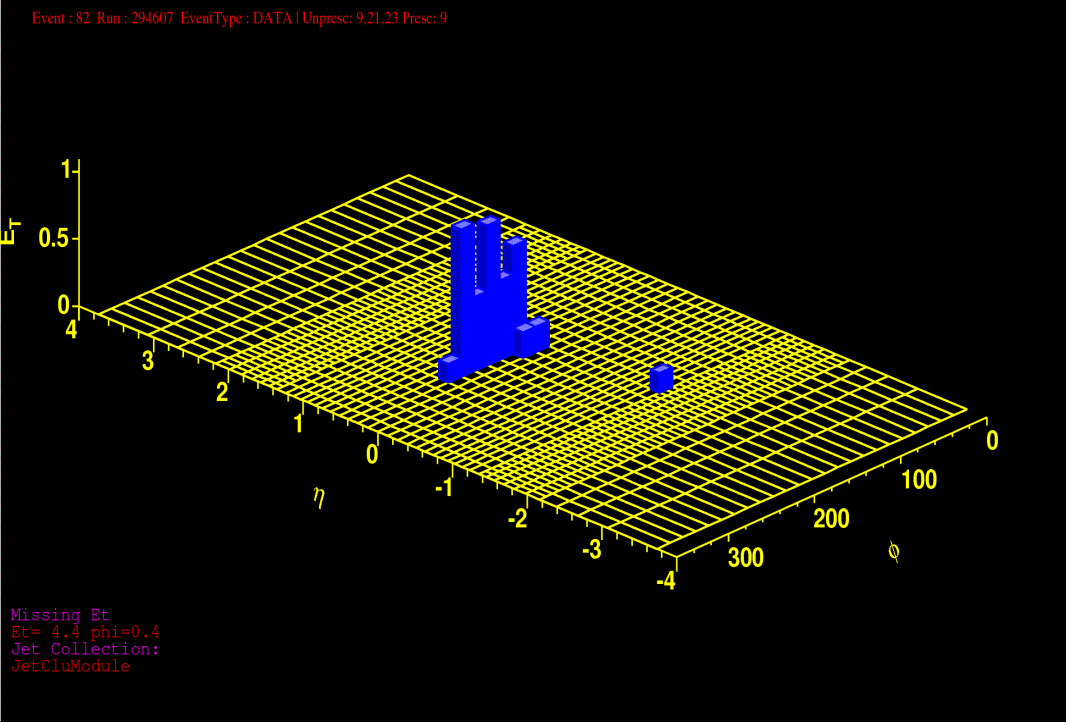
Beam Halo and Cosmics

Artur Święch

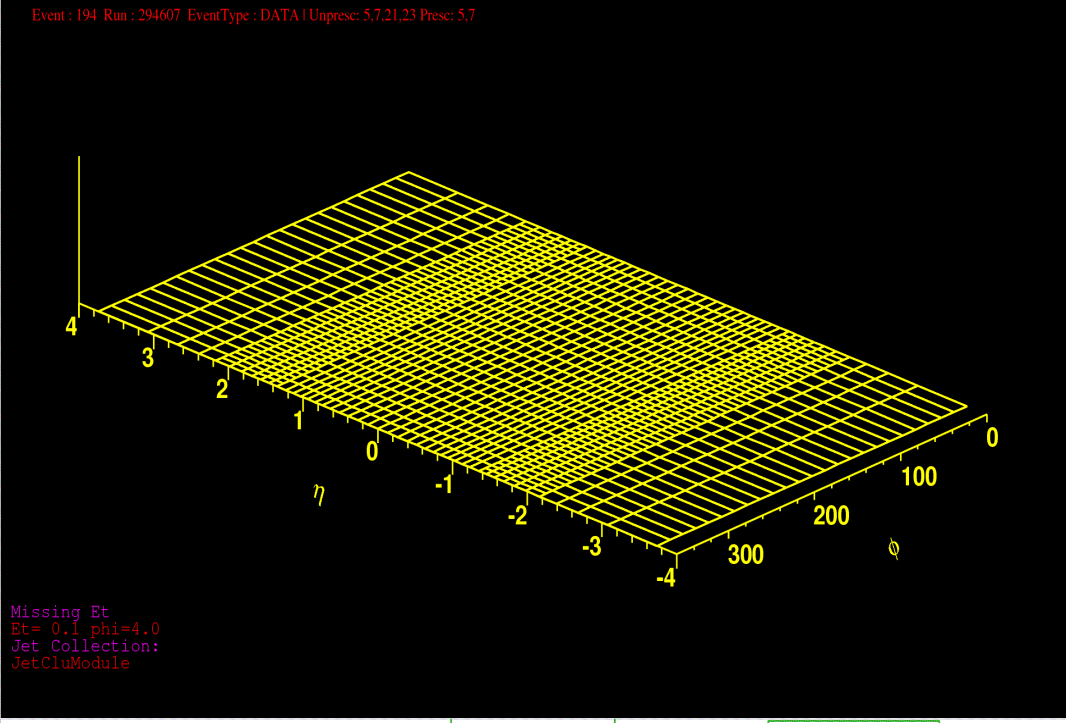
- Typical events
- Neural network method
- Pre-results

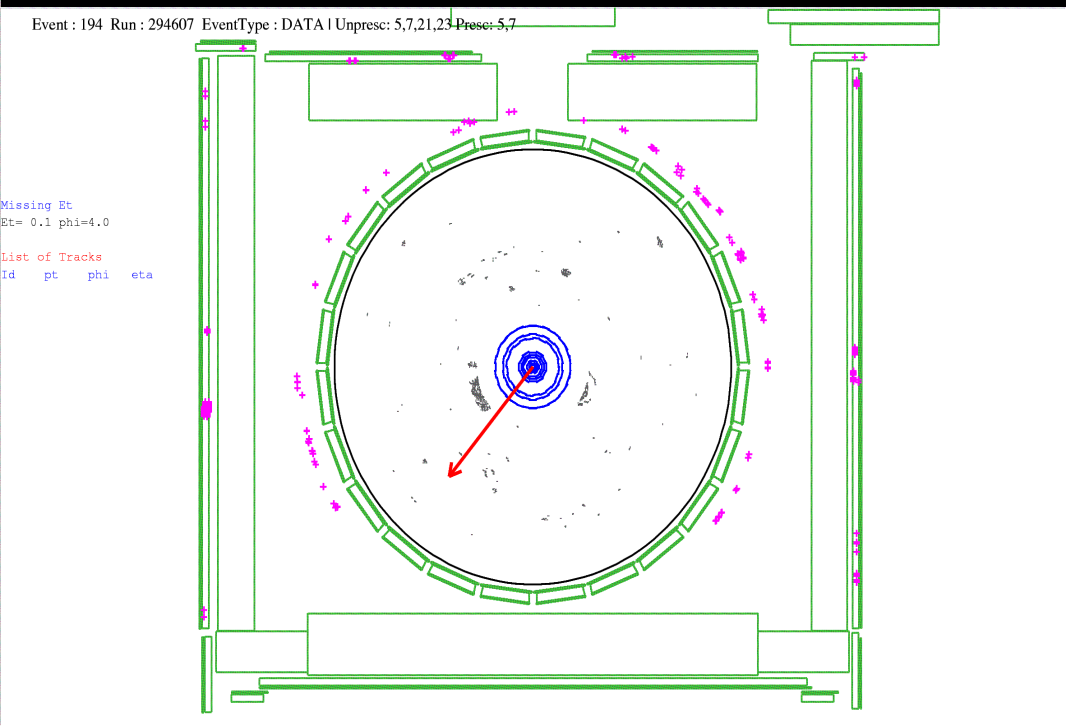


- Beam Halo

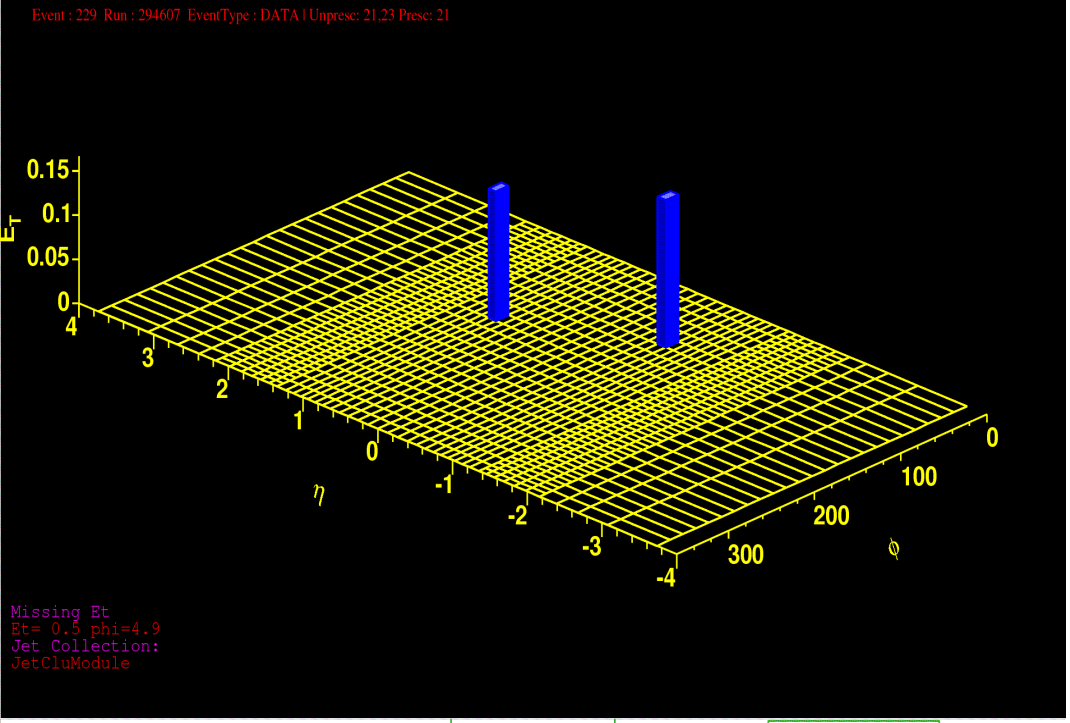


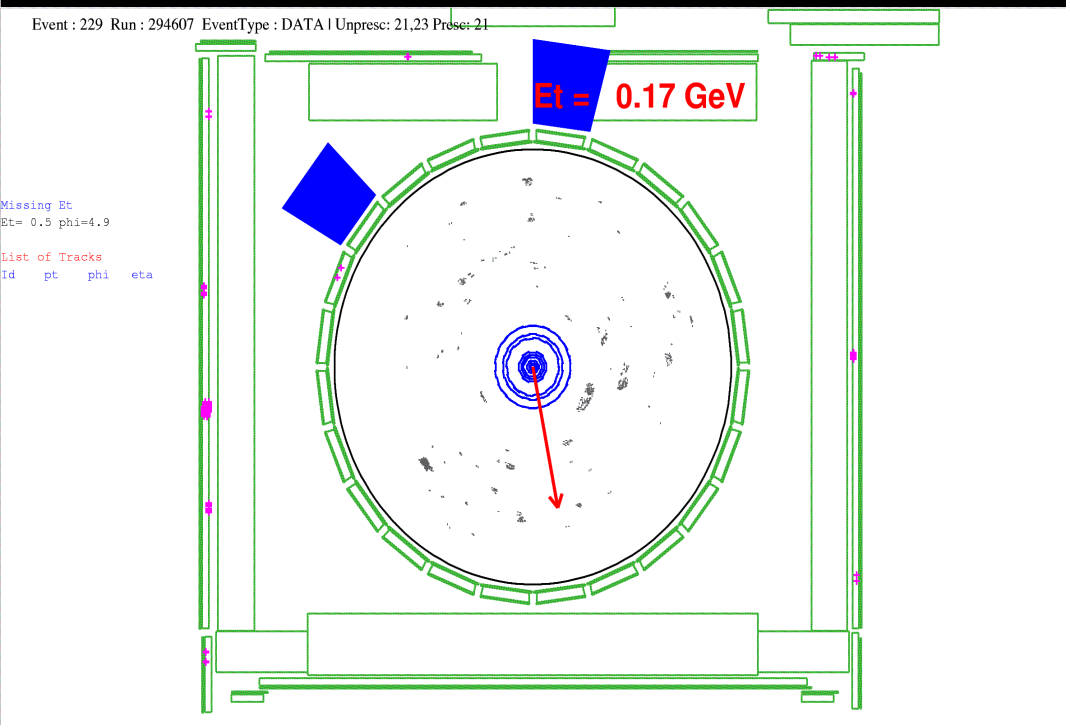
- Cosmic





- Empty events





- Only Hadronic
  Little energy
  Empty in COT

  ???

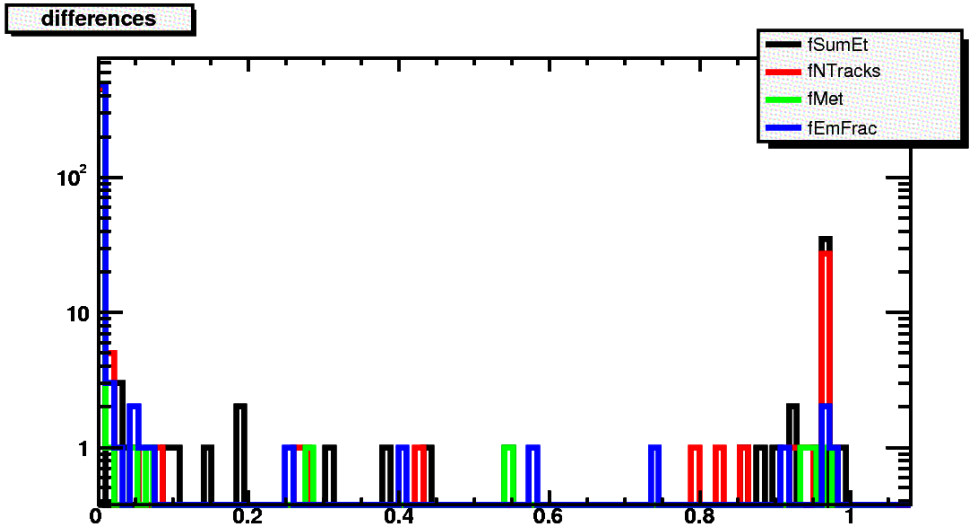
Neural Network

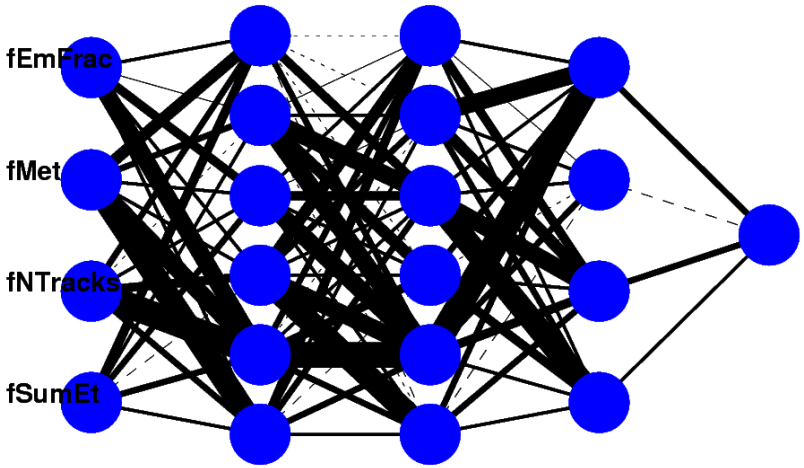
- Layers of neurons with mixing matrices between layers
- Require learning sample of events and selected input data
- Gives promising results

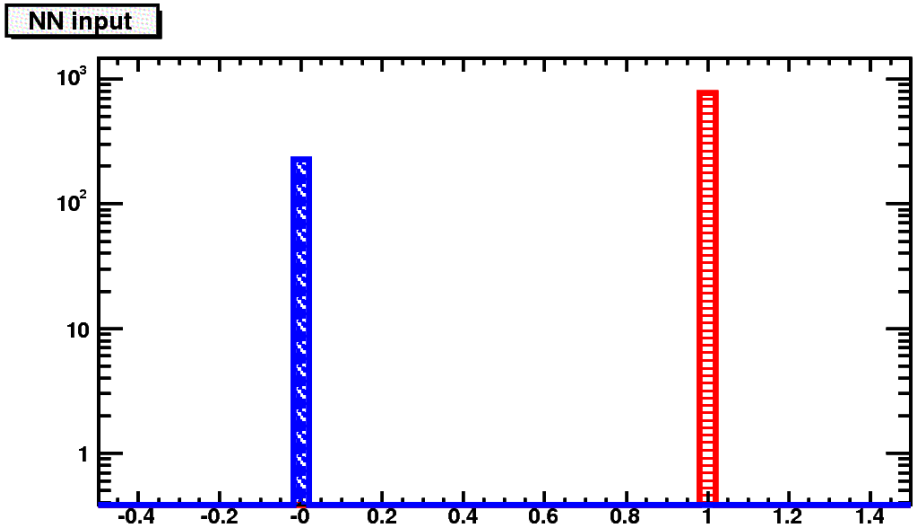
Pre-results

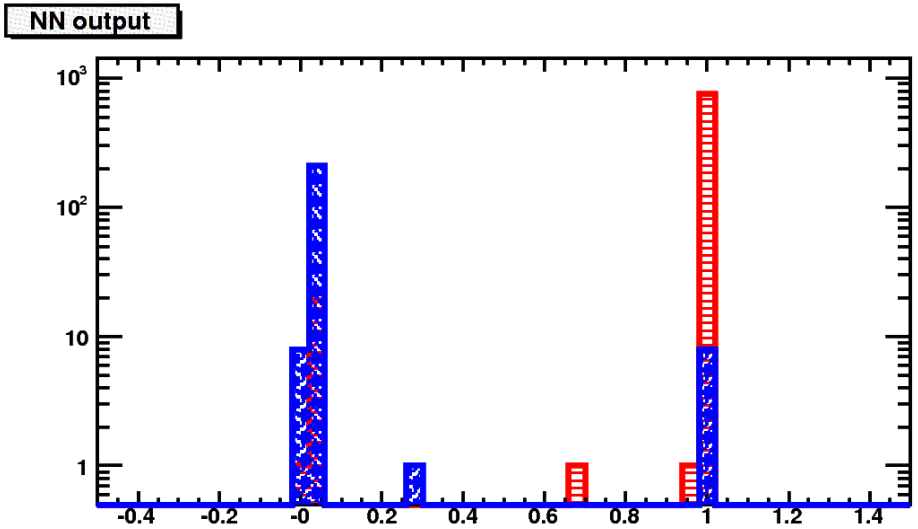
- 1000 events learning sample (10 000 in plans)
- Type = 0 for 0-Bias and Cosmics
- Type = 1 for good events
- Input:
  - SumEt,
  - Missing Et,
  - Em Energy,
  - Had Energy

Pre-results


differences
fSumEt
fNTracks
fMet
fEmFrac
10^2
10
1
0
0.2
0.4
0.6
0.8
1


fEmFrac
fMet
fNTracks
fSumEt


NN input
10^3
10^2
10
1
-0.4
-0.2
-0
0.2
0.4
0.6
0.8
1
1.2
1.4


NN output
10^3
10^2
10
1
-0.4
-0.2
-0
0.2
0.4
0.6
0.8
1
1.2
1.4

Pre-results

- 5 out of 225 bad events still in sample
- 8 out of 775 good events tagged as bad

- To do:
  - Bigger learning sample
  - More learining time
  - Improve Neural Net topology

New method of cleaning the calorimeter - results

Dominik Wrana

Picking good tracks
according to Sasha's code

- Pt > 0.3 GeV/c
- Pt < 980 GeV/c
- At least 2 segments in COT St with 5 hits
- At least 2 segments in COT Ax with 5 hits
- χ^2 of COT fit max of 3
- Z0 track – Z vertex < 3 (not used)

Tracks curvature included using Stntuple/photon/TExtrap.hh routines

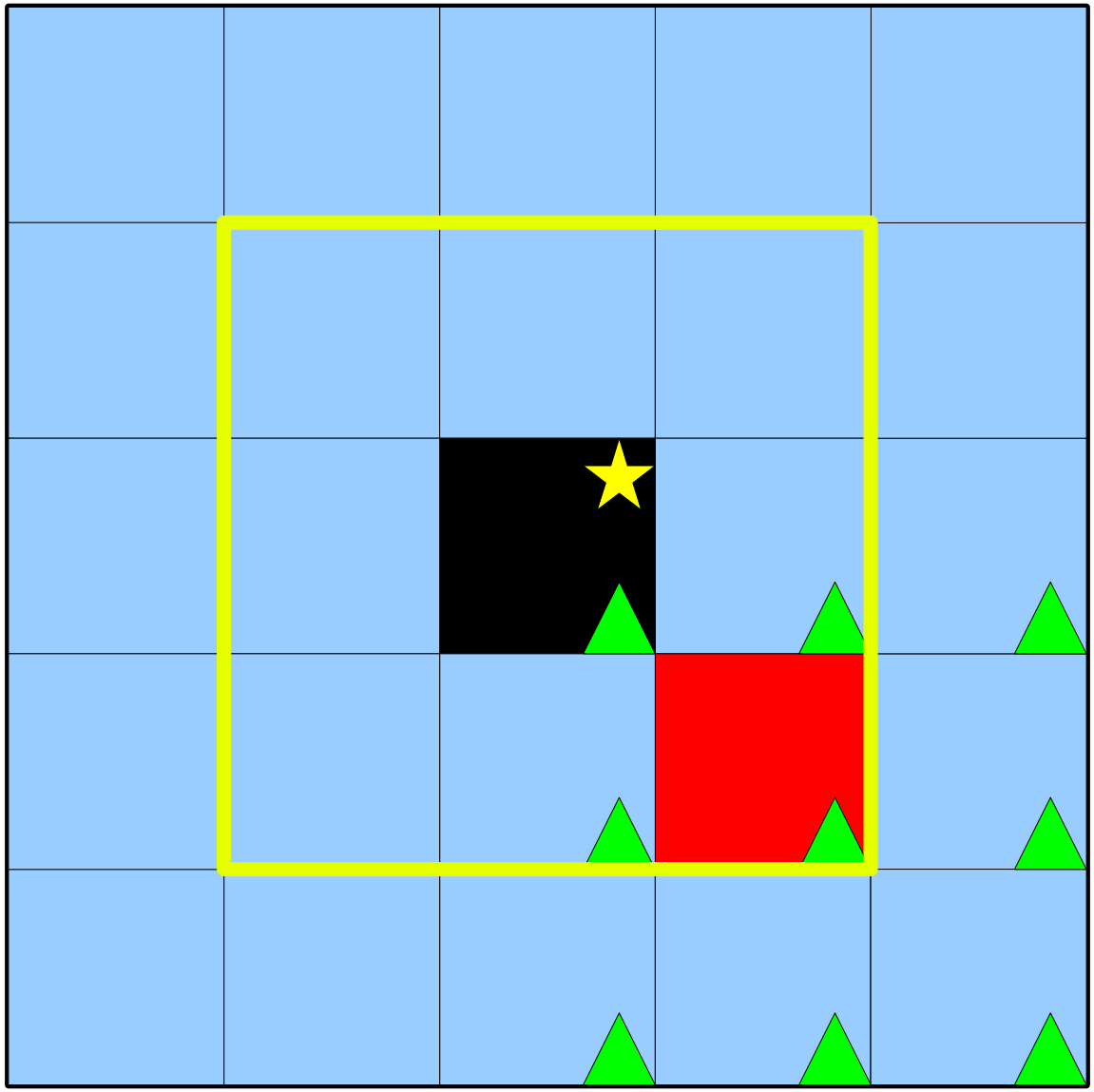
- GetPhiTower(), GetEtaTower()

(Iphi, Ieta of hit towers)

- DetEtaAtShowerMax(), PhiAtR(184.15)

(phi, eta of a track)

Track energy in a calorimeter



(Extrapolated) Track hit

Tower hit

Hottest tower

Finally picked towers

71% – the hit one is the hottest

Method of a central calorimeter cleaning

E_Track1 – energy from 9 towers around hottest one (with it) for 1st track

E_Track2 – energy from 9 towers around hottest one (with it) for 2nd track

E_Tracks = E_Track1 + E_Track2

E_All – energy from all towers in a central region

Cut (events rejected):

E_All – E_Tracks > 0.96 * 1 GeV

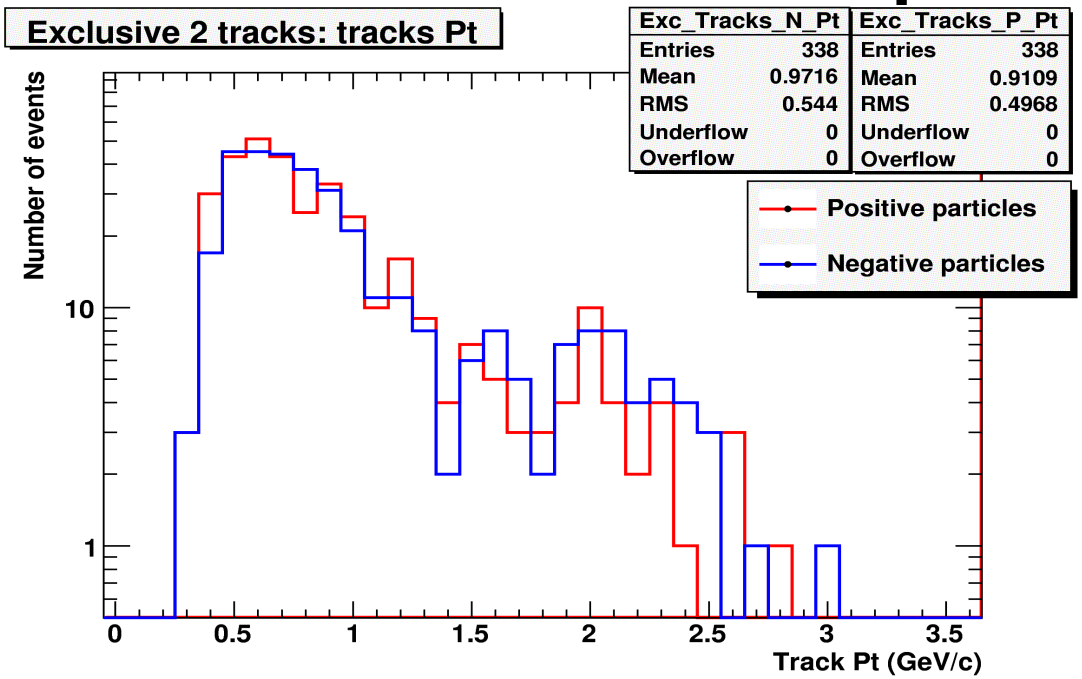
Noise level of the rest of the calorimeter

Cuts: Runs# 292319 + 294607

After:

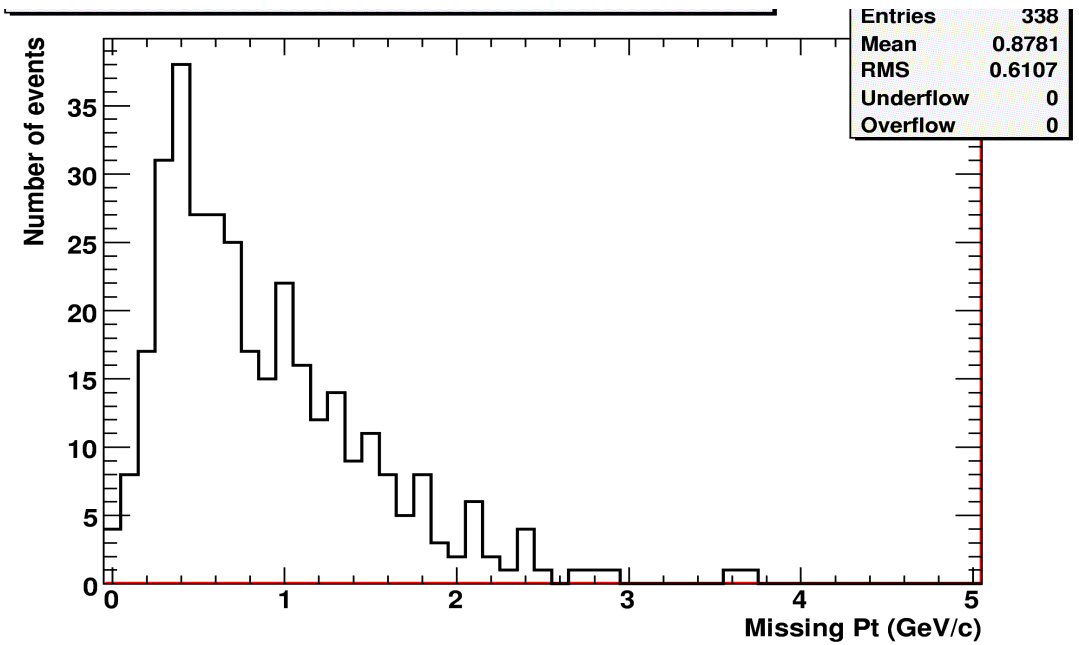
- gaps cuts	80714
- beam halo cuts	60116
- side cal cleaning	19887
- 2 tracks, opposite charge	1097
- Muons, cosmics	1035
- GoodTrack demand	873
- Not-the-edge-hit	792
- Exclusivity cuts	339
- Bad extrapolation cut	**338** **0.5% of gap data**

Exclusive 2 particles features



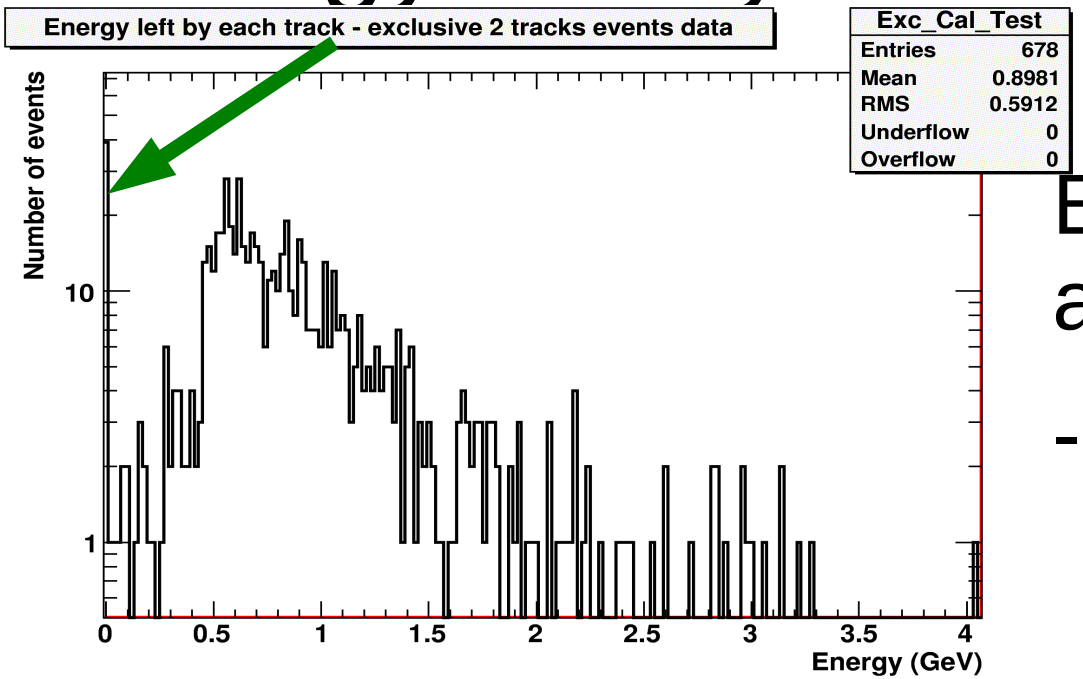
Pt for positive and negative particles separately

- similar distribution



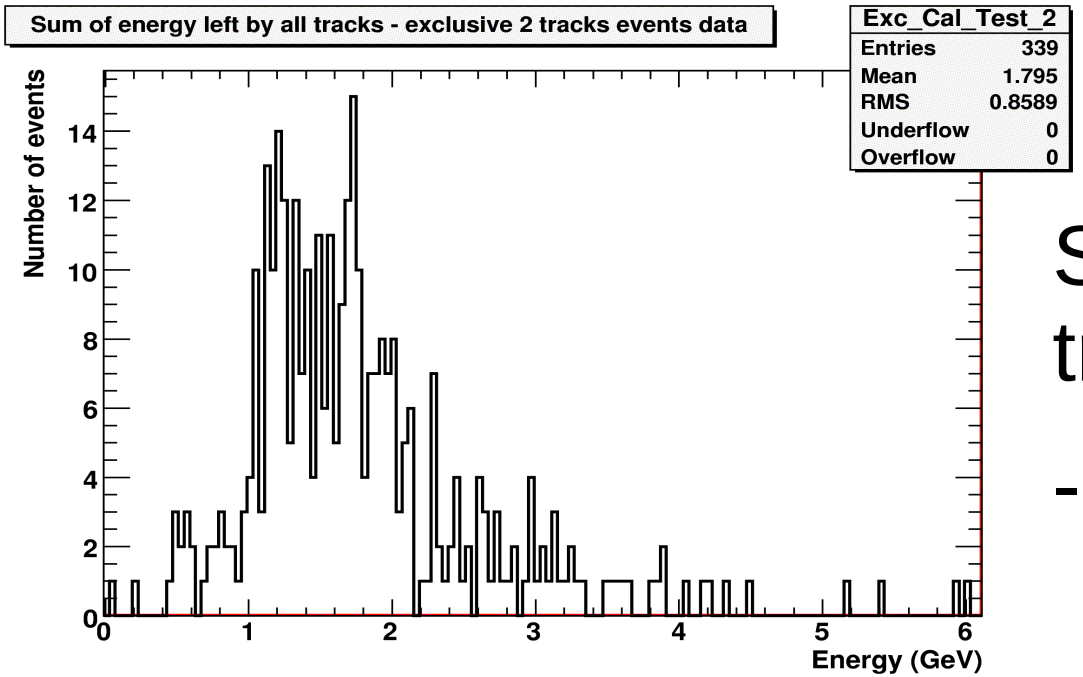
Missing Pt

Energy left by tracks in a calorimeter



Energy gathered from around each track hit

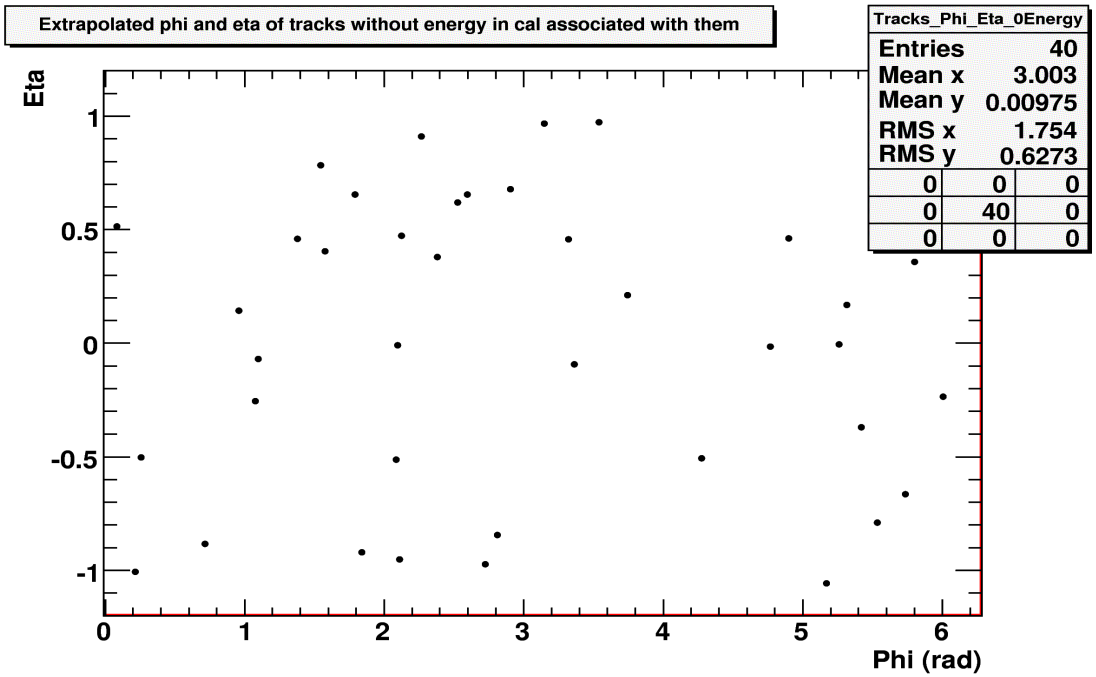
- 39 events with 0 energy



Sum of energy from both tracks hits

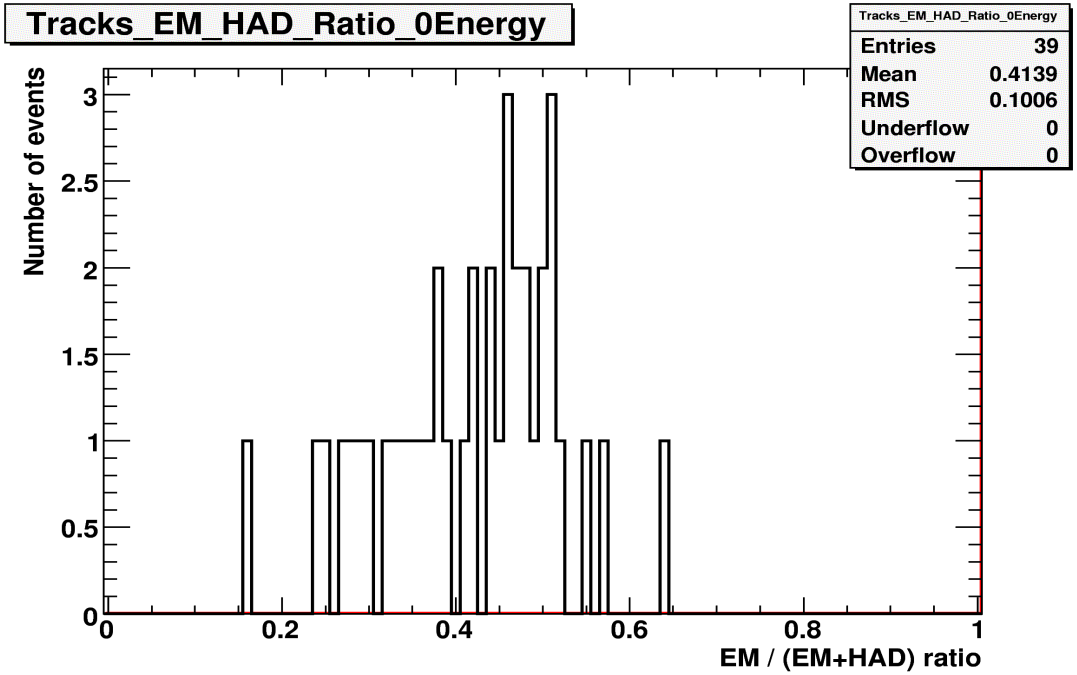
- 1 event with 0 energy

Events with no energy left by tracks

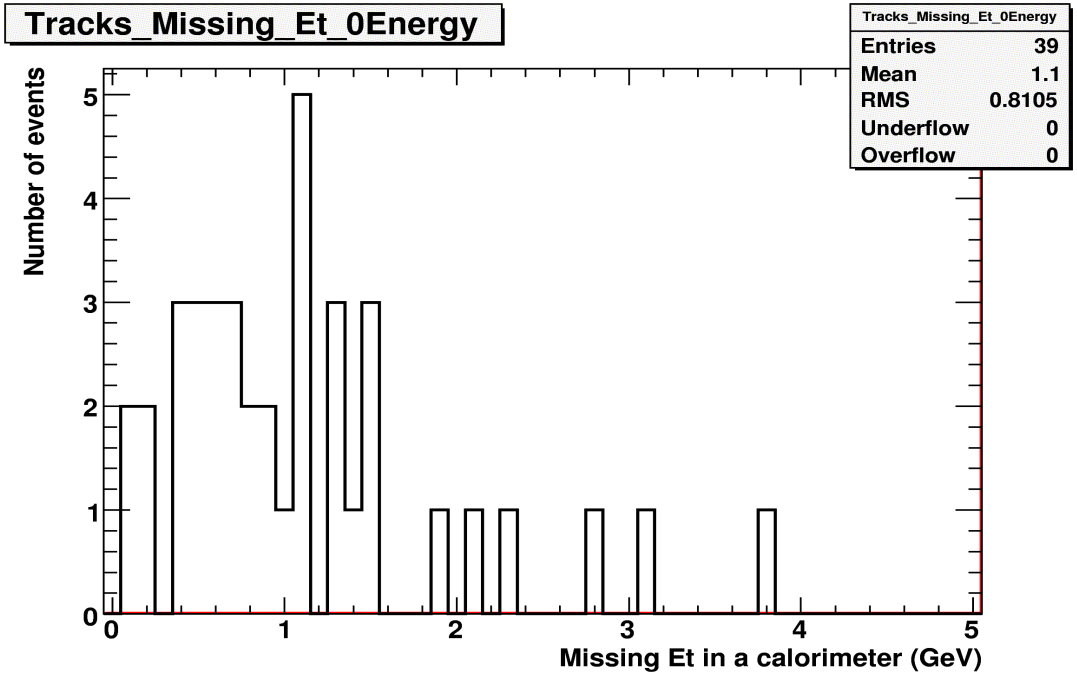


Eta vs Phi of these tracks

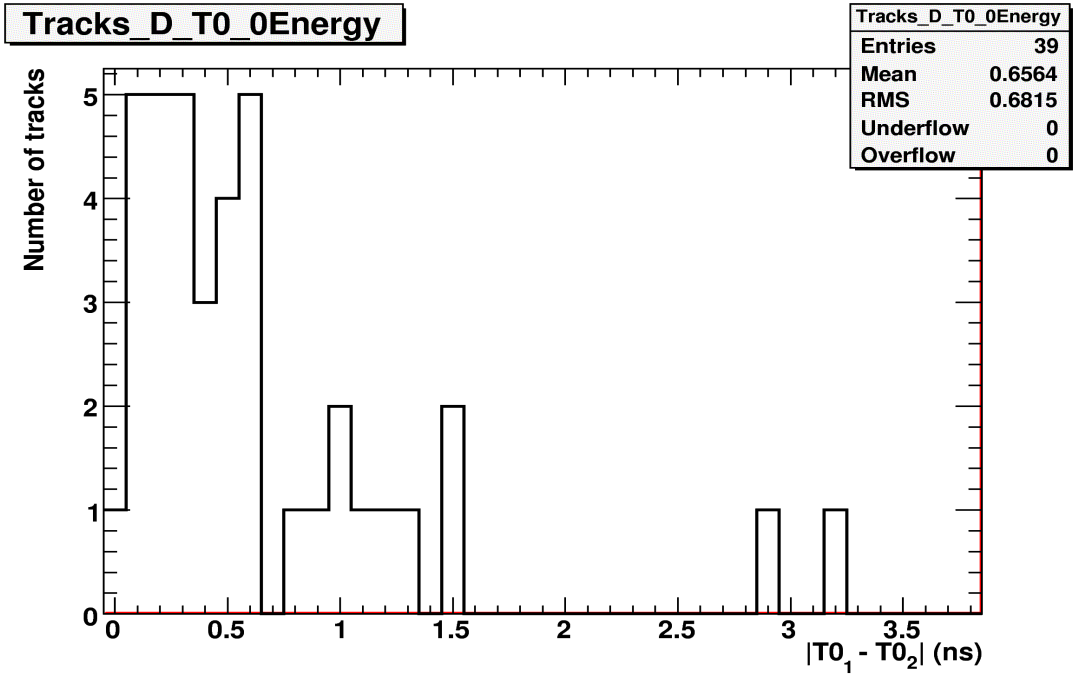
- tracks don't hit cracks in the calorimeter



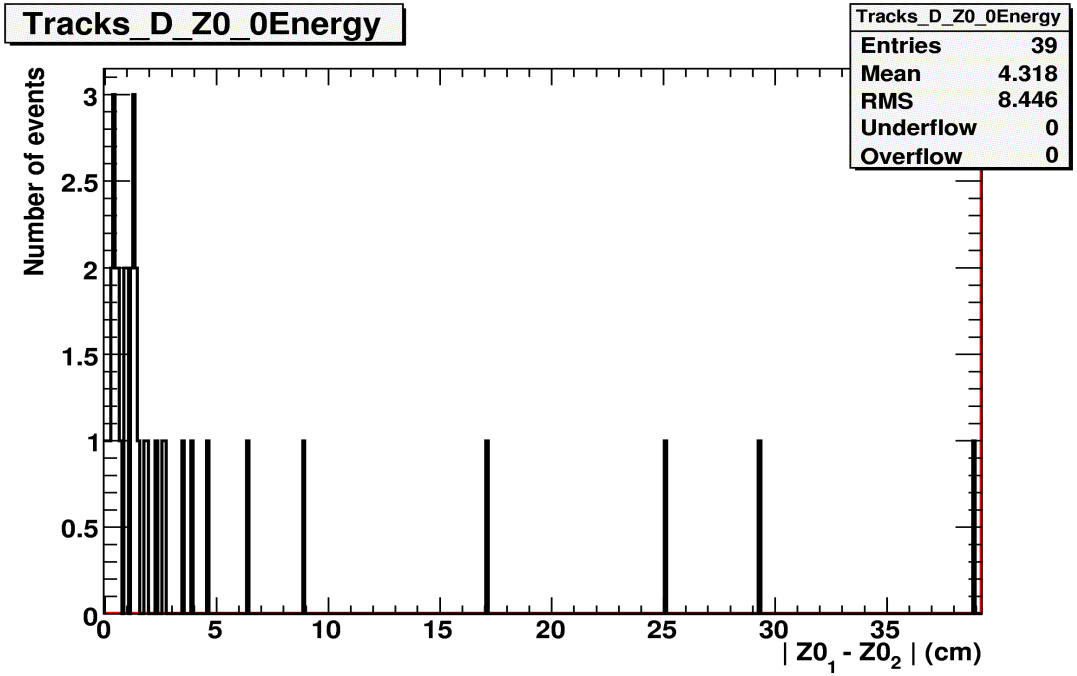
EM fraction of 0 energy from track events



Missing Et



Absolute value of a difference in tracks T0

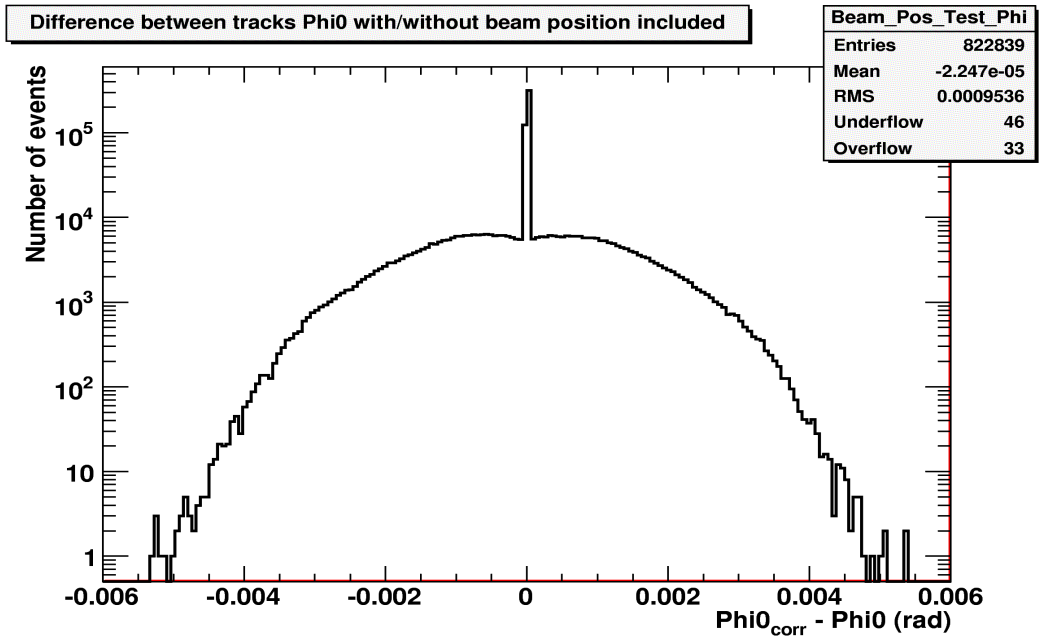


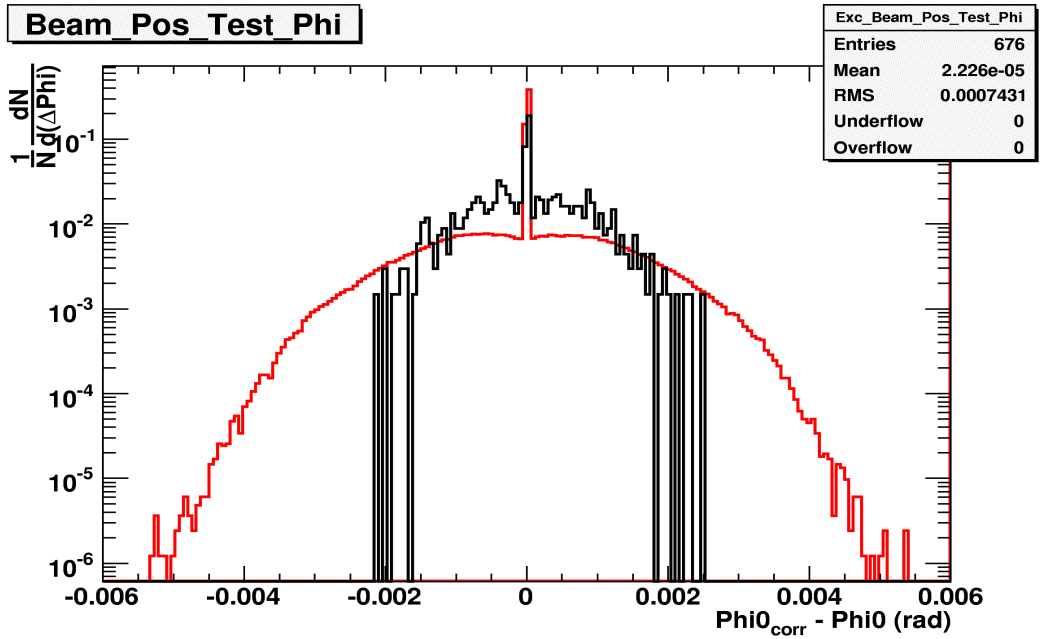
Absolute value of a difference in tracks Z0

- few events are far apart in Z0's

- no general characteristic

Position of a beam and Phi0





Position of a beam from COT

For every event

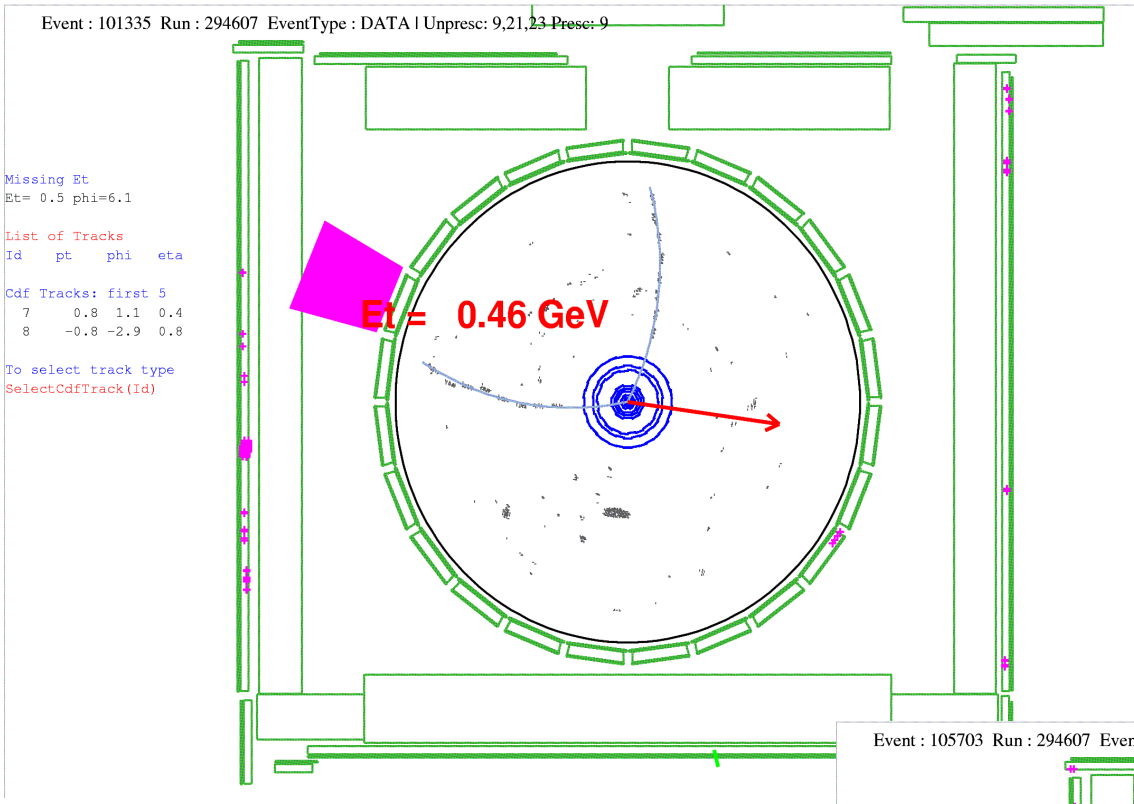
- small differences

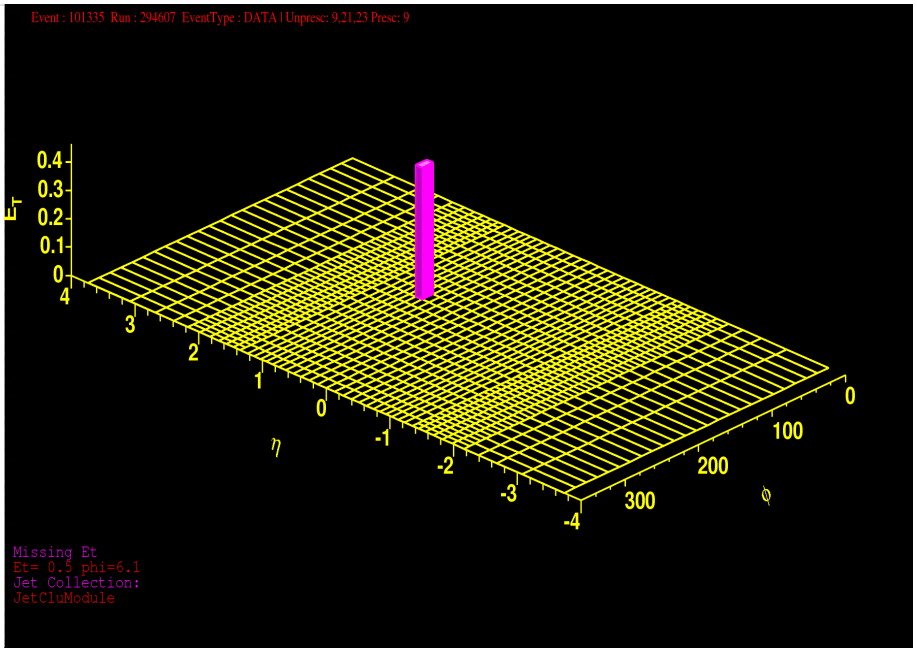
For exclusive events compared with all

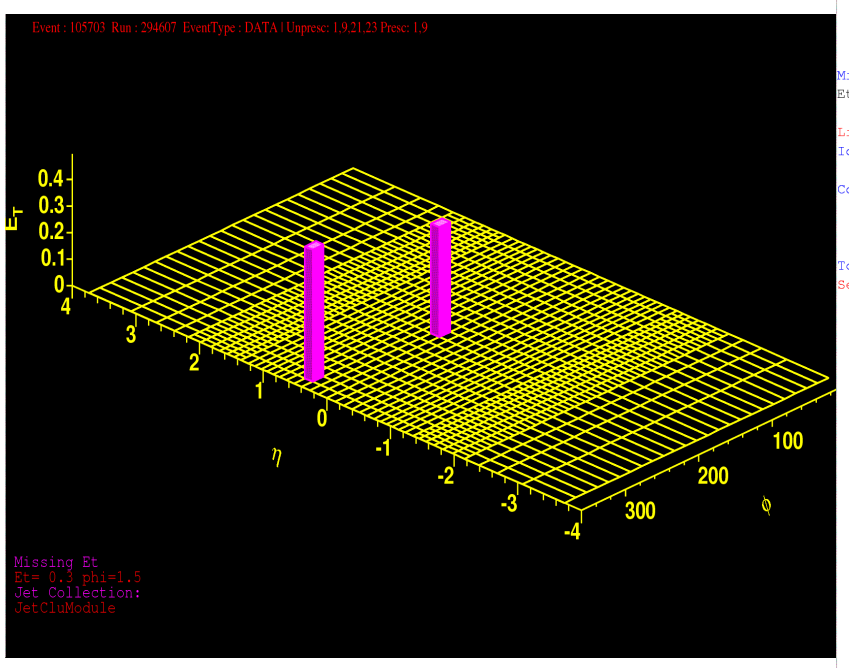
- similar distribution

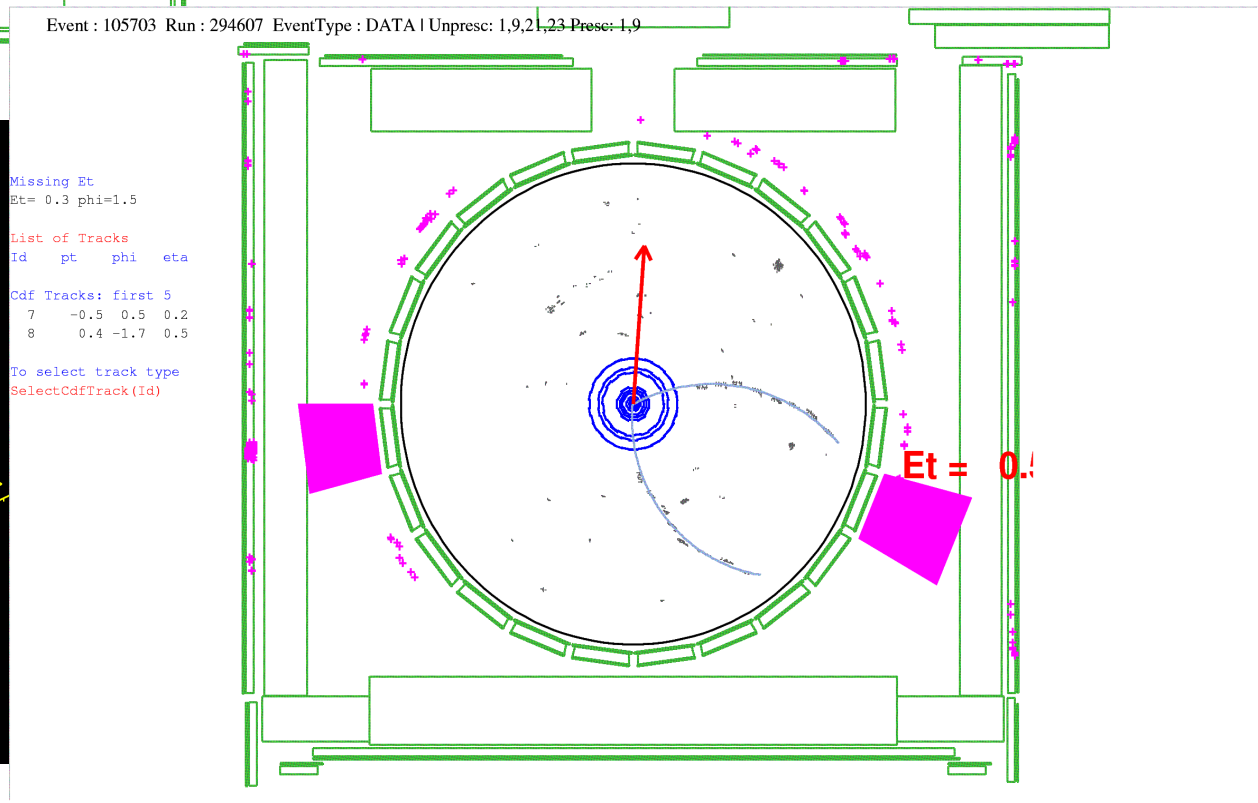
EVD images of events with no energy left by a track

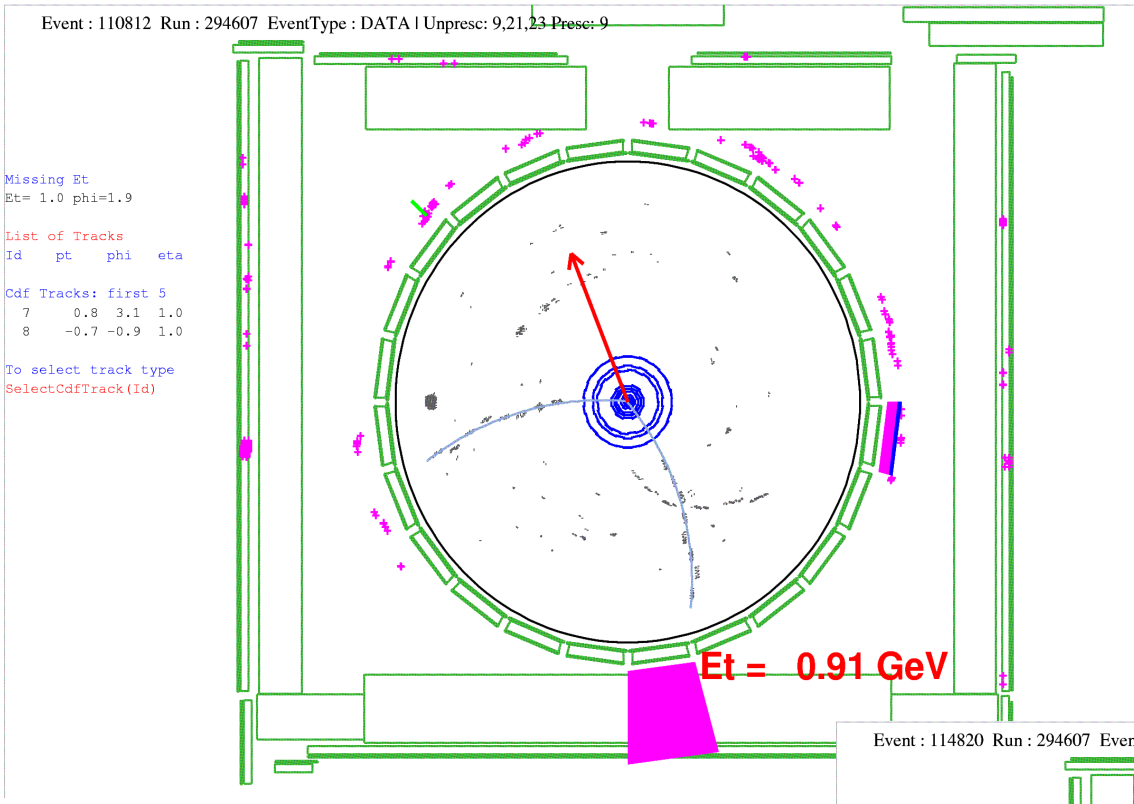
Events only from 294607 run (July 2010)

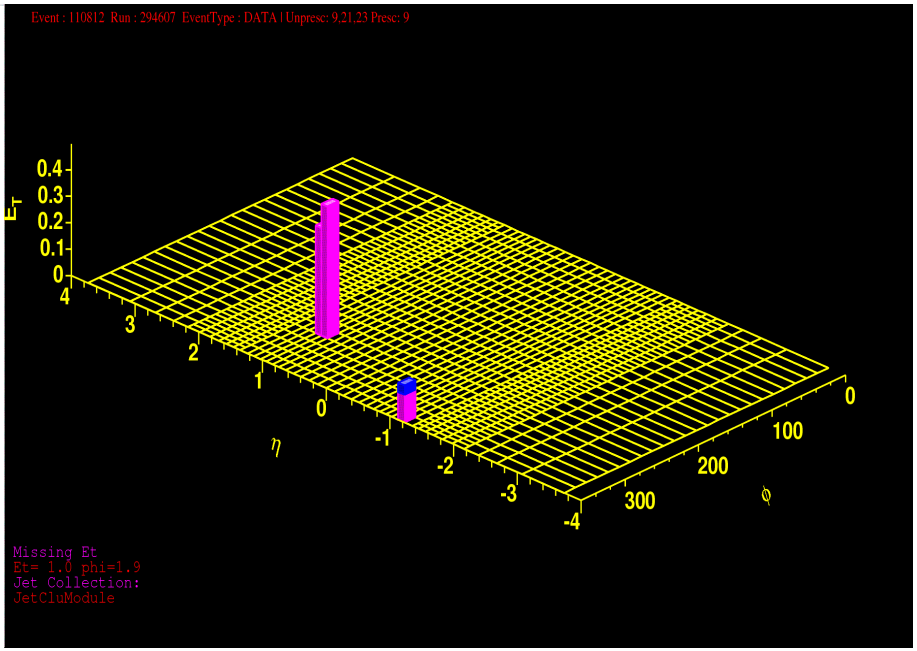

Event : 101335 Run : 294607 EventType : DATA | Unpresc: 9,21,23 Presc: 9
Missing Et
Et= 0.5 phi=6.1
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
7 0.8 1.1 0.4
8 -0.8 -2.9 0.8
To select track type
SelectCdfTrack(Id)
Et = 0.46 GeV

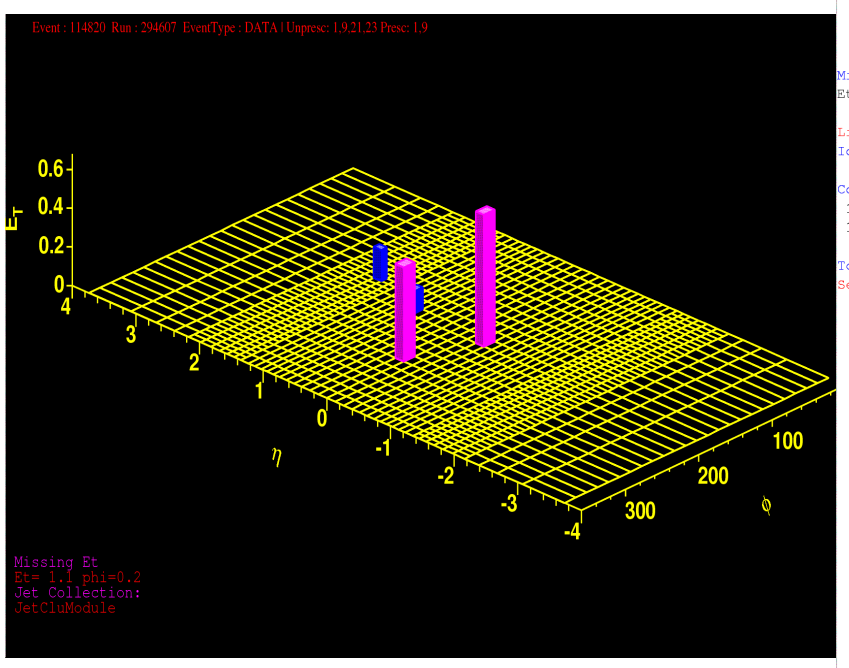

Event : 101335 Run : 294607 EventType : DATA | Unpresc: 9,21,23 Presc: 9
E_T
0.4
0.3
0.2
0.1
0
4
3
2
1
0
-1
-2
-3
-4
η
0
100
200
300
ϕ
Missing Et
Et= 0.5 phi=6.1
Jet Collection:
JetCluModule

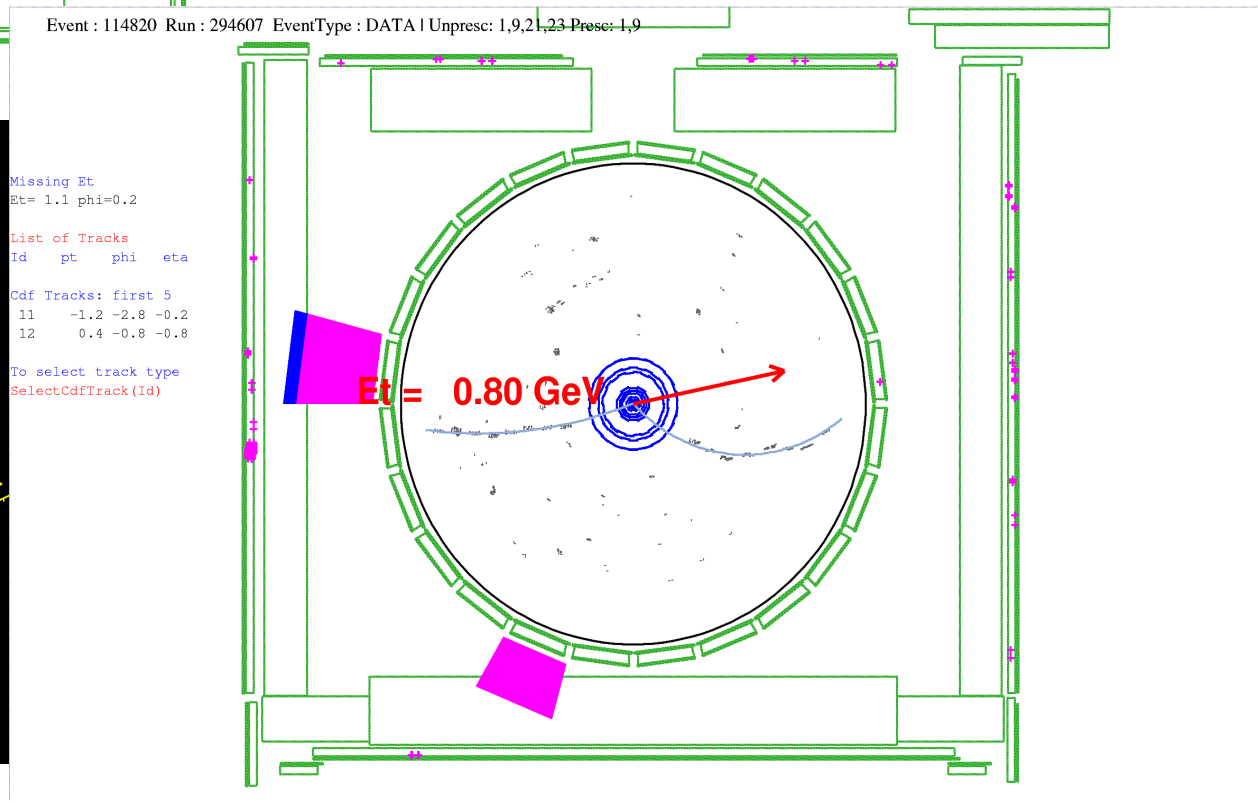

Event : 105703 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
E_T
0.4
0.3
0.2
0.1
0
4
3
2
1
0
-1
-2
-3
-4
η
100
200
300
ϕ
Missing Et
Et= 0.3 phi=1.5
Jet Collection:
JetCluModule

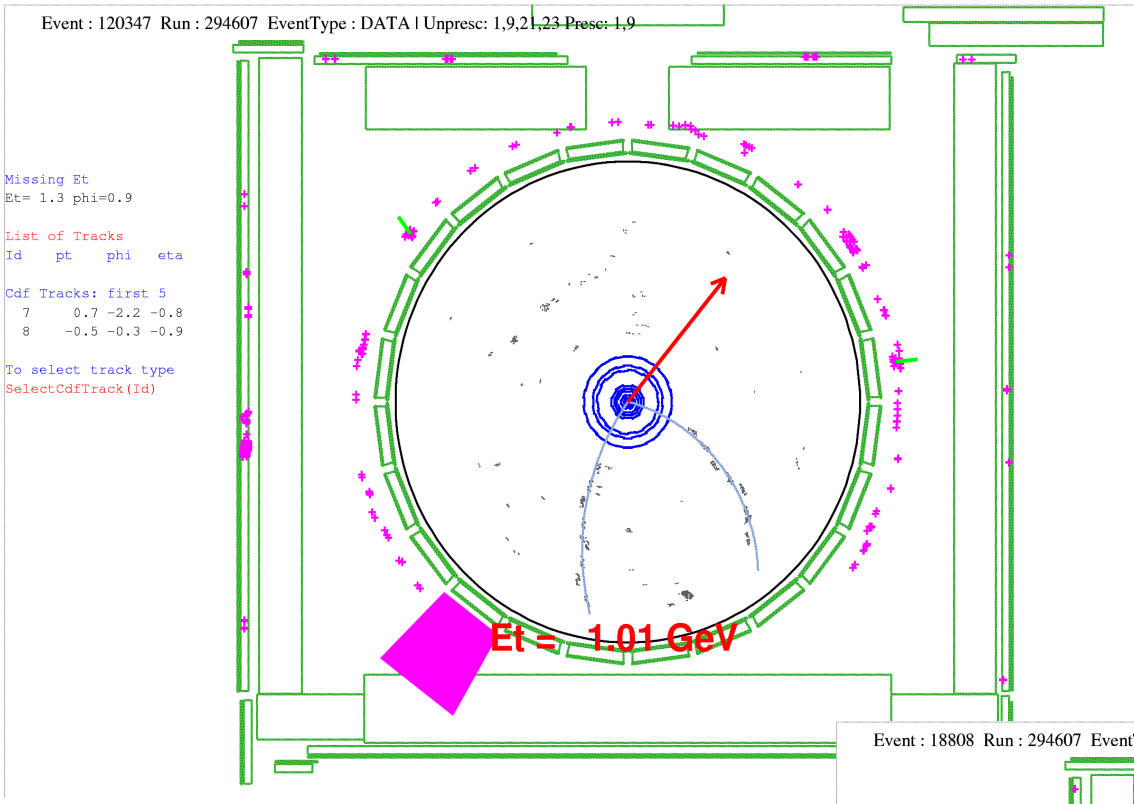

Event : 105703 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
Missing Et
Et= 0.3 phi=1.5
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
7 -0.5 0.5 0.2
8 0.4 -1.7 0.5
To select track type
SelectCdfTrack(Id)
Et = 0.

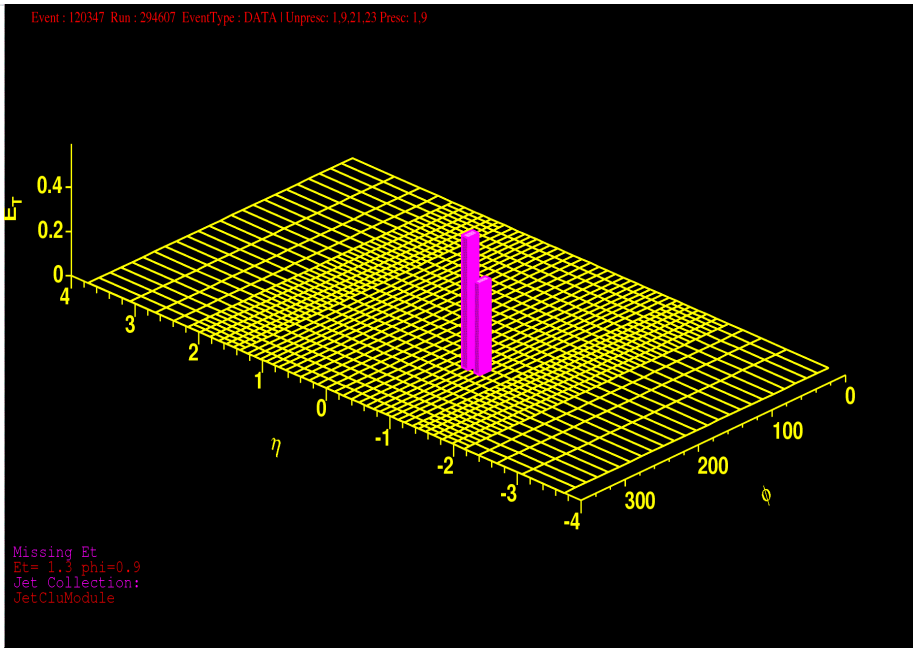

Event : 110812 Run : 294607 EventType : DATA | Unpresc: 9,21,23 Presc: 9
Missing Et
Et= 1.0 phi=1.9
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
7 0.8 3.1 1.0
8 -0.7 -0.9 1.0
To select track type
SelectCdfTrack(Id)
Et = 0.91 GeV

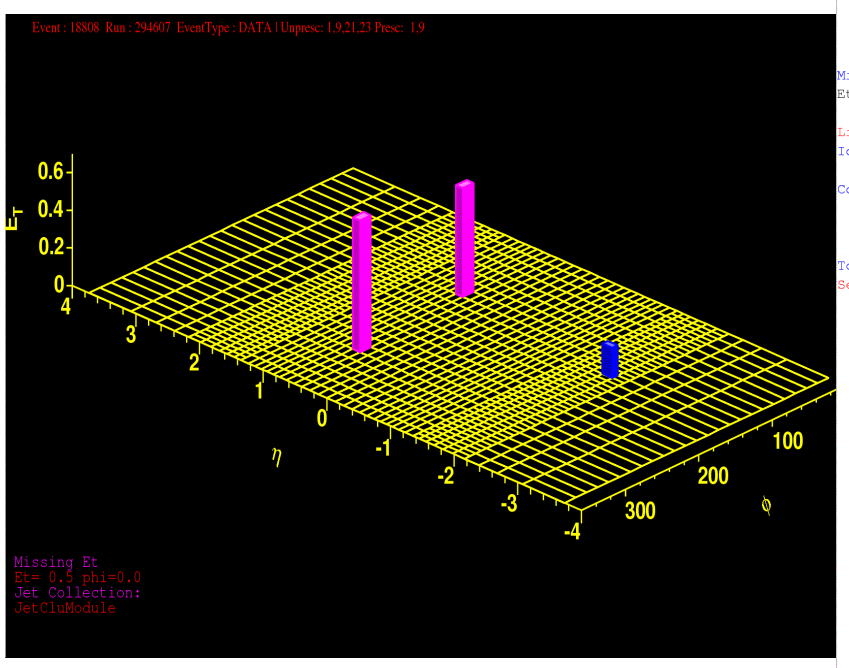

Event : 110812 Run : 294607 EventType : DATA | Unpresc: 9,21,23 Presc: 9
E_T
0.4
0.3
0.2
0.1
0
4
3
2
1
0
-1
-2
-3
-4
η
0
100
200
300
φ
Missing Et
Et= 1.0 phi=1.9
Jet Collection:
JetCluModule

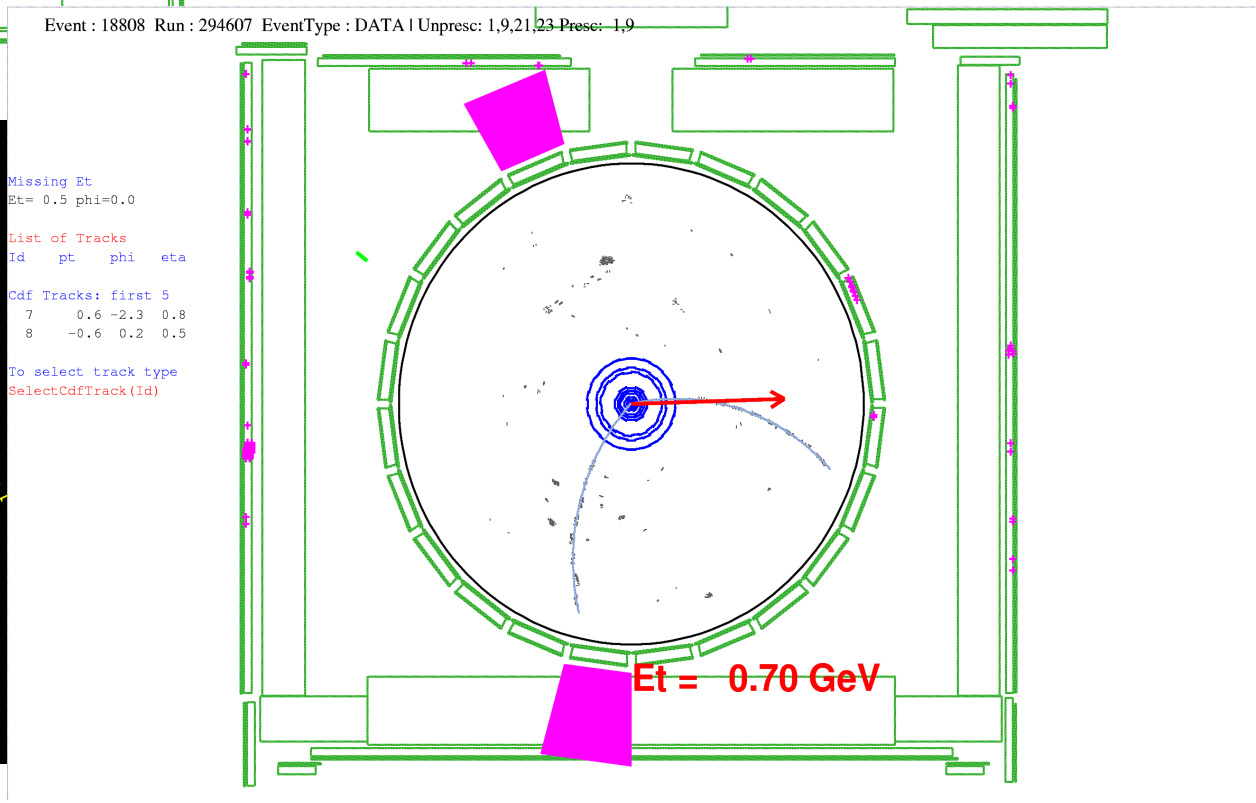

Event : 114820 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
E_T
0.6
0.4
0.2
0
4
3
2
1
0
-1
-2
-3
-4
η
100
200
300
φ
Missing Et
Et= 1.1 phi=0.2
Jet Collection:
JetCluModule

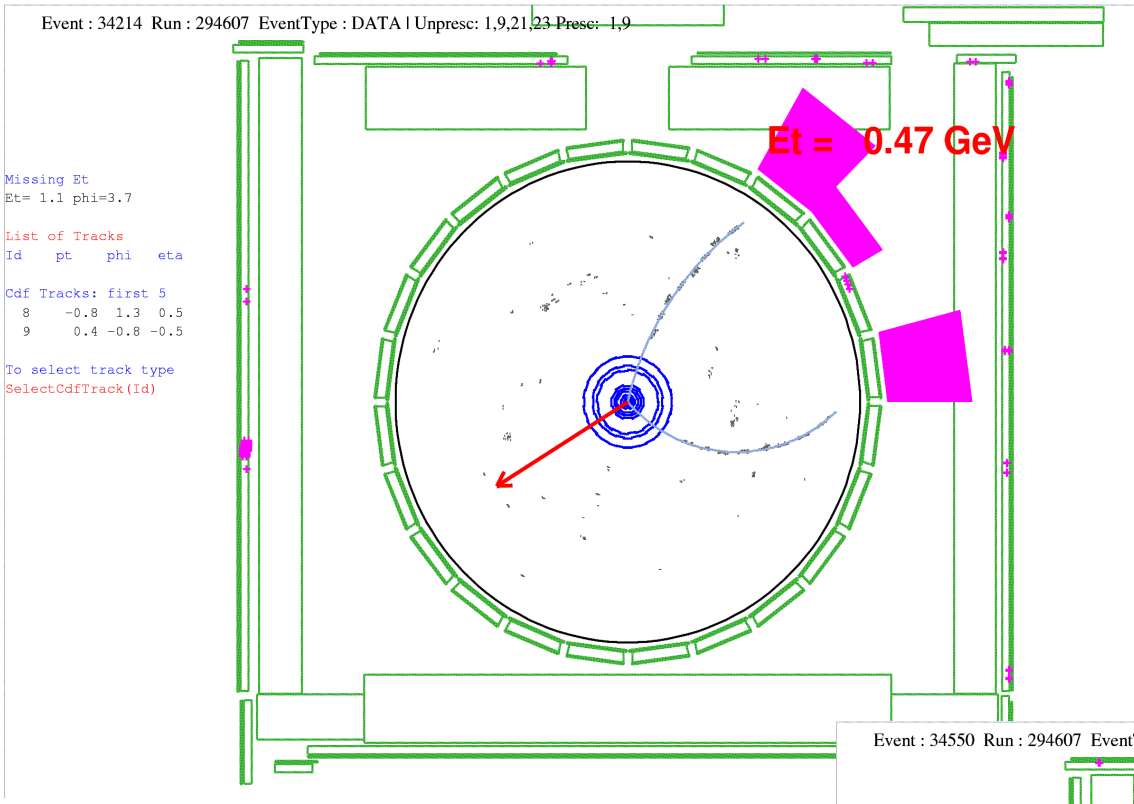

Event : 114820 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
Missing Et
Et= 1.1 phi=0.2
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
11 -1.2 -2.8 -0.2
12 0.4 -0.8 -0.8
To select track type
SelectCdfTrack(Id)
Et = 0.80 GeV

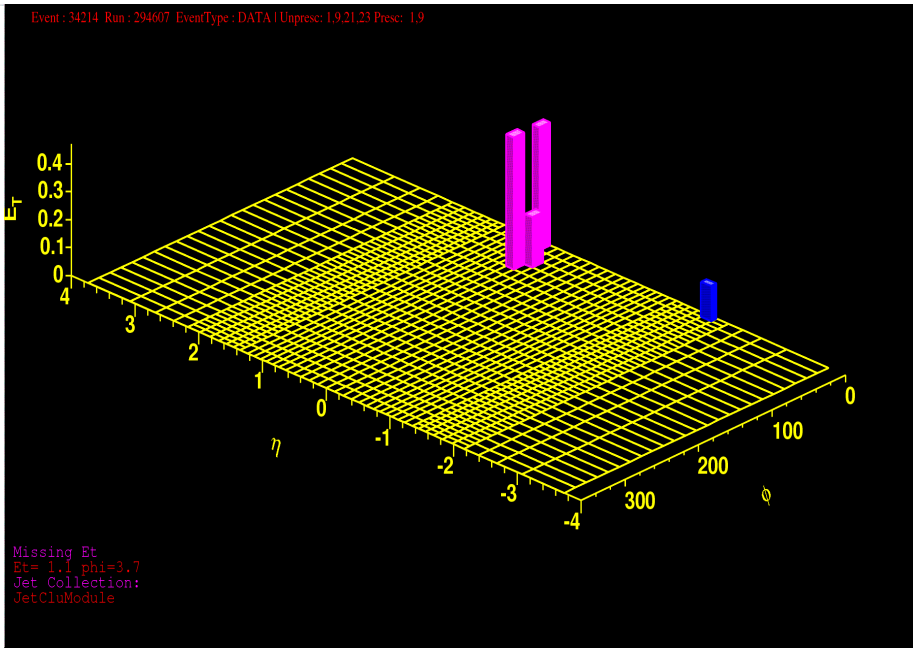

Event : 120347 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
Missing Et
Et= 1.3 phi=0.9
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
7 0.7 -2.2 -0.8
8 -0.5 -0.3 -0.9
To select track type
SelectCdfTrack(Id)
Et = 1.01 GeV

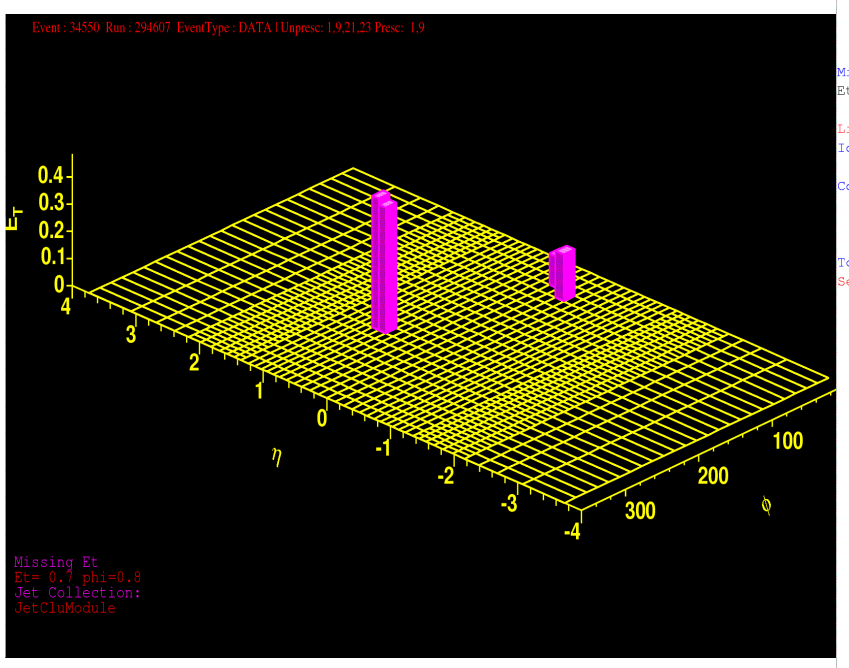

Event : 120347 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
E_T
0.4
0.2
0
4
3
2
1
0
-1
-2
-3
-4
η
0
100
200
300
φ
Missing Et
Et= 1.3 phi=0.9
Jet Collection:
JetCluModule

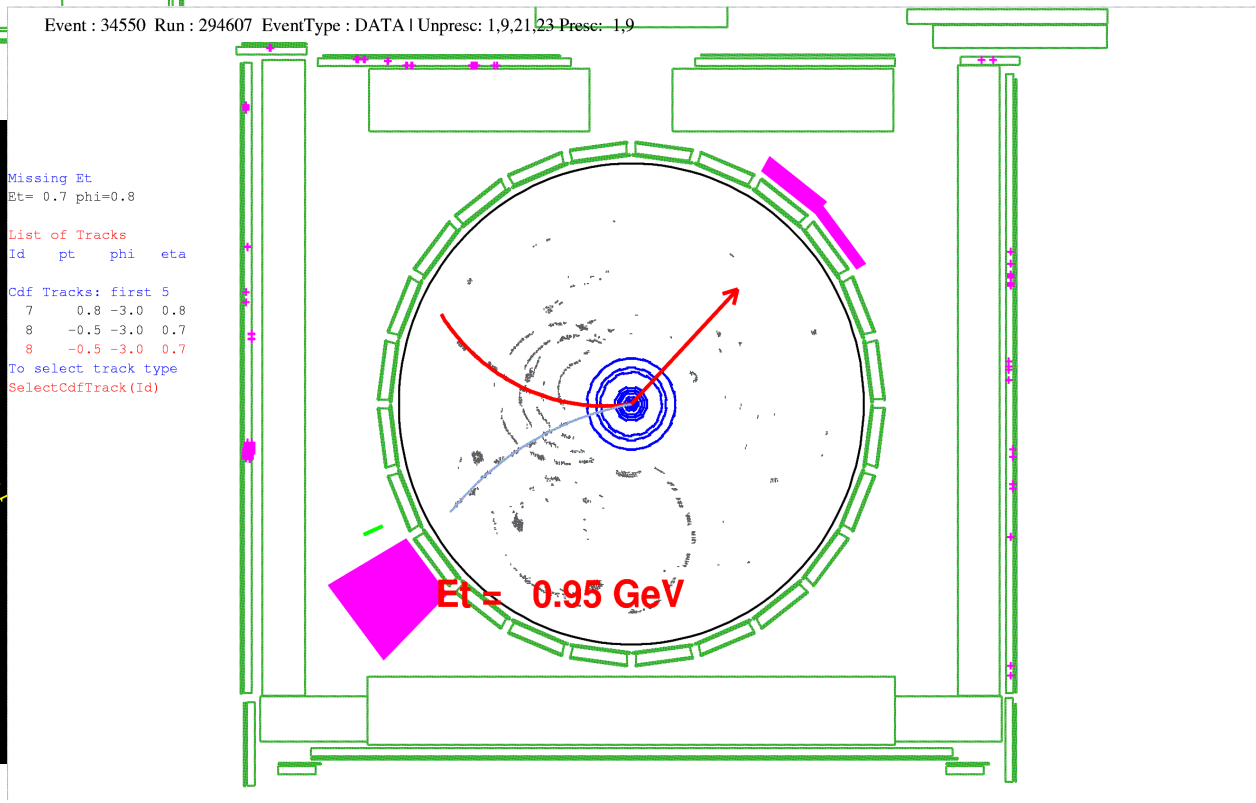

Event : 18808 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
E_T
0.6
0.4
0.2
0
4
3
2
1
0
-1
-2
-3
-4
η
100
200
300
φ
Missing Et
Et= 0.5 phi=0.0
Jet Collection:
JetCluModule

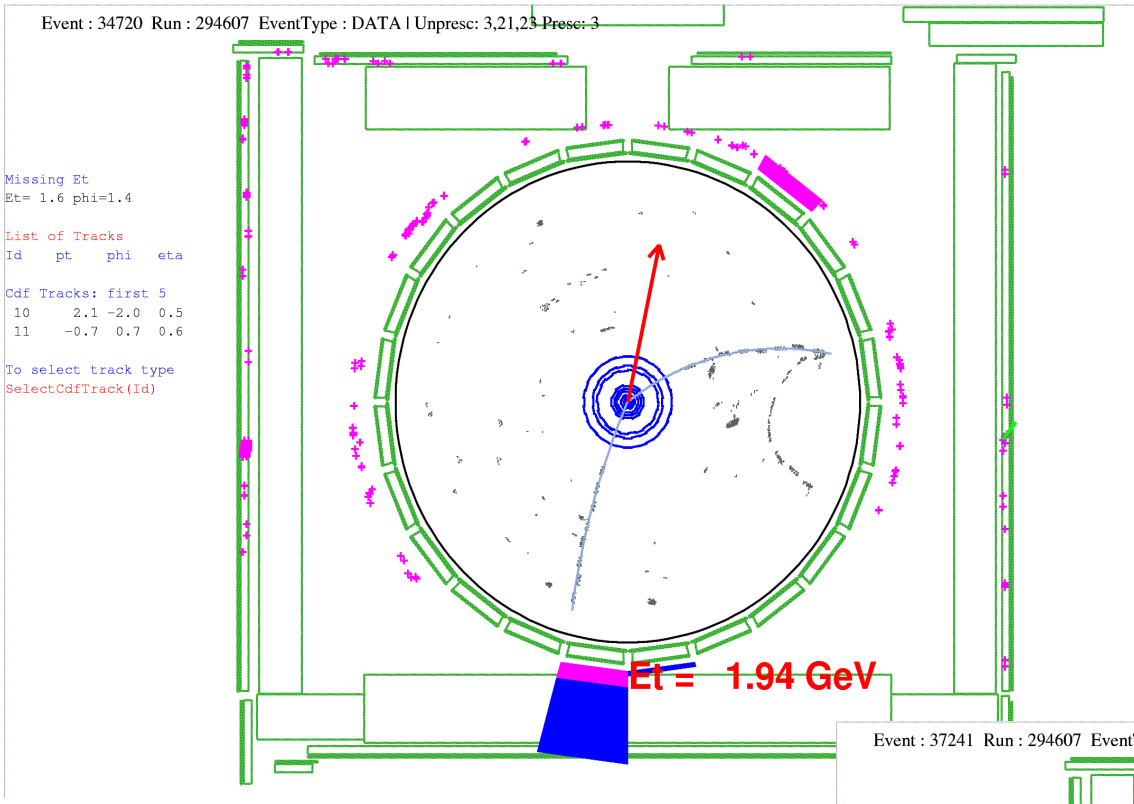

Event : 18808 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
Missing Et
Et= 0.5 phi=0.0
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
7 0.6 -2.3 0.8
8 -0.6 0.2 0.5
To select track type
SelectCdfTrack(Id)
Et = 0.70 GeV

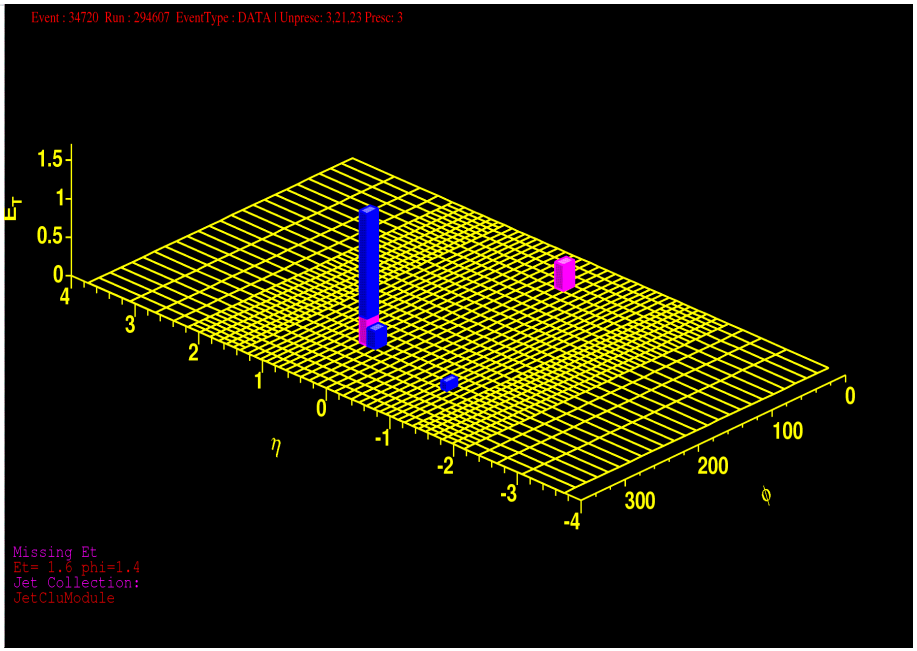

Event : 34214 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
Et = 0.47 GeV
Missing Et
Et= 1.1 phi=3.7
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
8 -0.8 1.3 0.5
9 0.4 -0.8 -0.5
To select track type
SelectCdfTrack(Id)

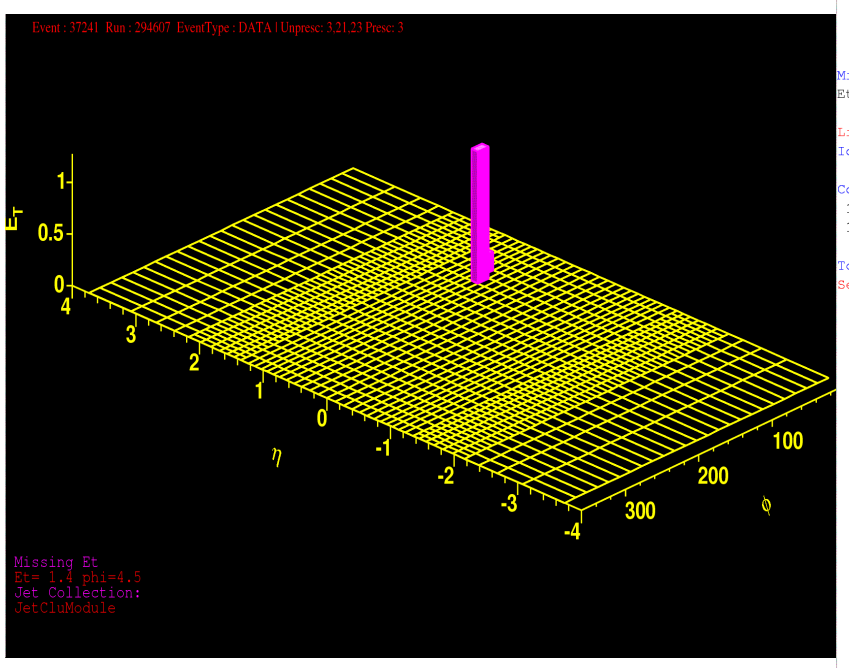

Event : 34214 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
E_T
0.4
0.3
0.2
0.1
0
4
3
2
1
0
-1
-2
-3
-4
η
0
100
200
300
φ
Missing Et
Et= 1.1 phi=3.7
Jet Collection:
JetCluModule

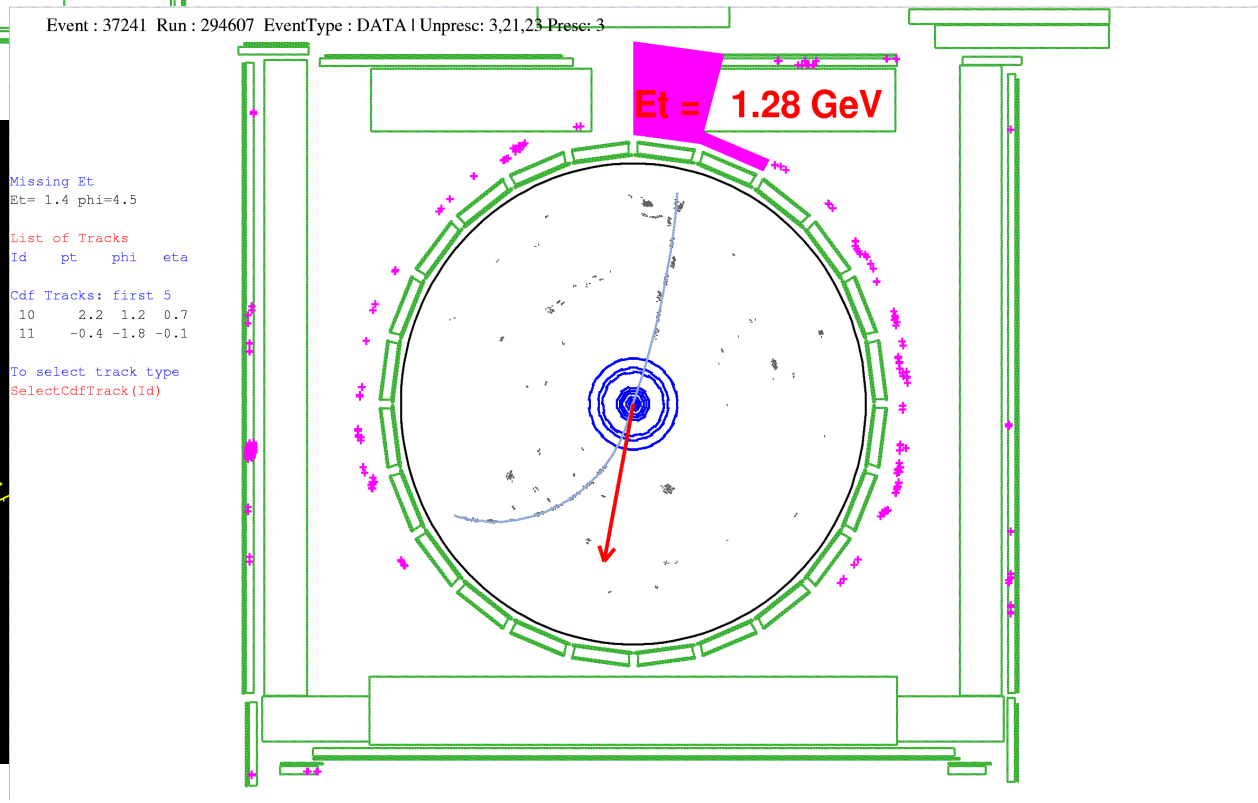

Event : 34550 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
E_T
0.4
0.3
0.2
0.1
0
4
3
2
1
0
-1
-2
-3
-4
η
100
200
300
φ
Missing Et
Et= 0.7 phi=0.8
Jet Collection:
JetCluModule

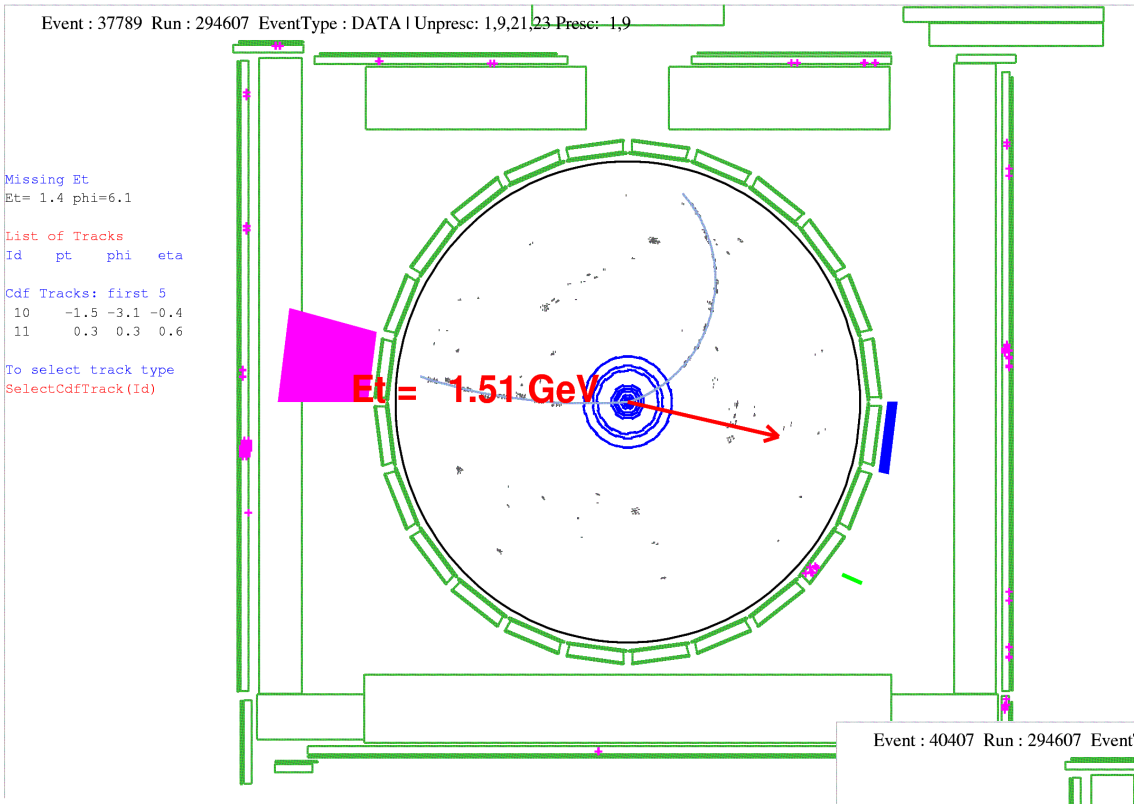

Event : 34550 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
Missing Et
Et= 0.7 phi=0.8
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
7 0.8 -3.0 0.8
8 -0.5 -3.0 0.7
8 -0.5 -3.0 0.7
To select track type
SelectCdfTrack(Id)
Et = 0.95 GeV

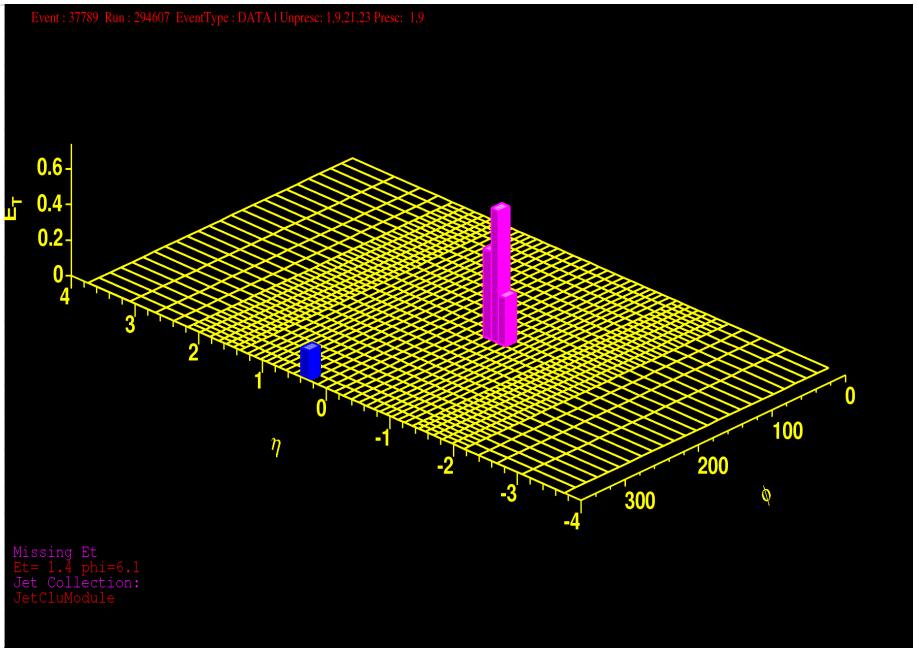

Event : 34720 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
Missing Et
Et= 1.6 phi=1.4
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
10 2.1 -2.0 0.5
11 -0.7 0.7 0.6
To select track type
SelectCdfTrack(Id)
Et = 1.94 GeV

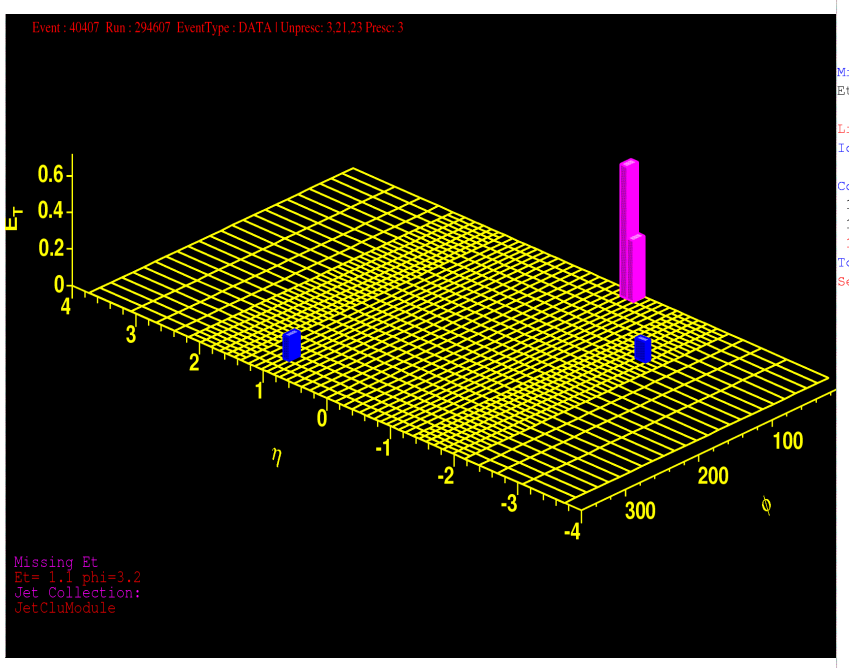

Event : 34720 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
E_T
1.5
1
0.5
0
4
3
2
1
0
-1
-2
-3
-4
η
0
100
200
300
φ
Missing Et
Et= 1.6 phi=1.4
Jet Collection:
JetCluModule

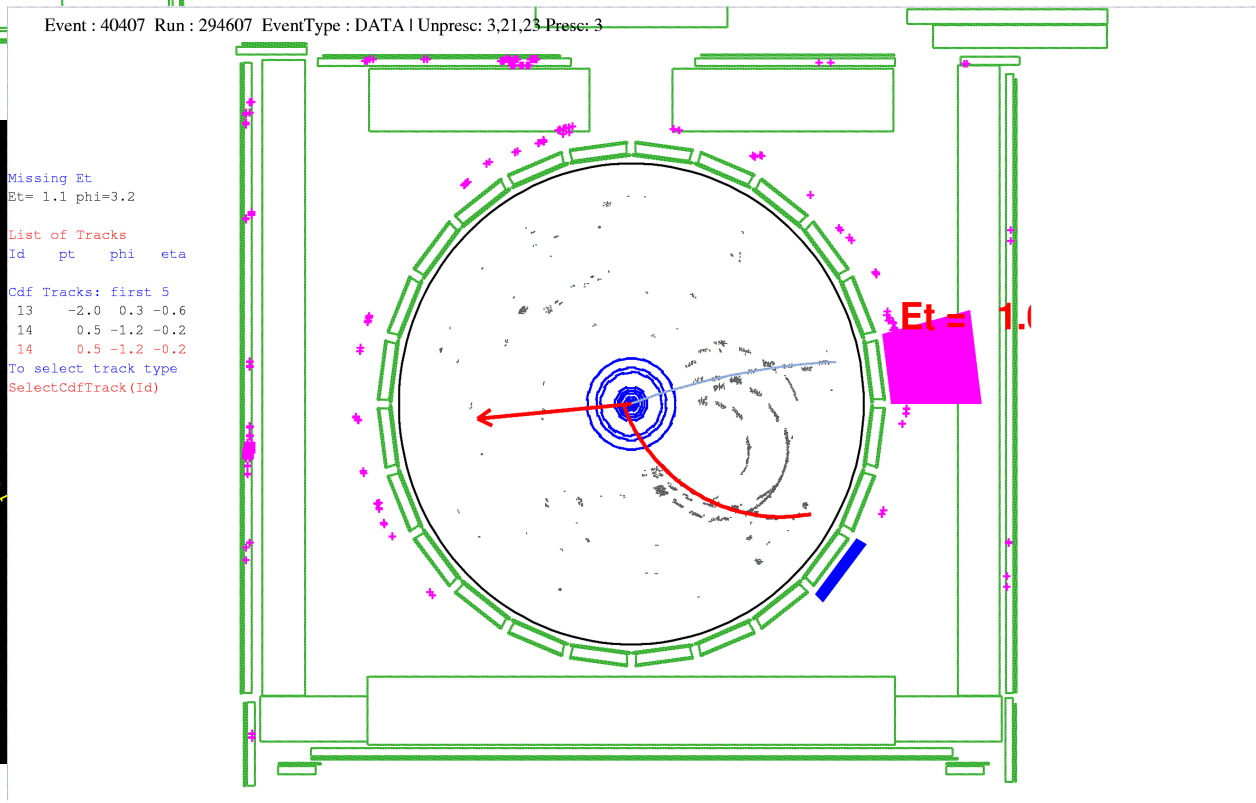

Event : 37241 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
E_T
1
0.5
0
4
3
2
1
0
-1
-2
-3
-4
η
100
200
300
φ
Missing Et
Et= 1.4 phi=4.5
Jet Collection:
JetCluModule

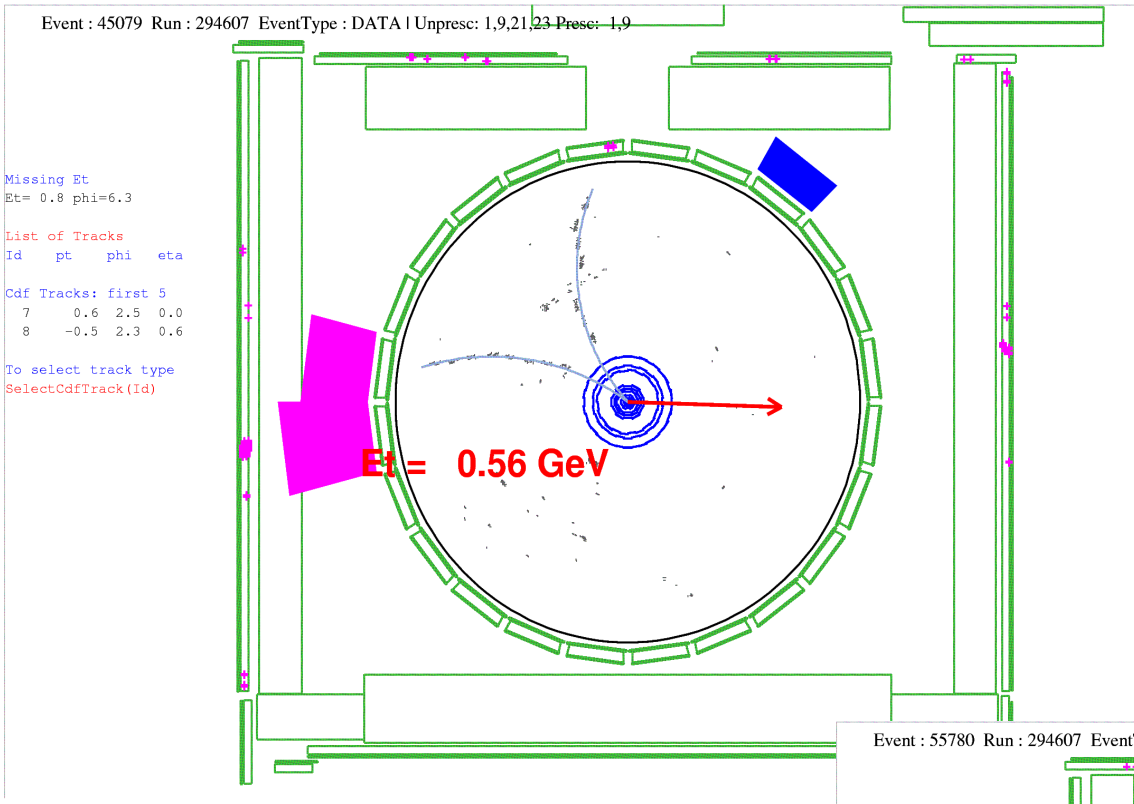

Event : 37241 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
Missing Et
Et= 1.4 phi=4.5
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
10 2.2 1.2 0.7
11 -0.4 -1.8 -0.1
To select track type
SelectCdfTrack(Id)
Et = 1.28 GeV

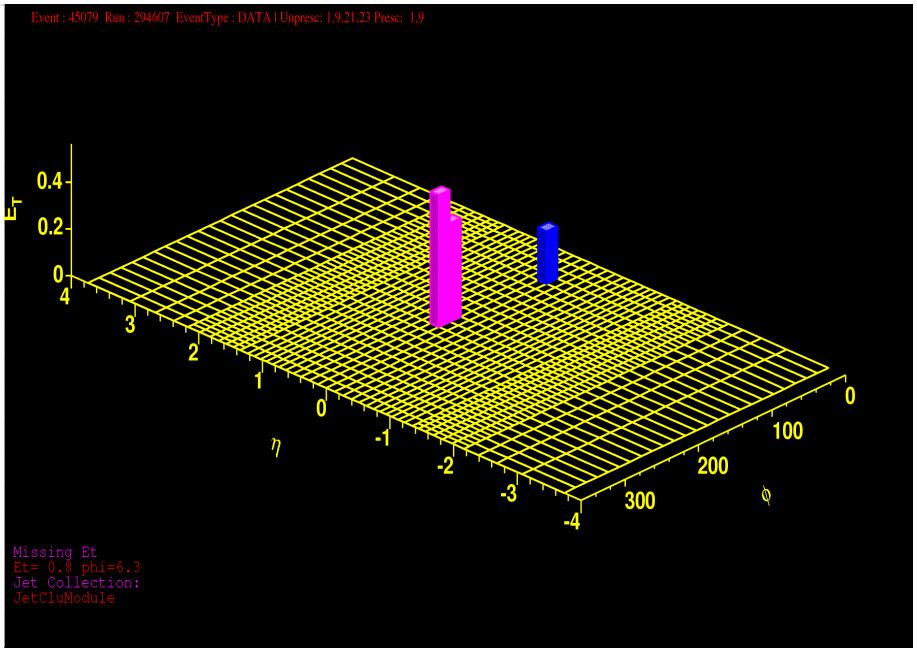

Event : 37789 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
Missing Et
Et= 1.4 phi=6.1
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
10 -1.5 -3.1 -0.4
11 0.3 0.3 0.6
To select track type
SelectCdfTrack(Id)
Et = 1.51 GeV

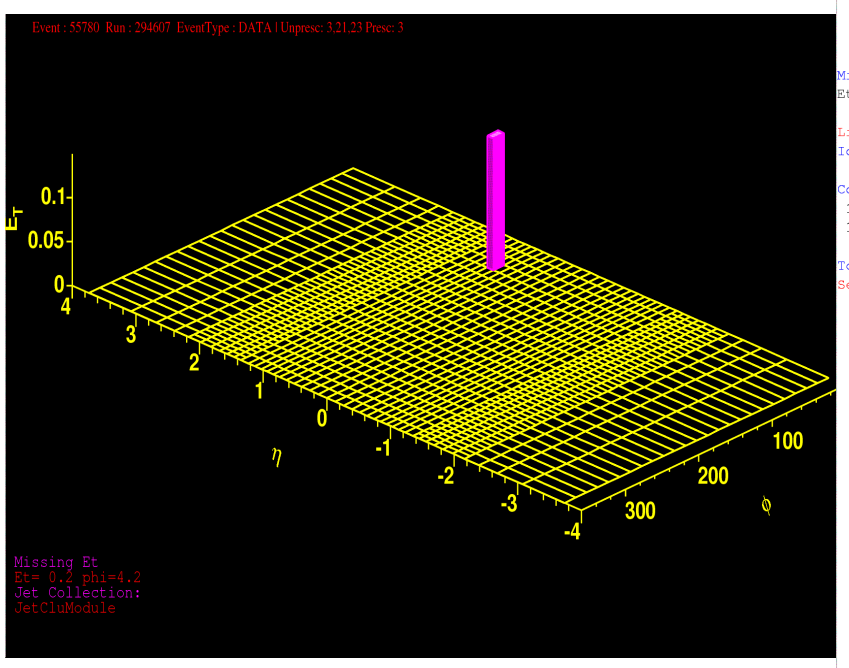

Event : 37789 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
E_T
0.6
0.4
0.2
0
4
3
2
1
0
-1
-2
-3
-4
η
0
100
200
300
φ
Missing Et
Et= 1.4 phi=6.1
Jet Collection:
JetCluModule

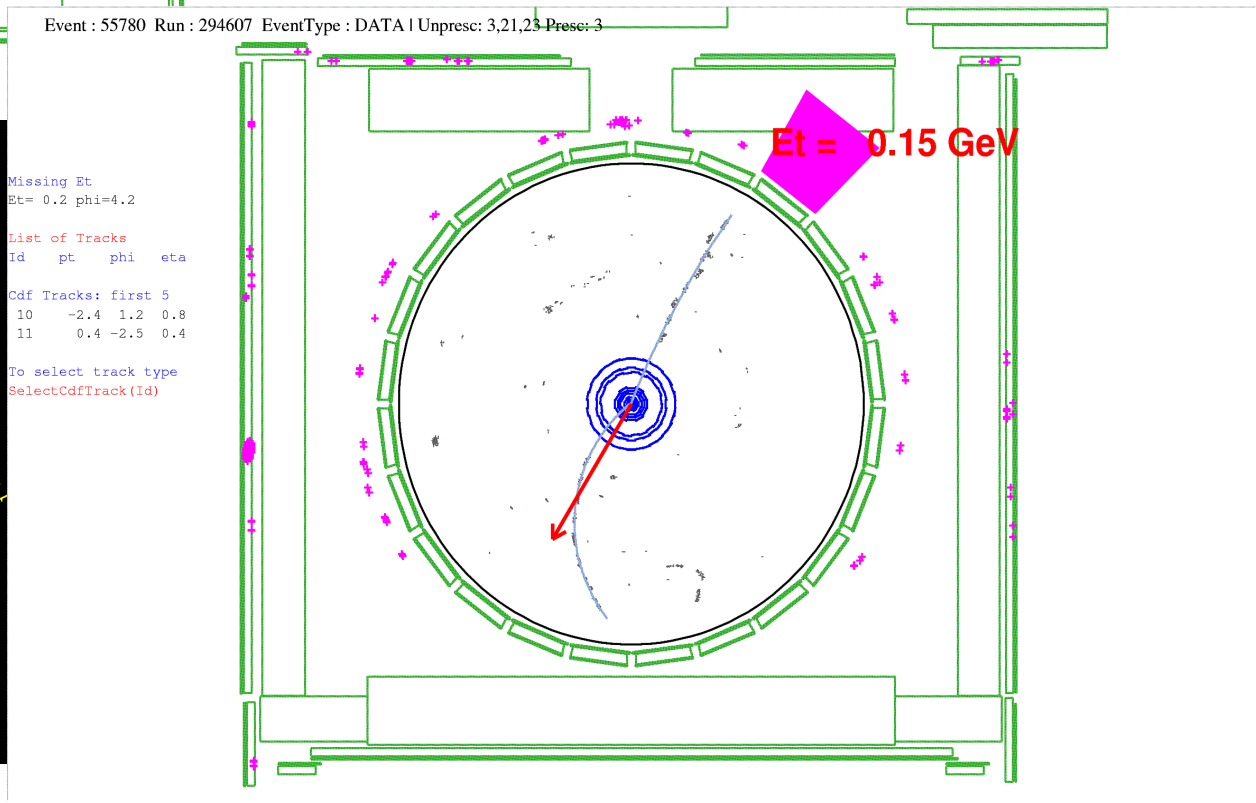

Event : 40407 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
E_T
0.6
0.4
0.2
0
4
3
2
1
0
-1
-2
-3
-4
η
100
200
300
φ
Missing Et
Et= 1.1 phi=3.2
Jet Collection:
JetCluModule


Event : 40407 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
Missing Et
Et= 1.1 phi=3.2
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
13 -2.0 0.3 -0.6
14 0.5 -1.2 -0.2
14 0.5 -1.2 -0.2
To select track type
SelectCdfTrack(Id)


Event : 45079 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
Missing Et
Et= 0.8 phi=6.3
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
7 0.6 2.5 0.0
8 -0.5 2.3 0.6
To select track type
SelectCdfTrack(Id)
Et = 0.56 GeV


Event : 45079 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
E_T
0.4
0.2
0
4
3
2
1
0
-1
-2
-3
-4
η
0
100
200
300
φ
Missing Et
Et= 0.8 phi=6.3
Jet Collection:
JetCluModule


Event : 55780 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
E_T
0.1
0.05
0
4
3
2
1
0
-1
-2
-3
-4
η
100
200
300
φ
Missing Et
Et= 0.2 phi=4.2
Jet Collection:
JetCluModule


Event : 55780 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
Missing Et
Et= 0.2 phi=4.2
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
10 -2.4 1.2 0.8
11 0.4 -2.5 0.4
To select track type
SelectCdfTrack(Id)
Et = 0.15 GeV

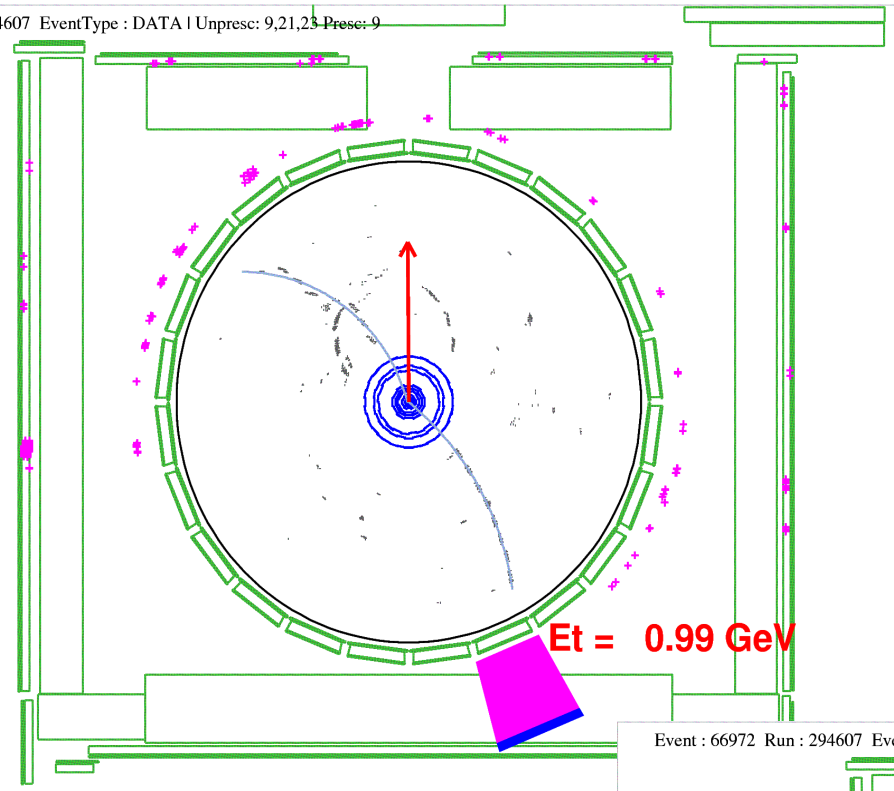
Event : 62372 Run : 294607 EventType : DATA | Unpresc: 9,21,23 Presc: 9

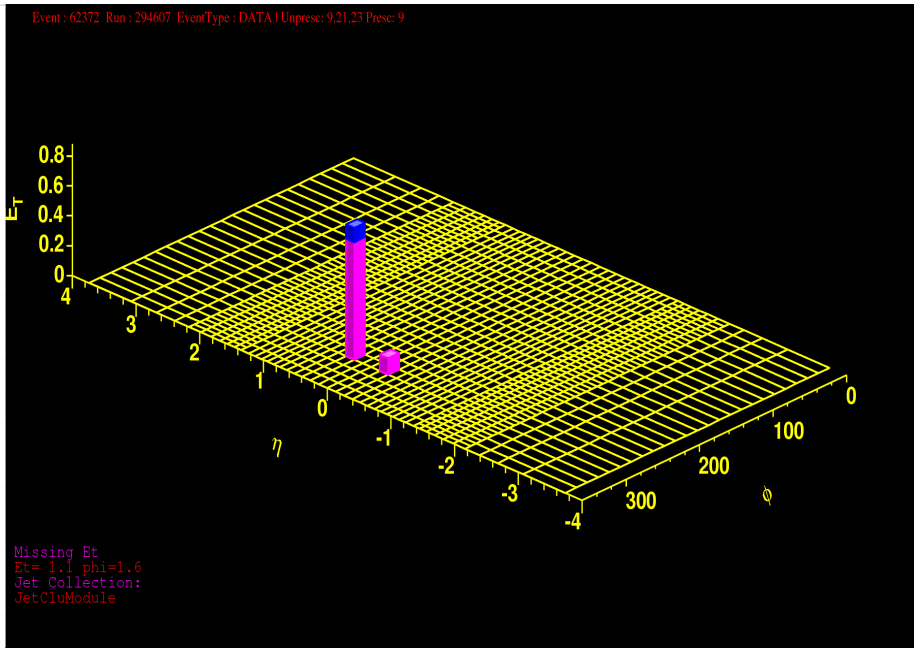
Missing Et
Et= 1.1 phi=1.6

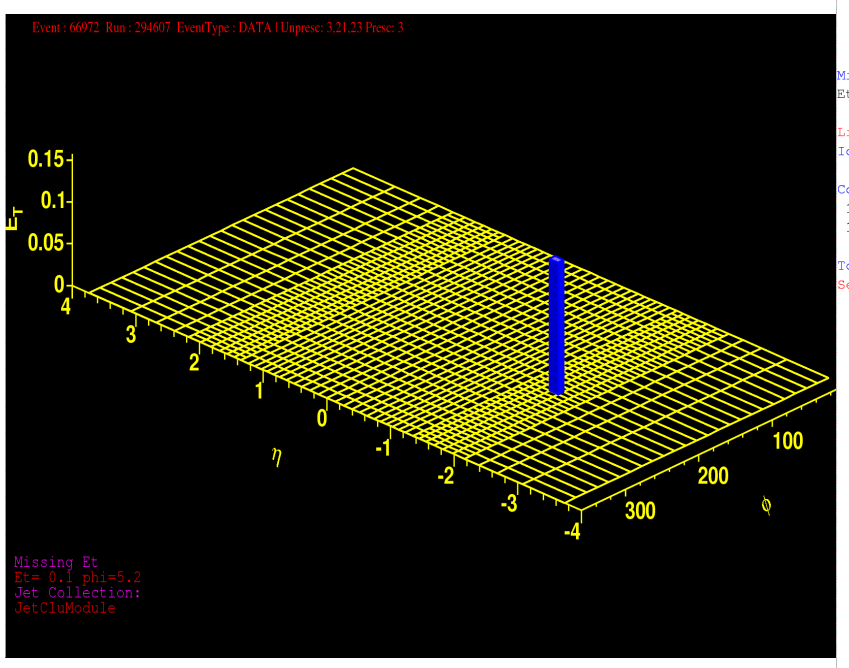
List of Tracks
Id pt phi eta

Cdf Tracks: first 5
7 -0.8 -0.7 0.5
8 0.5 1.8 -0.7

To select track type
SelectCdfTrack(Id)







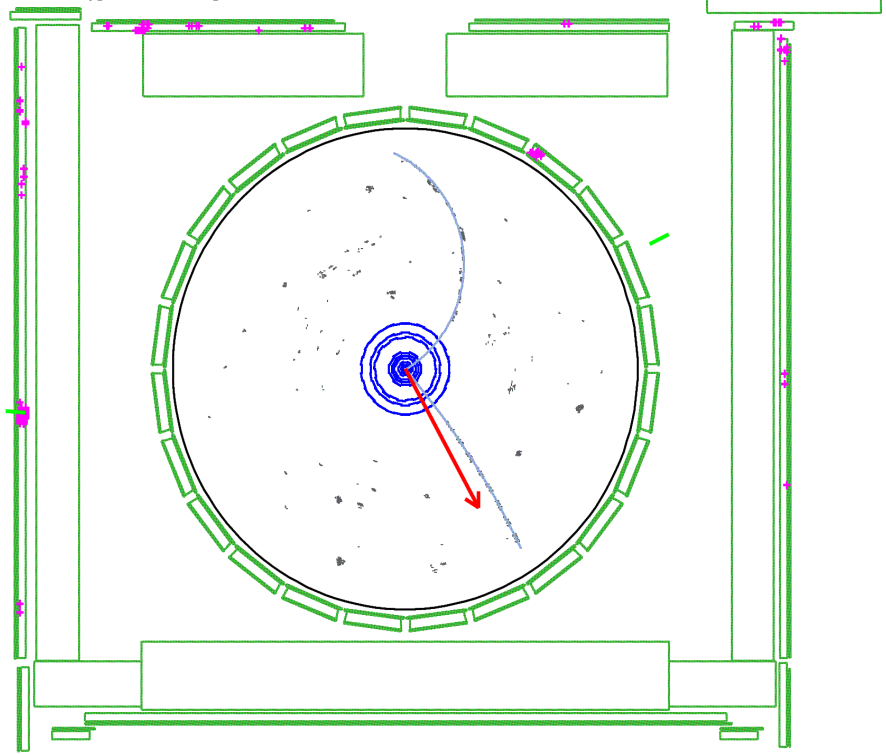
Event : 66972 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3

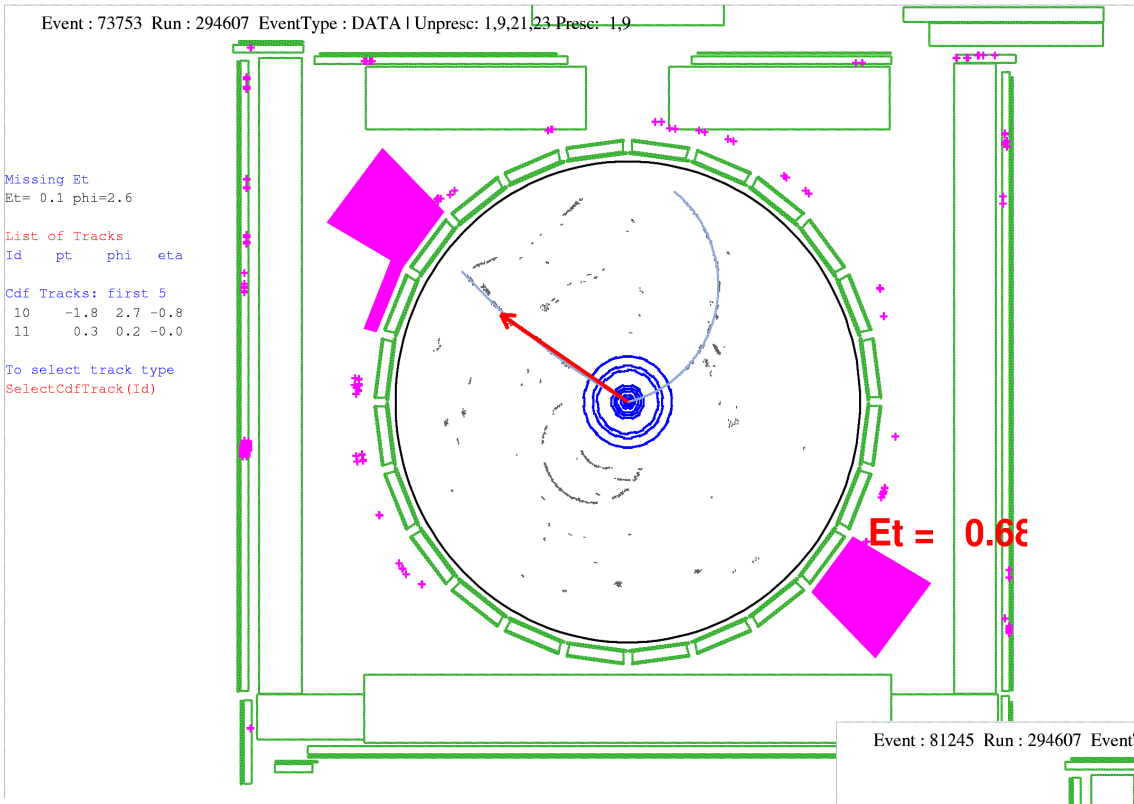
Missing Et
Et= 0.1 phi=5.2

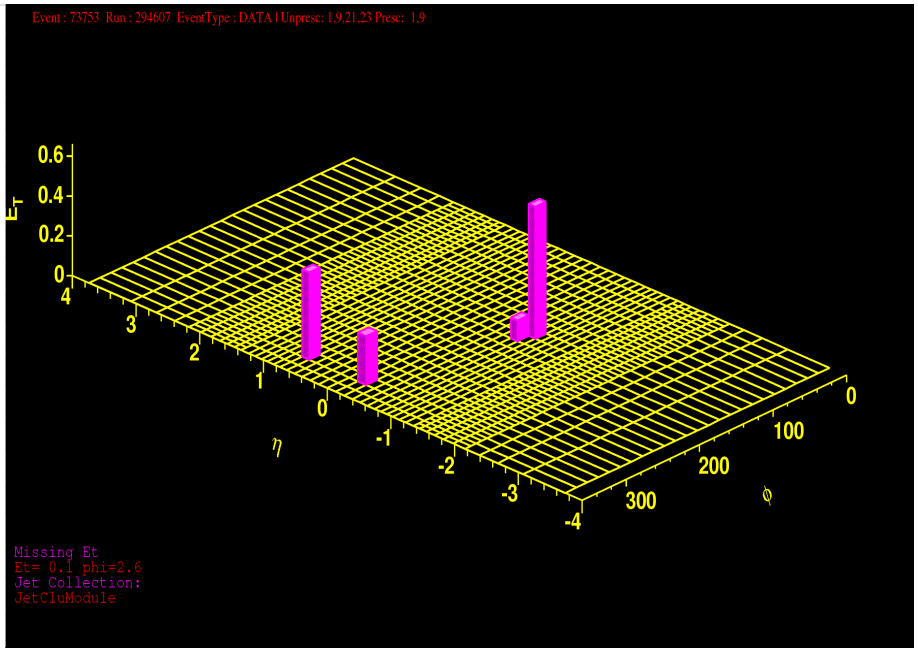
List of Tracks
Id pt phi eta

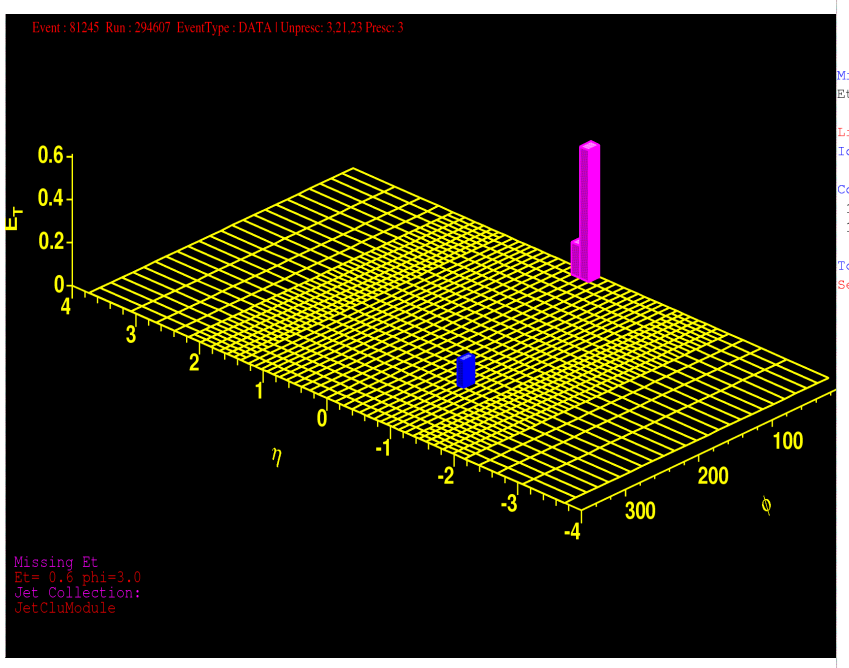
Cdf Tracks: first 5
10 -2.2 -0.8 0.0
11 0.3 0.5 0.7

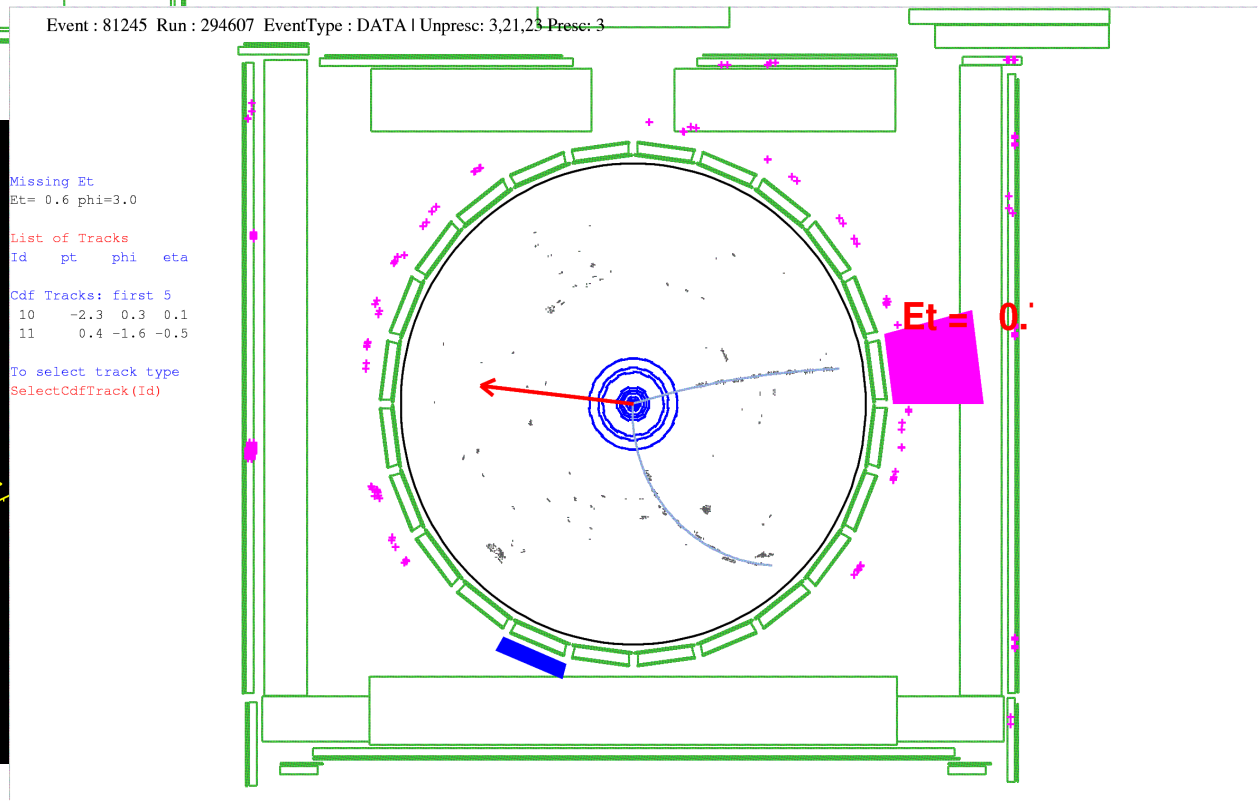
To select track type
SelectCdfTrack(Id)

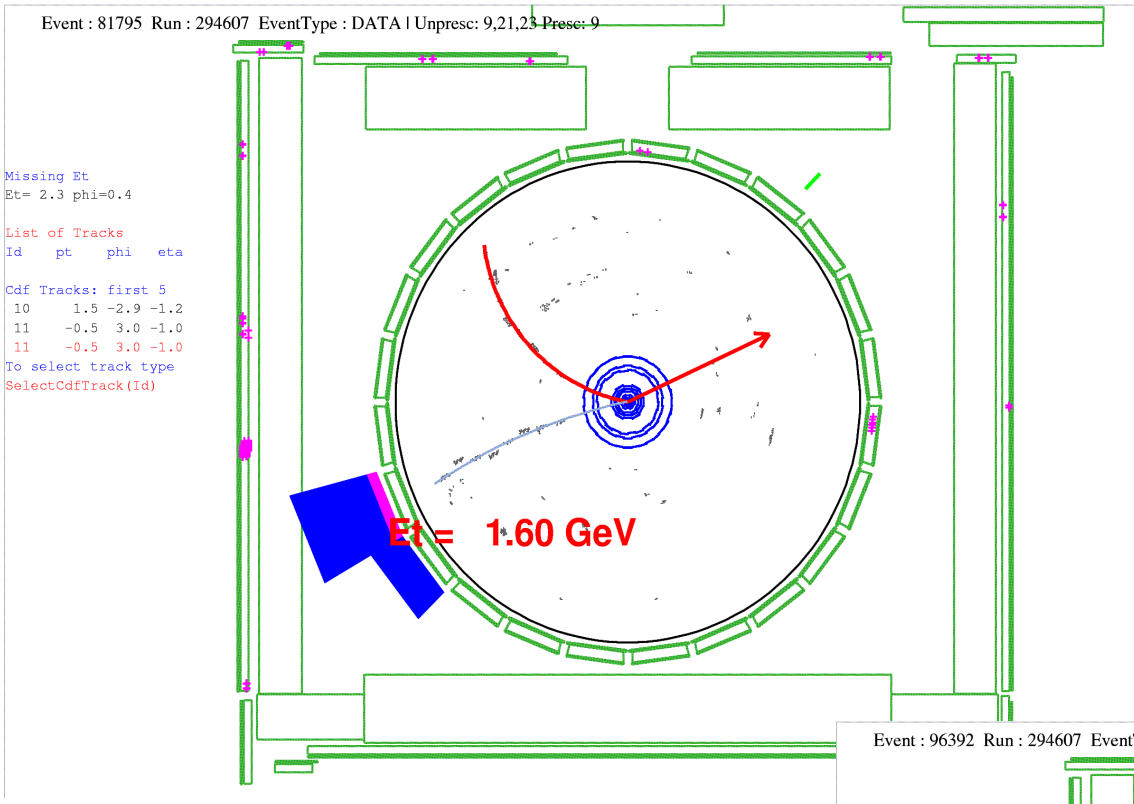


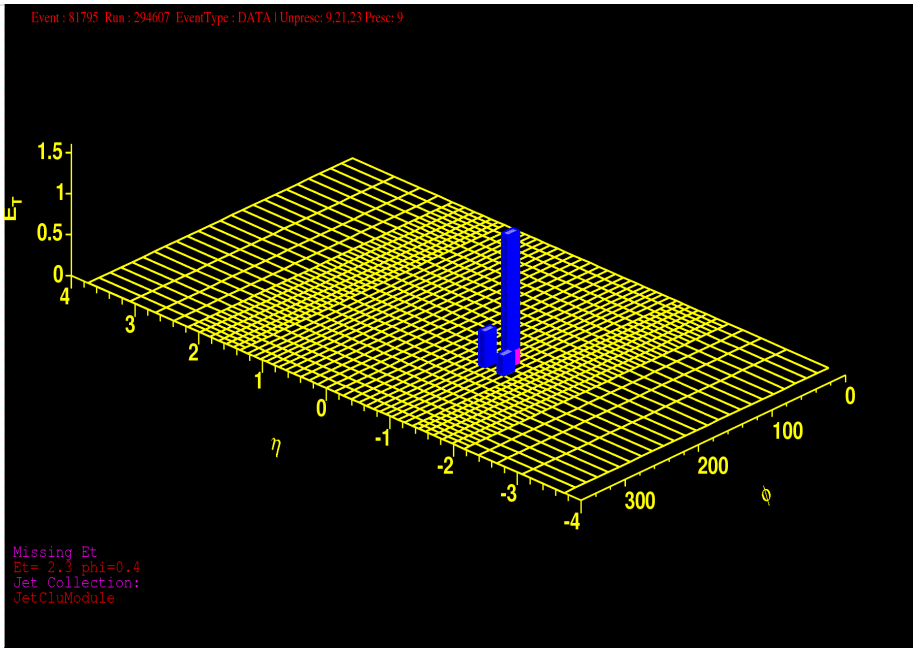

Event : 73753 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
Missing Et
Et= 0.1 phi=2.6
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
10 -1.8 2.7 -0.8
11 0.3 0.2 -0.0
To select track type
SelectCdfTrack(Id)
Et = 0.68

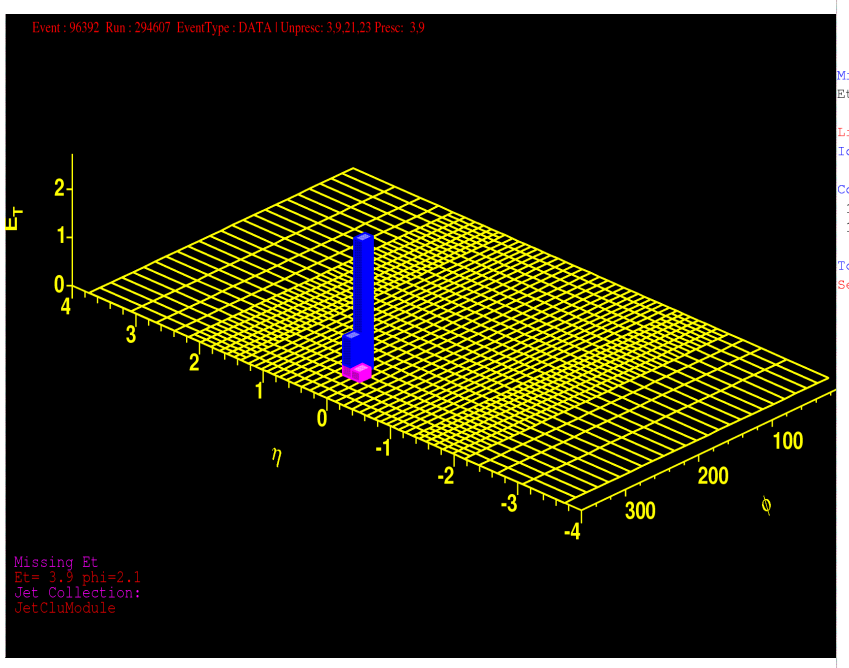

Event : 73753 Run : 294607 EventType : DATA | Unpresc: 1,9,21,23 Presc: 1,9
E_T
0.6
0.4
0.2
0
4
3
2
1
0
-1
-2
-3
-4
η
0
100
200
300
φ
Missing Et
Et= 0.1 phi=2.6
Jet Collection:
JetCluModule

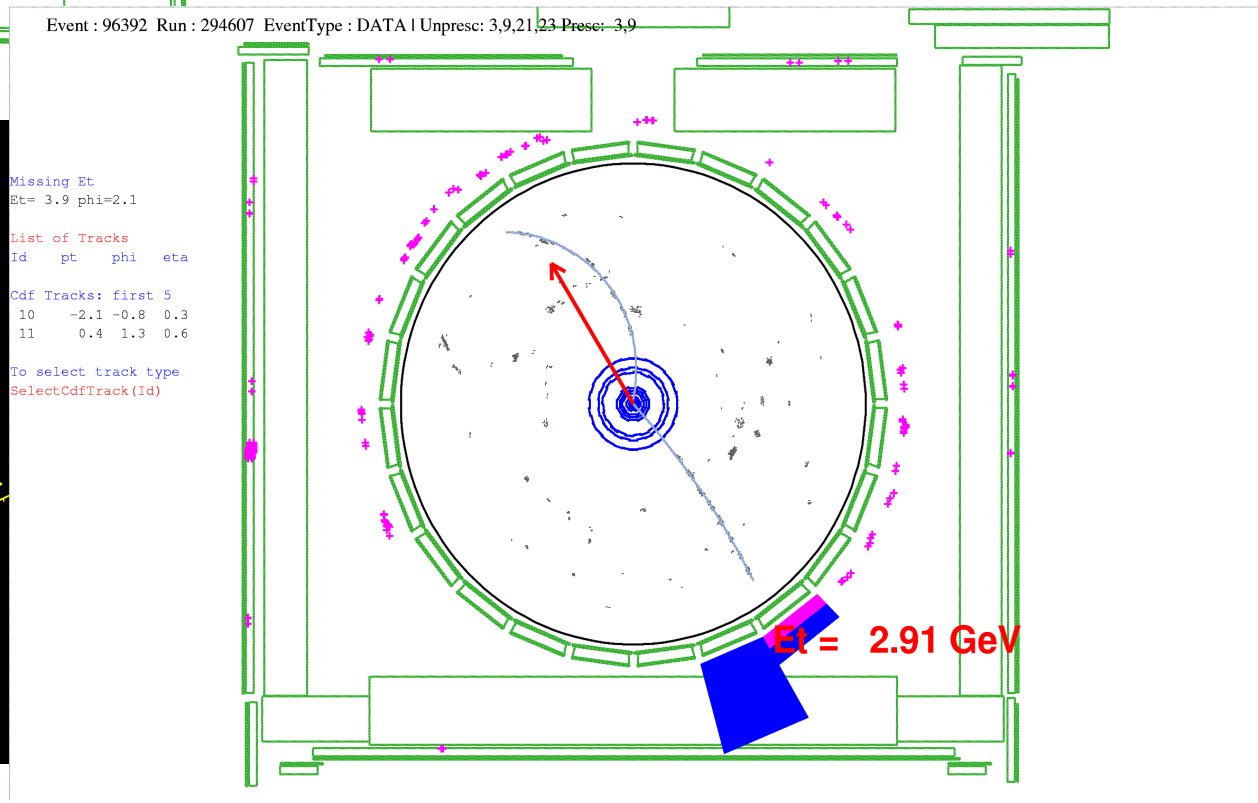

Event : 81245 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
E_T
0.6
0.4
0.2
0
4
3
2
1
0
-1
-2
-3
-4
η
100
200
300
φ
Missing Et
Et= 0.6 phi=3.0
Jet Collection:
JetCluModule


Event : 81245 Run : 294607 EventType : DATA | Unpresc: 3,21,23 Presc: 3
Missing Et
Et= 0.6 phi=3.0
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
10 -2.3 0.3 0.1
11 0.4 -1.6 -0.5
To select track type
SelectCdfTrack(Id)
Et =


Event : 81795 Run : 294607 EventType : DATA | Unpresc: 9,21,23 Presc: 9
Missing Et
Et= 2.3 phi=0.4
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
10 1.5 -2.9 -1.2
11 -0.5 3.0 -1.0
11 -0.5 3.0 -1.0
To select track type
SelectCdfTrack(Id)
Et = 1.60 GeV


Event : 81795 Run : 294607 EventType : DATA | Unpresc: 9,21,23 Presc: 9
E_T
1.5
1
0.5
0
4
3
2
1
0
-1
-2
-3
-4
η
0
100
200
300
φ
Missing Et
Et= 2.3 phi=0.4
Jet Collection:
JetCluModule


Event : 96392 Run : 294607 EventType : DATA | Unpresc: 3,9,21,23 Presc: 3,9
E_T
2
1
0
4
3
2
1
0
-1
-2
-3
-4
η
100
200
300
φ
Missing Et
Et= 3.9 phi=2.1
Jet Collection:
JetCluModule

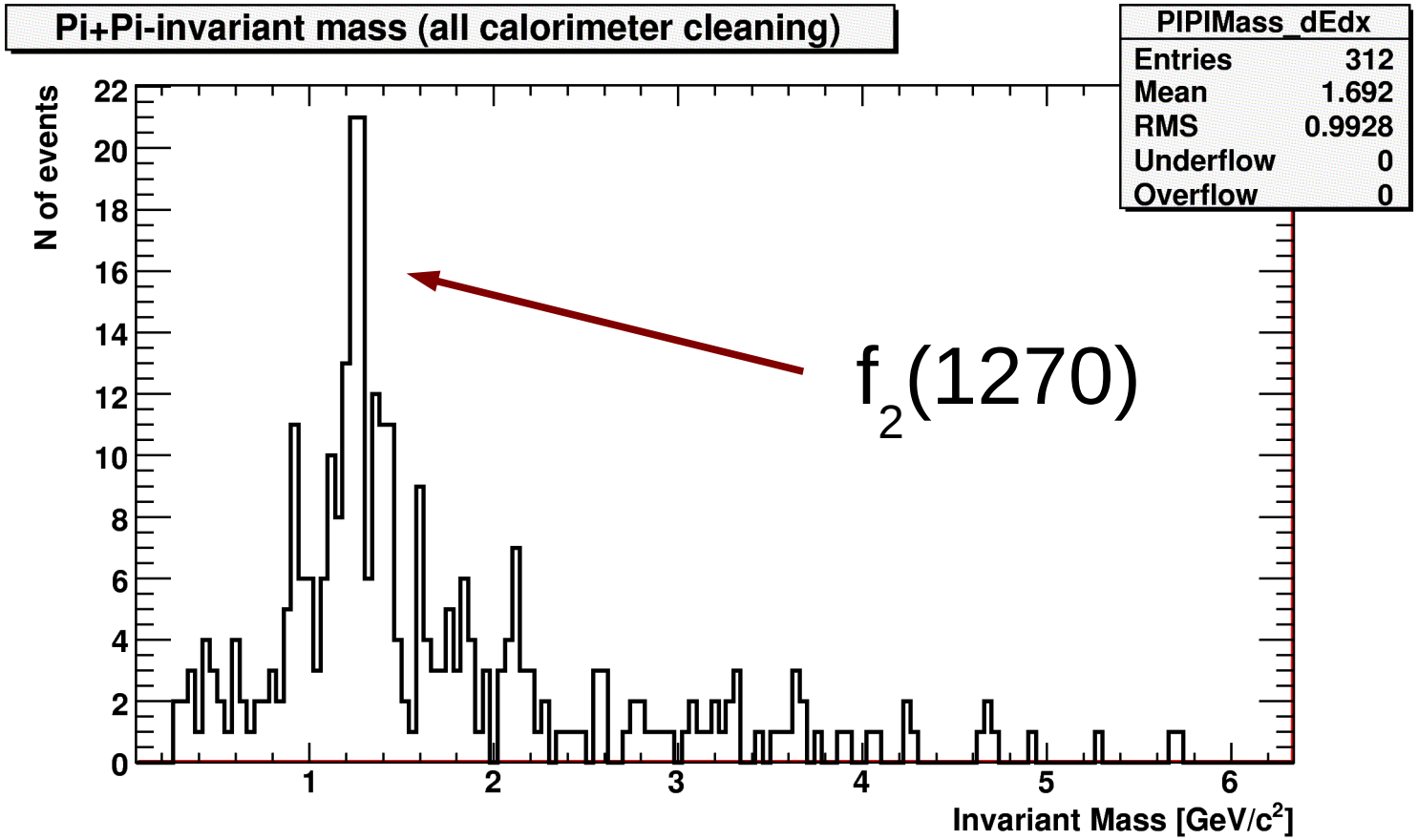

Event : 96392 Run : 294607 EventType : DATA | Unpresc: 3,9,21,23 Presc: 3,9
Missing Et
Et= 3.9 phi=2.1
List of Tracks
Id pt phi eta
Cdf Tracks: first 5
10 -2.1 -0.8 0.3
11 0.4 1.3 0.6
To select track type
SelectCdfTrack(Id)
Et = 2.91 GeV

Maria Żurek

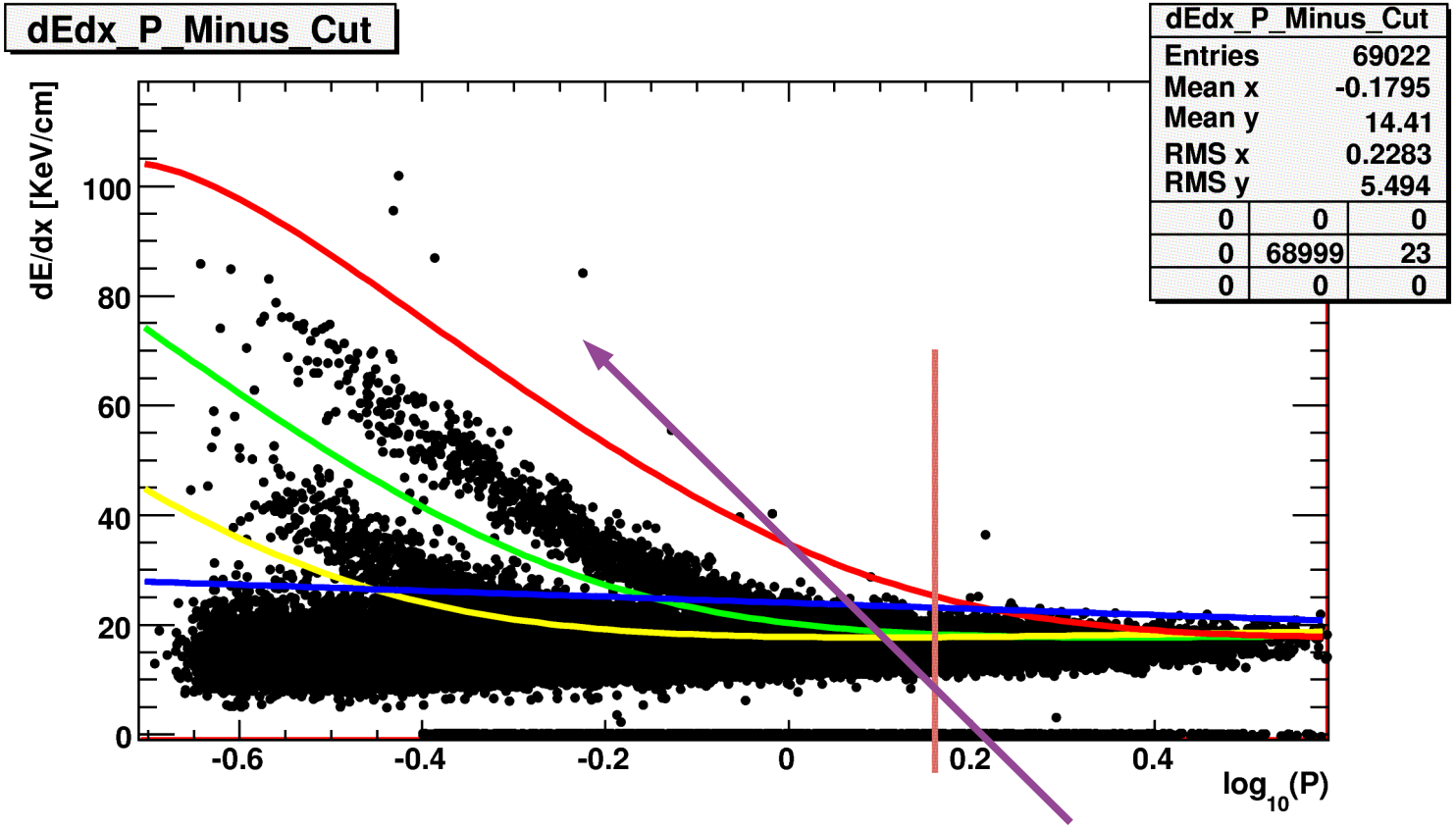
- Pi+Pi- invariant mass – new calorimeter cleaning
- Antideuterons events
- X-G-X events vs X-X-X events Pi+Pi- invariant mass and antideuterons events

Pi+Pi- invariant mass

new calorimeter cleaning

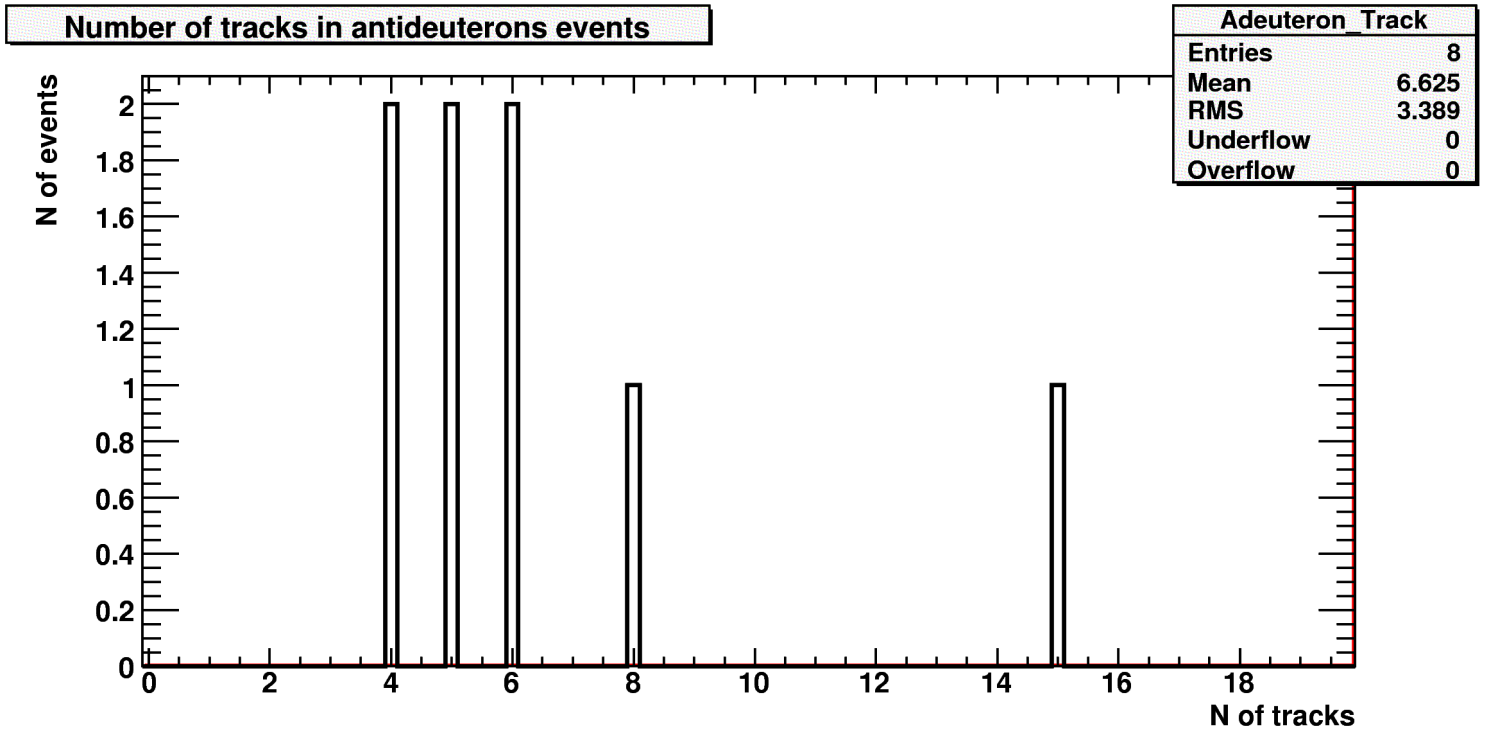


Antideuterons events

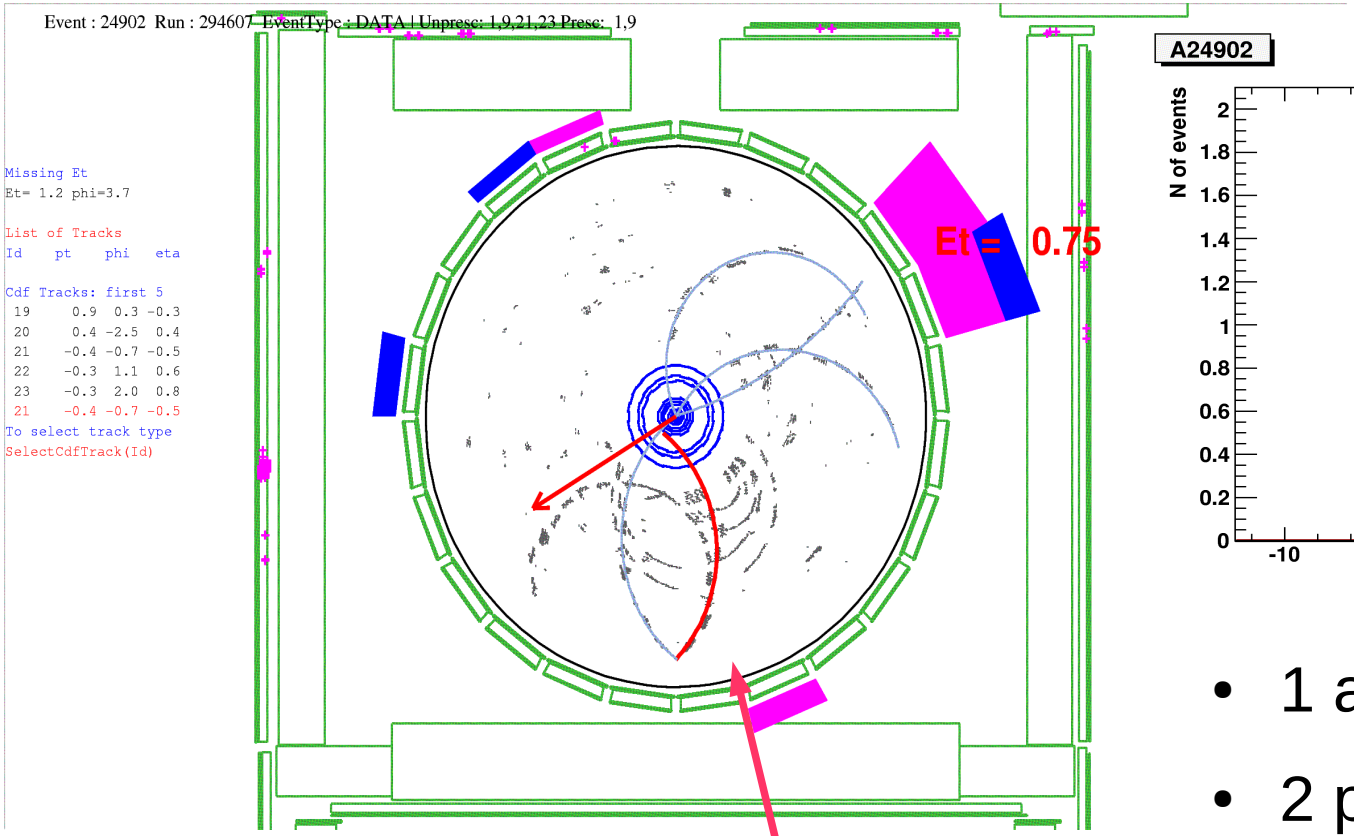


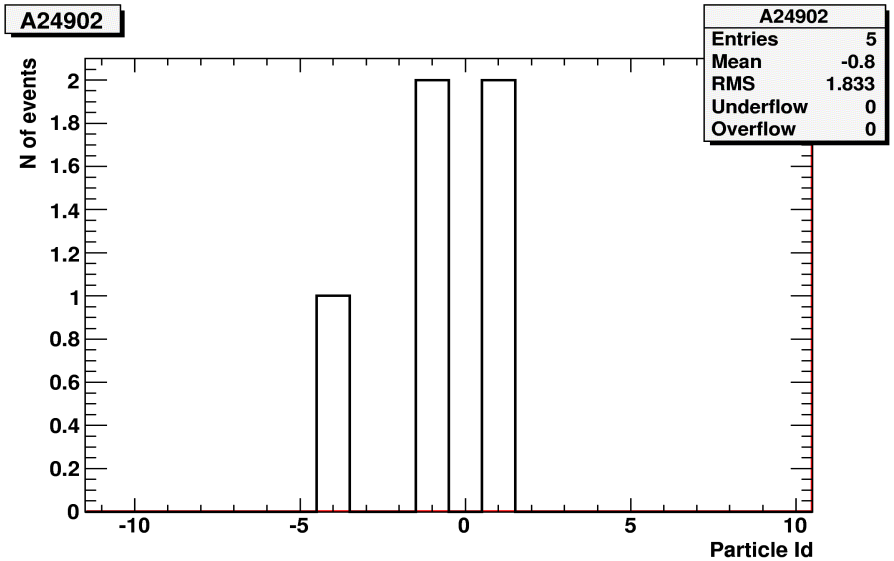
Anideuterons – 8 entries

Number of tracks in events with antideuterons



Events with antideuterons - evd

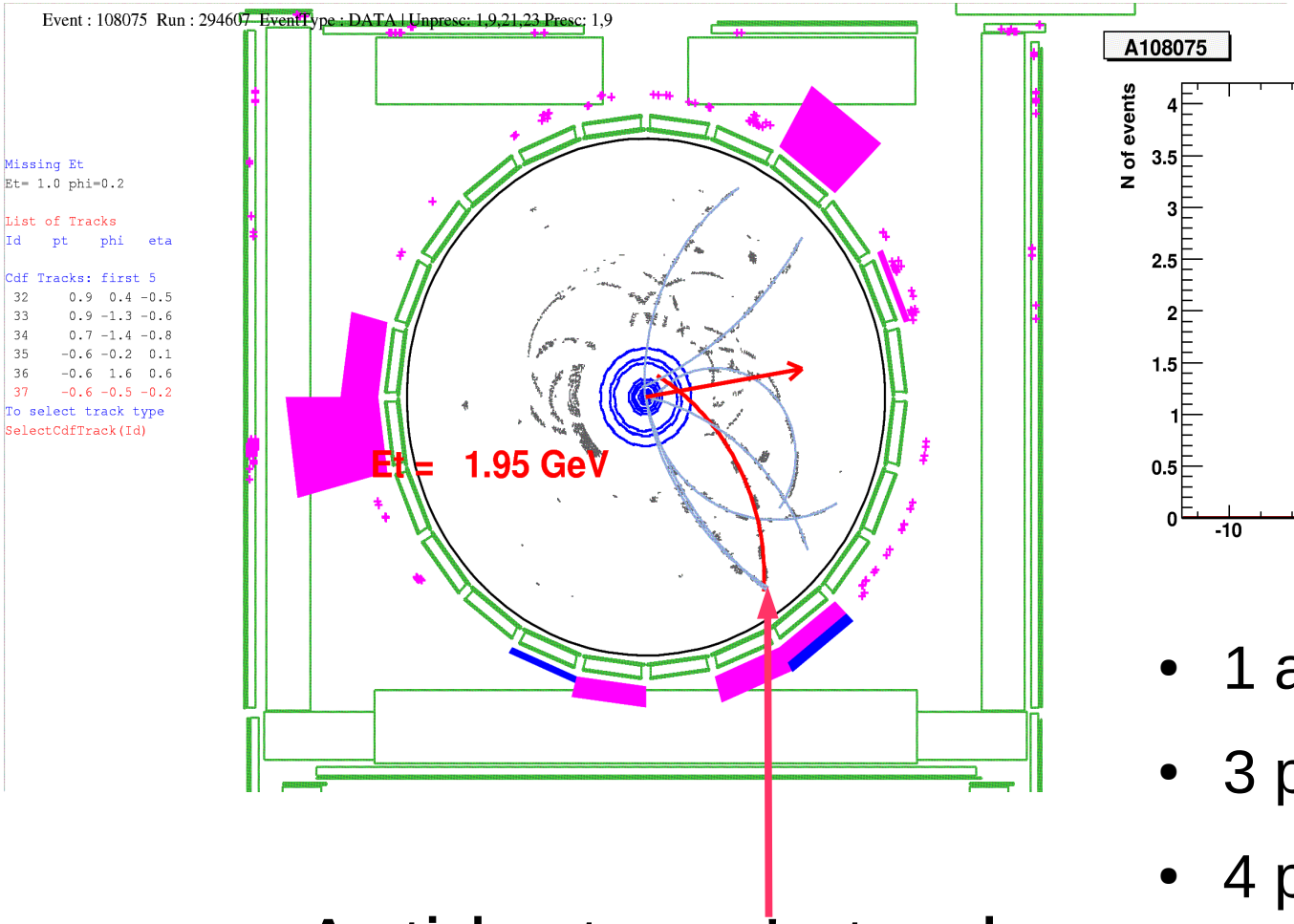


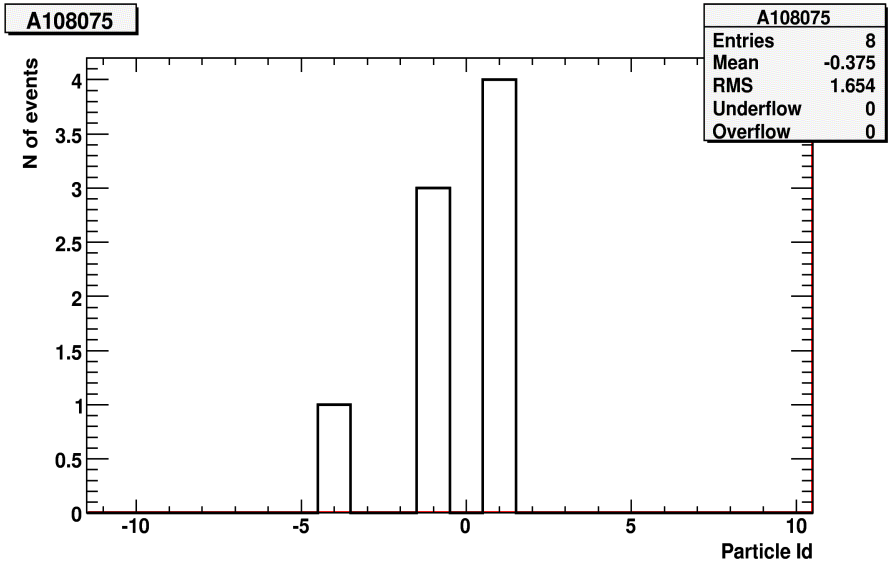


- 1 antideuteron
- 2 pions+
- 2 pions-

Antideuteron's track

Events with antideuterons - evd

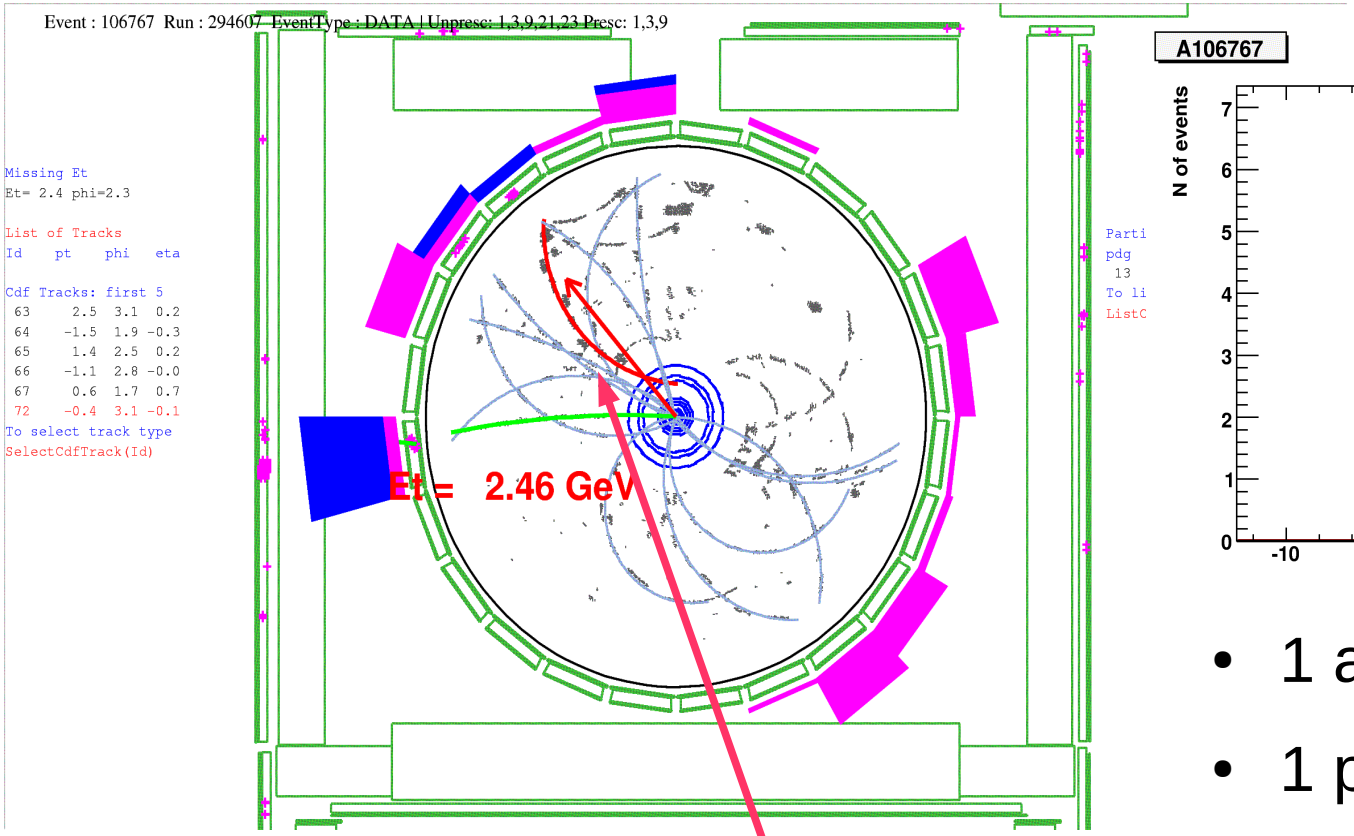


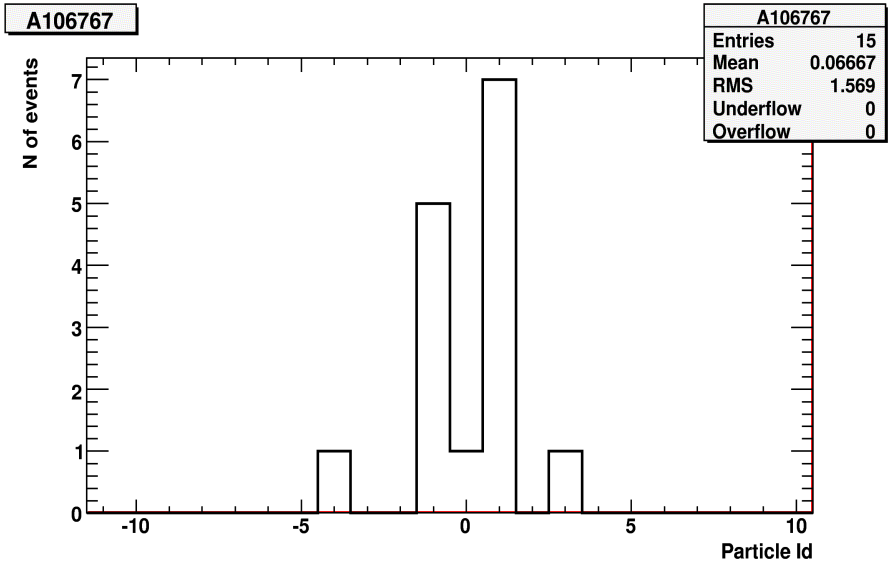


- 1 antideuteron
- 3 pions-
- 4 pions+

Antideuteron's track

Events with antideuterons - evd

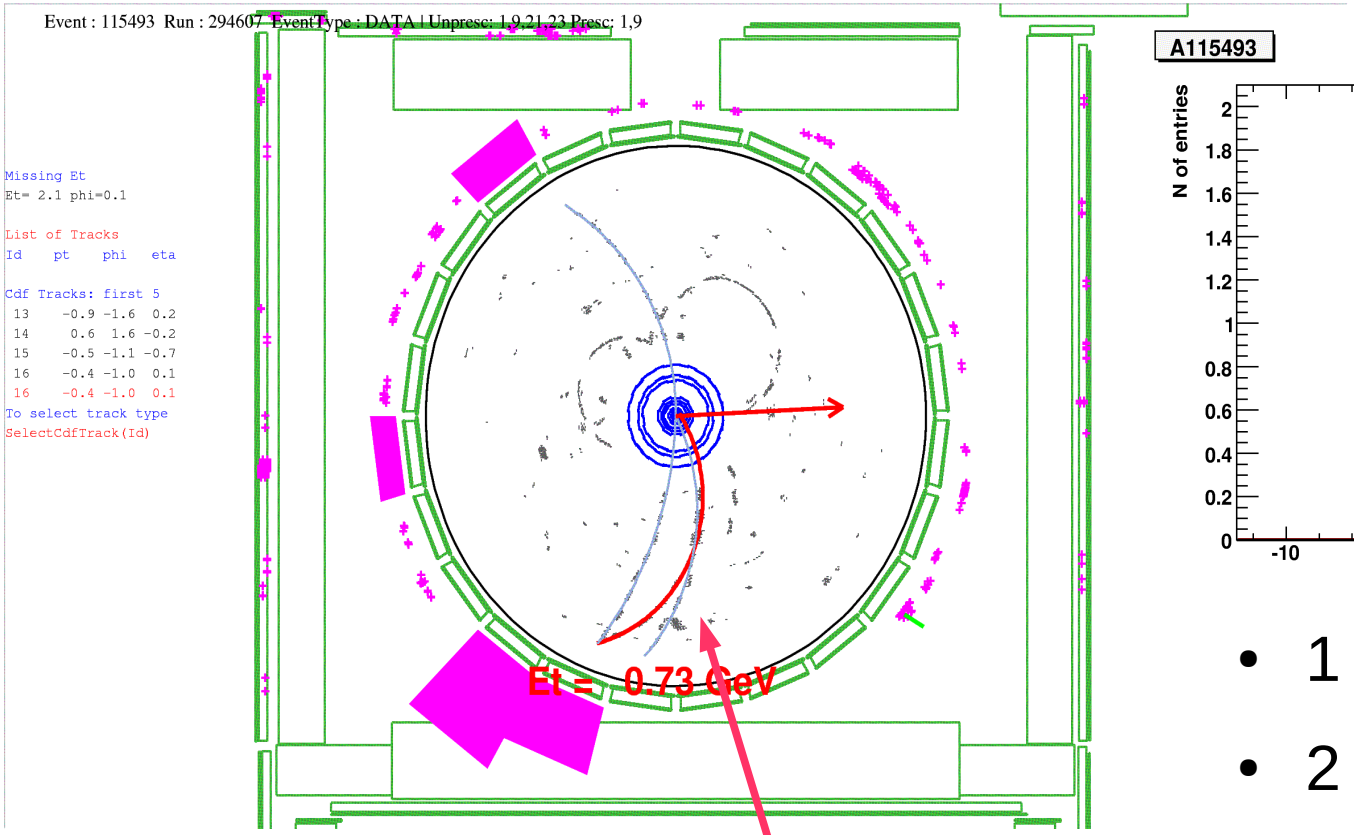


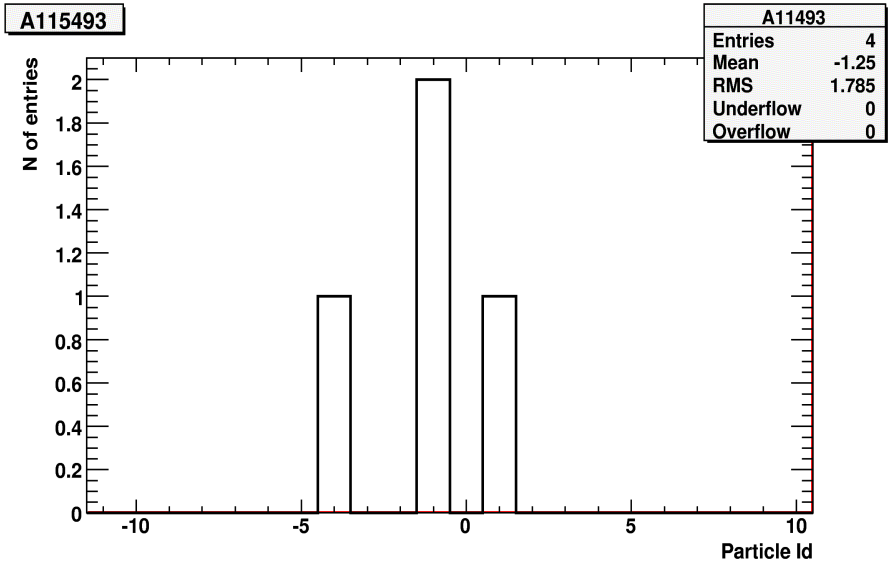


- 1 antideuteron
- 1 proton
- 5 pions -
- 7 pions +

Antideuteron's track

Events with antideuterons - evd



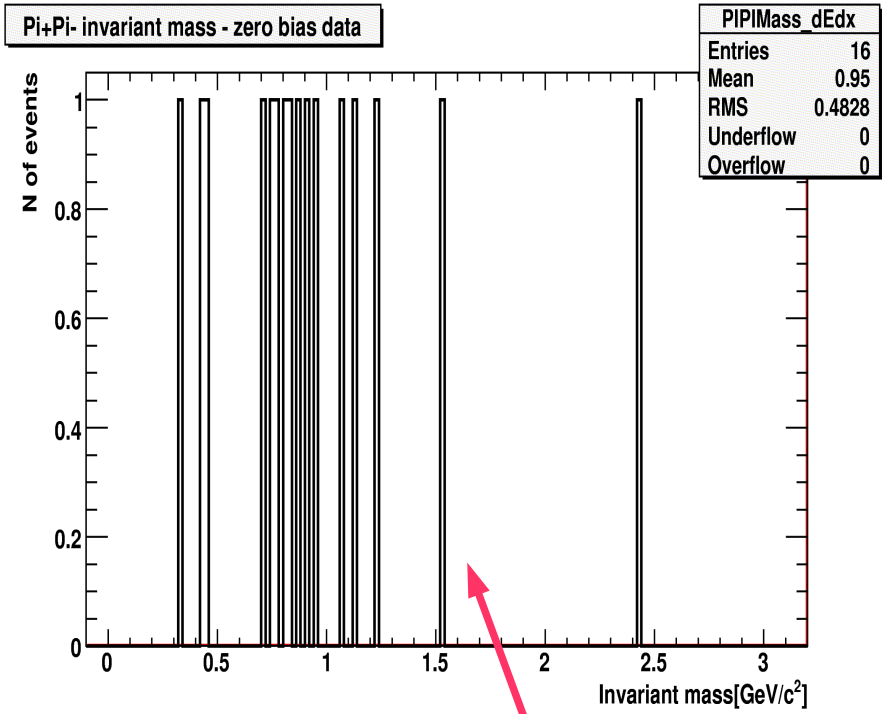


- 1 antideuteron
- 2 pions -
- 1 pion +

Antideuteron's track

G-X-G vs X-X-X events
Pi+Pi-Mass

- Zero Bias data from runs 292319 and 294607
- Central calorimeter cleaning
- In central region (|eta| <1.2) exactly 2 tracks
- With |eta| > 1.2 anything is allowed



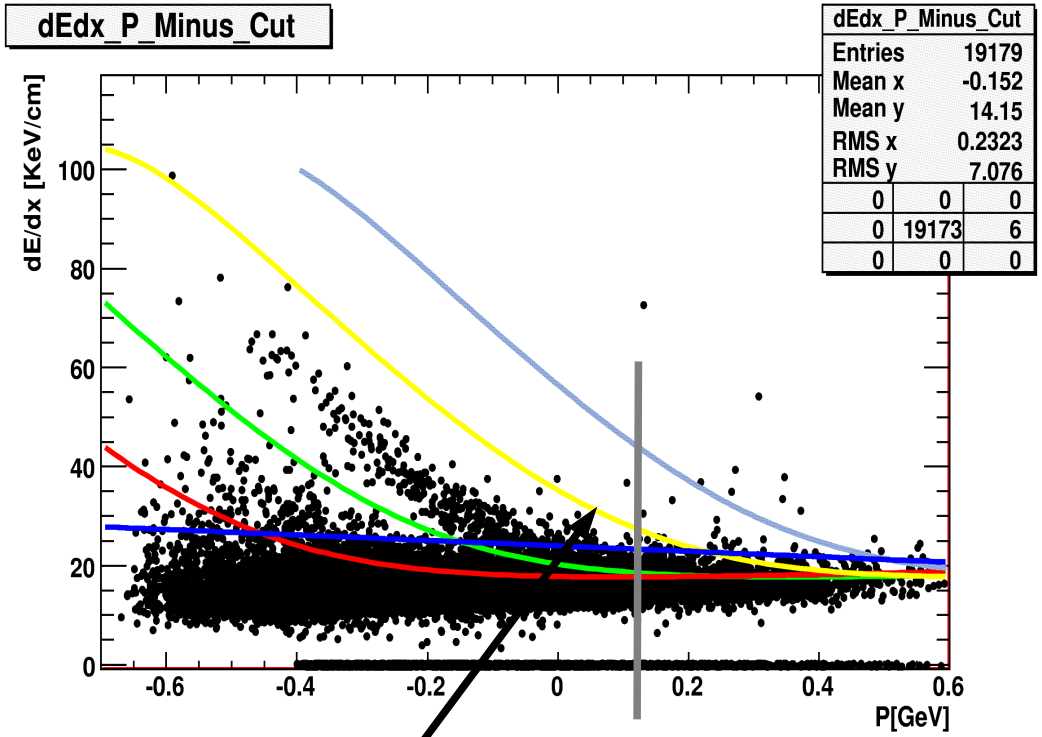
Low statistics

G-X-G vs X-X-X events
Antideuterons

- Zero bias deta – runs 292319, 294607
- Exactly 1 Vertex
- 2 Jets > 0.5 GeV

Ratio d_bar/d

- XGX – 0.0123
- XXX – 0.0125



6 entries