

Jens Berger
University of Frankfurt

The Level-3 Trigger System at STAR

STAR Collaboration

STAR Level 3 Trigger

- Online event reconstruction at an input rate up to 100 Hz for Au+Au or p+p collisions.
- Trigger for Au+Au or p+p collisions with special topological or physics characteristics.

Trigger Applications:

already applied:

- event vertex in beam direction
 - trigger on events which are centred in the STAR detector.
- ρ^0 produced in peripheral collisions
 - trigger on $\pi^+\pi^-$ candidates from ρ^0 .

planned:

- rare particles

$$J/\psi \rightarrow e^+ e^-$$

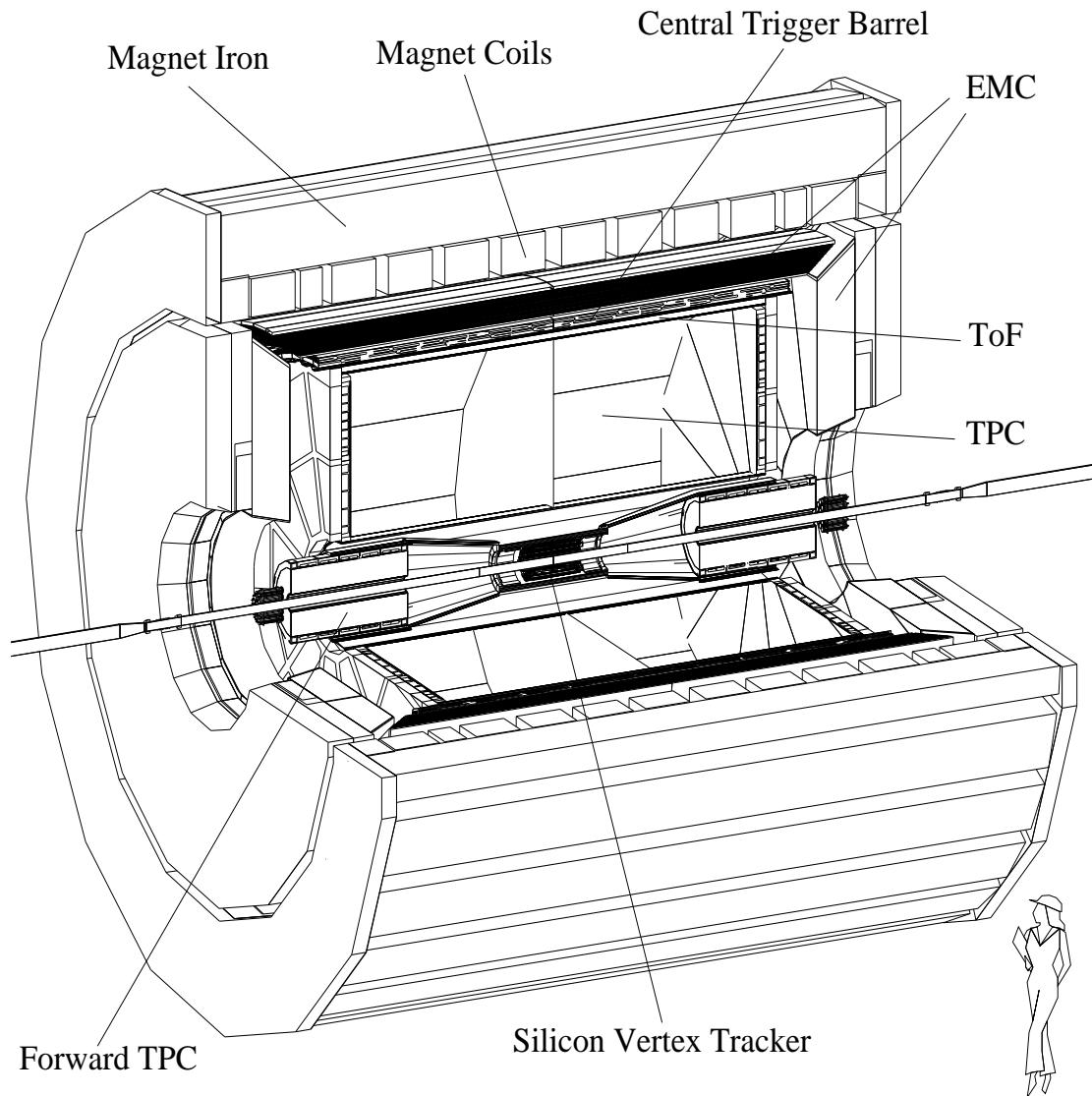
- heavy fragments
 - antideuterons

STAR Experiment

Solenoidal Tracker At RHIC

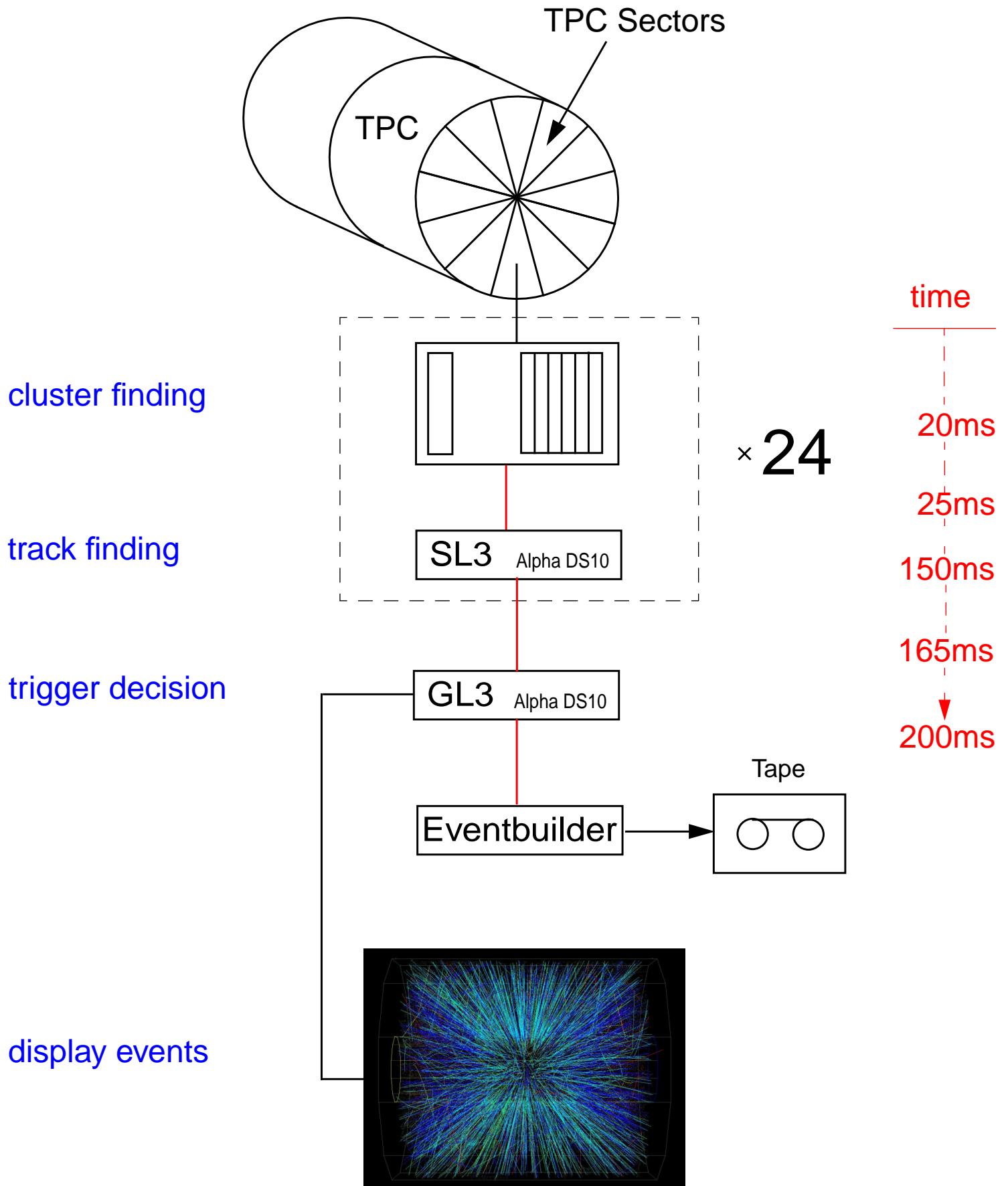
June: Au+Au at $\sqrt{s_{NN}} = 70 \text{ GeV}$

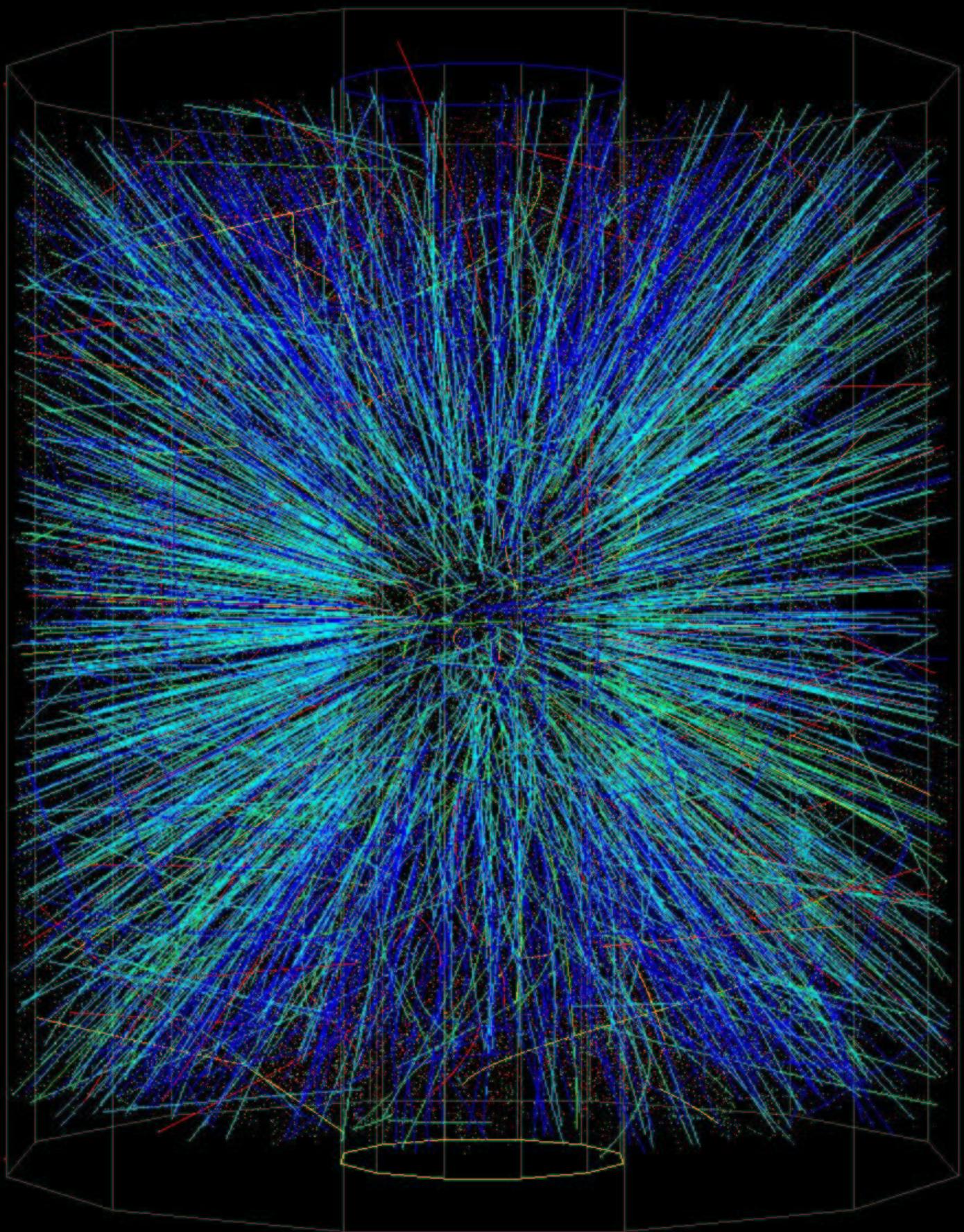
July - Sept: Au+Au at $\sqrt{s_{NN}} = 130 \text{ GeV}$



2000: Level-3 Trigger based on TPC data only

Level 3 Trigger Architecture





Trigger on Event Vertex

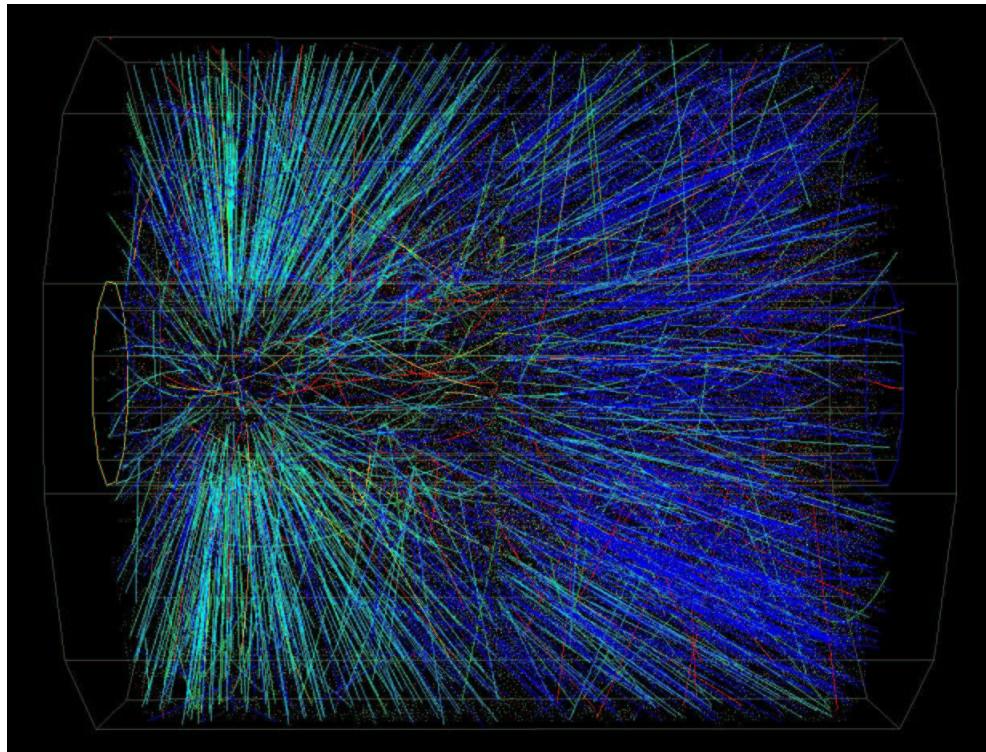
z=200cm

0

z=-200 cm

rejected

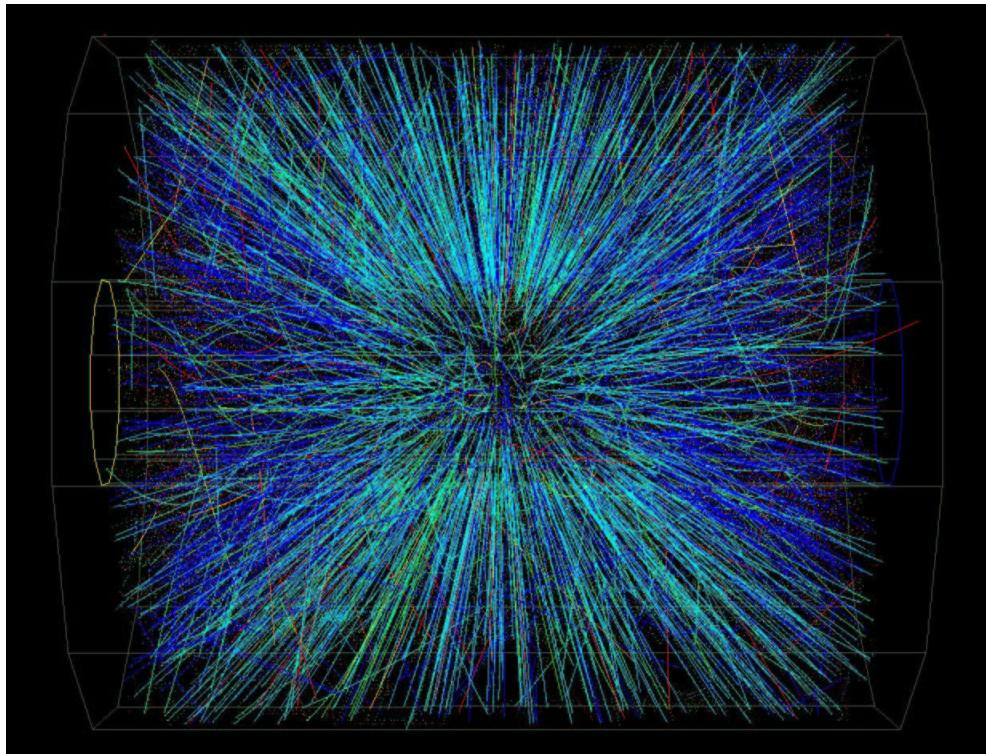
$|V_z| > 75\text{cm}$



↑ z=147cm

triggered

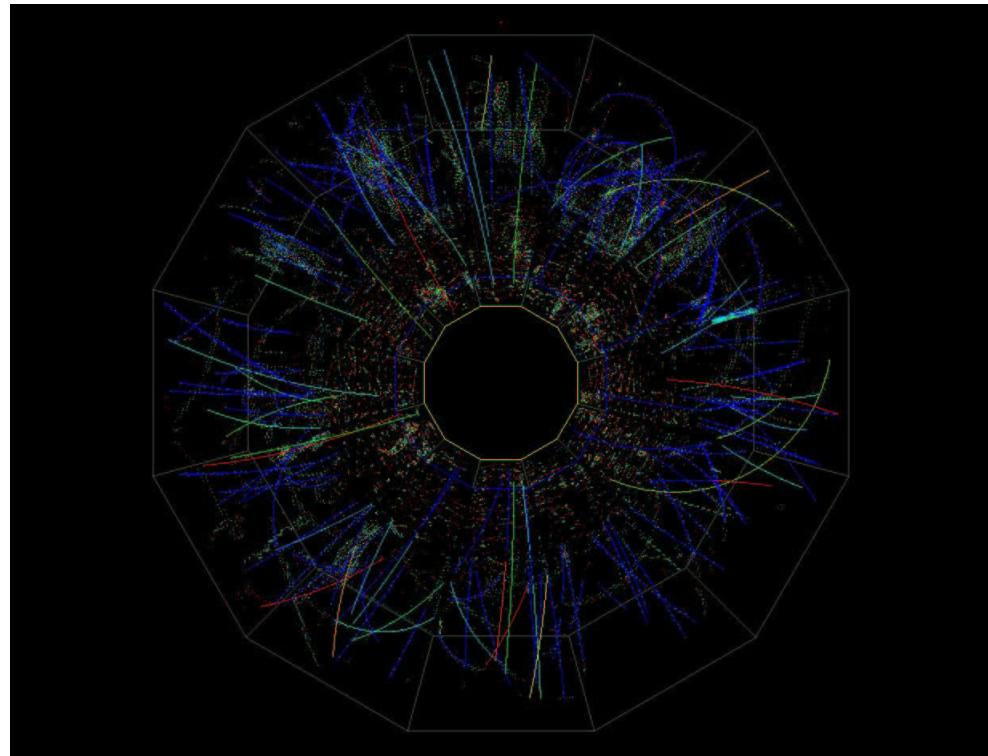
$|V_z| < 75\text{cm}$



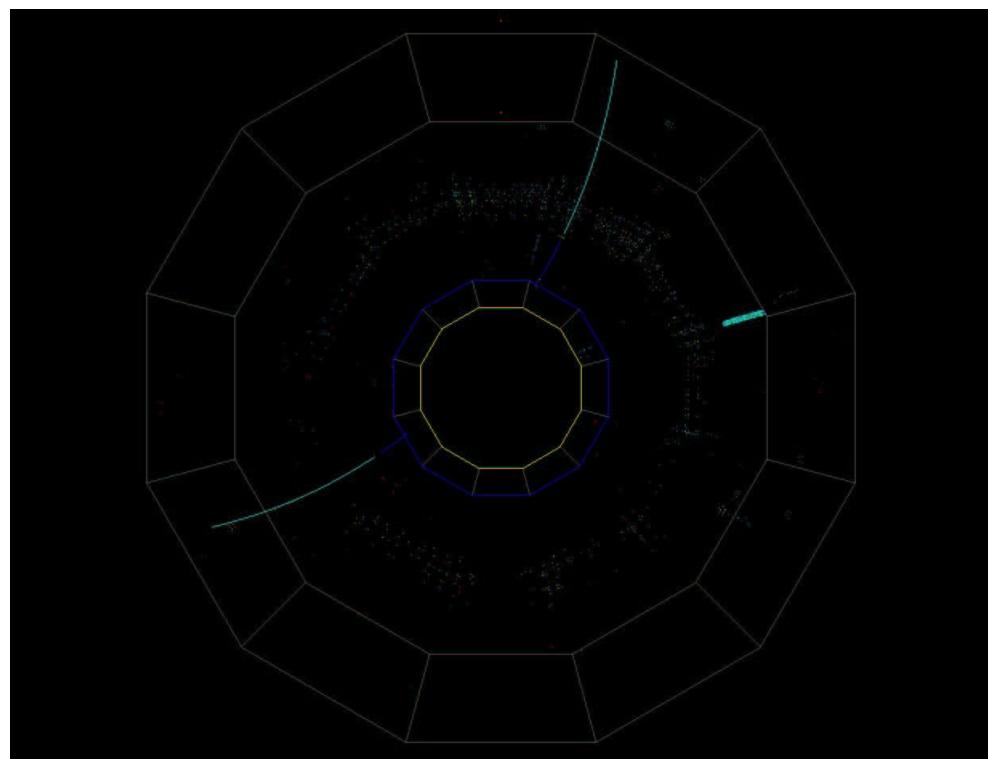
↑ z=-2cm

Trigger on $\pi^+ \pi^-$ from ρ^0 in peripheral Collisions

rejected
beam gas event

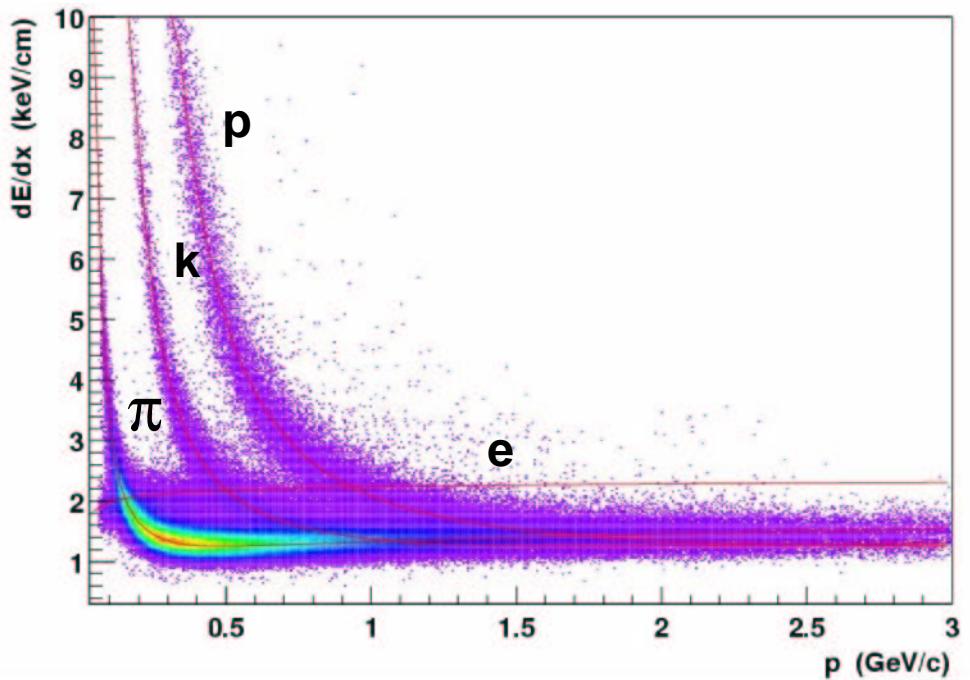


triggered
pair points to
beam position



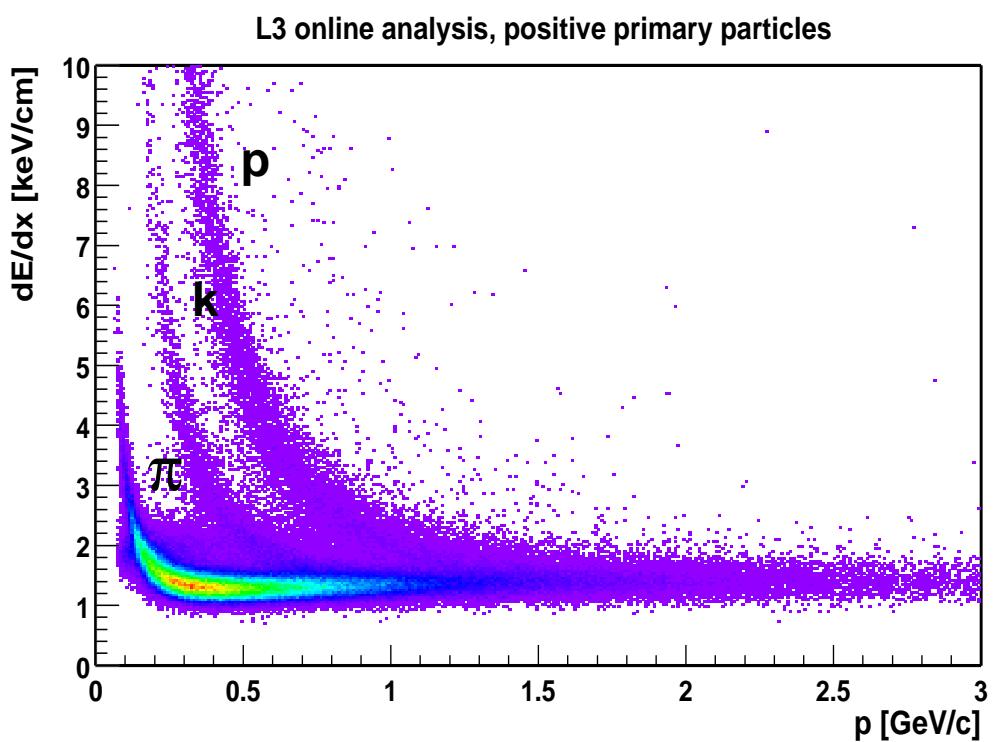
Particle Identification

dE/dx offline analysis

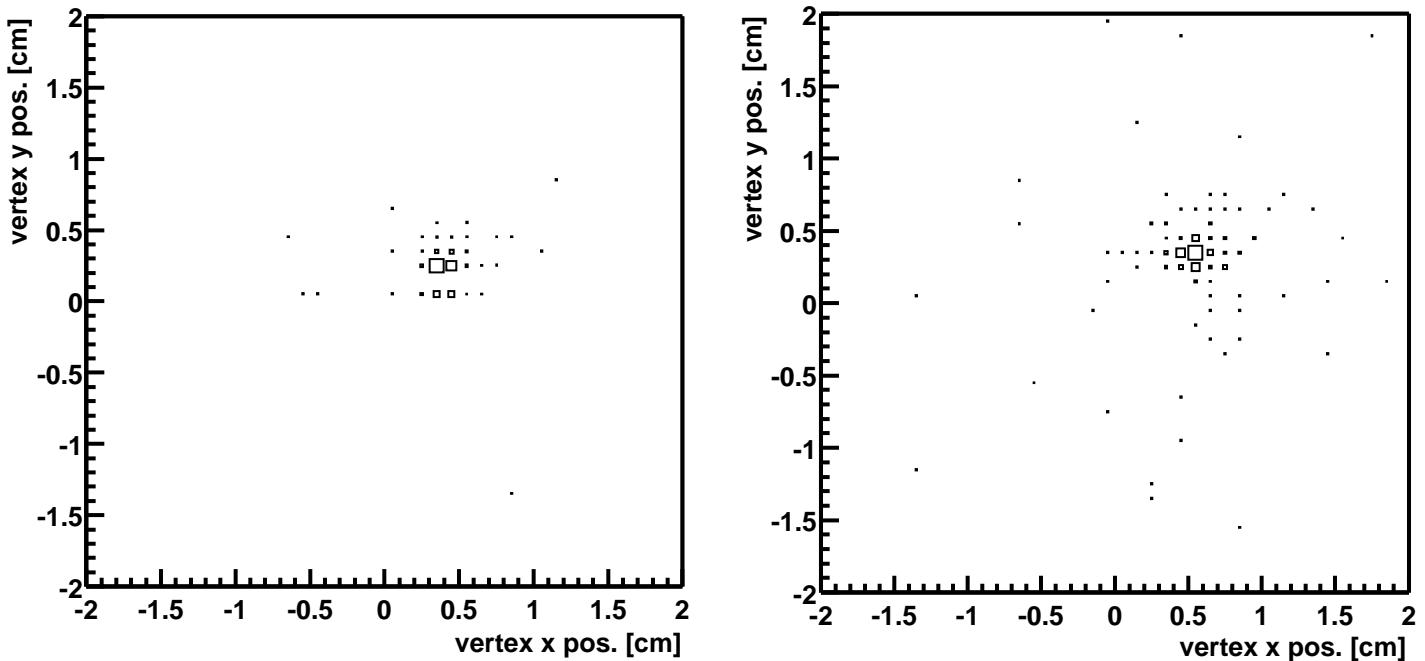


dE/dx online analysis

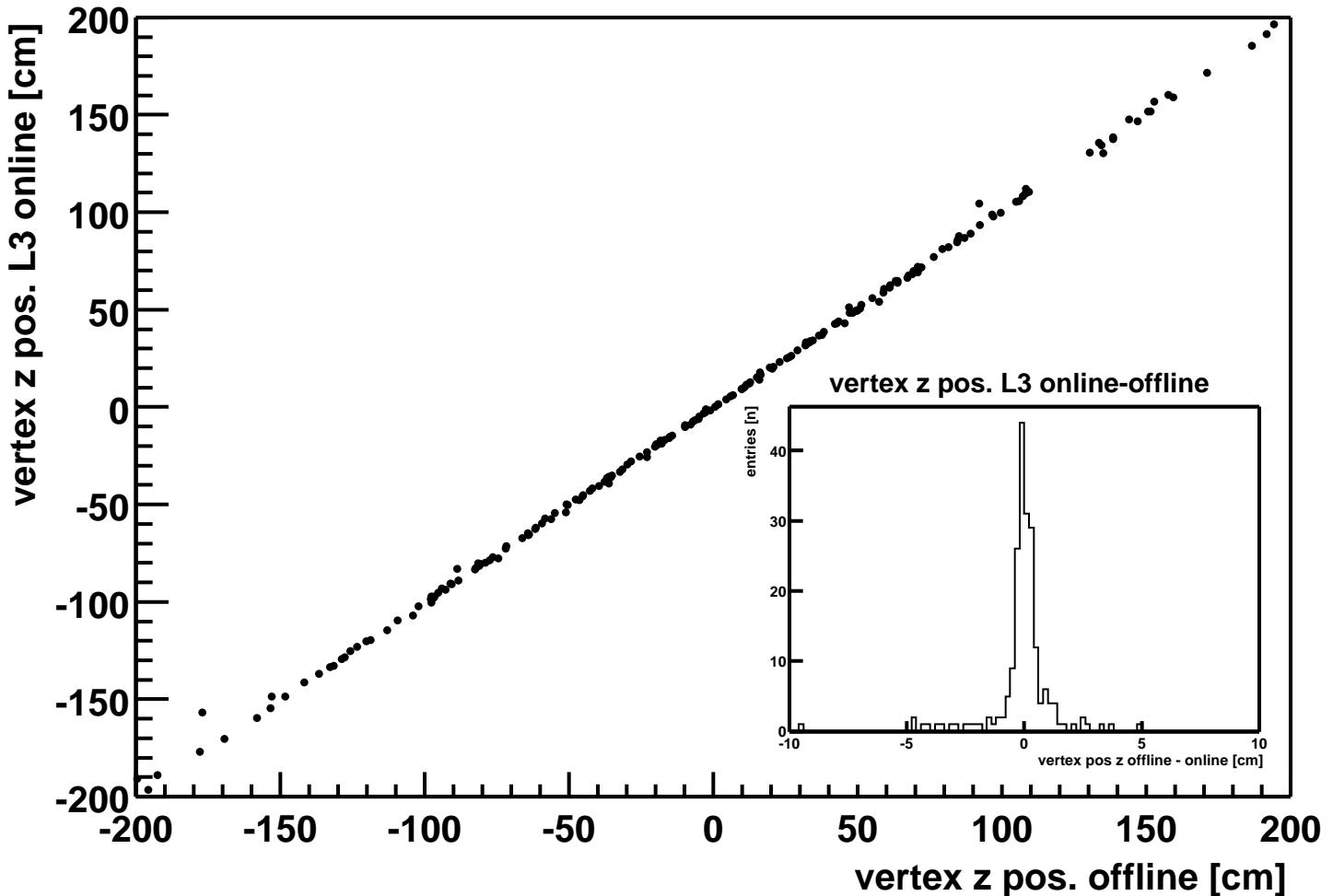
Pid in 200 ms with
L3 online analysis



Event Vertex

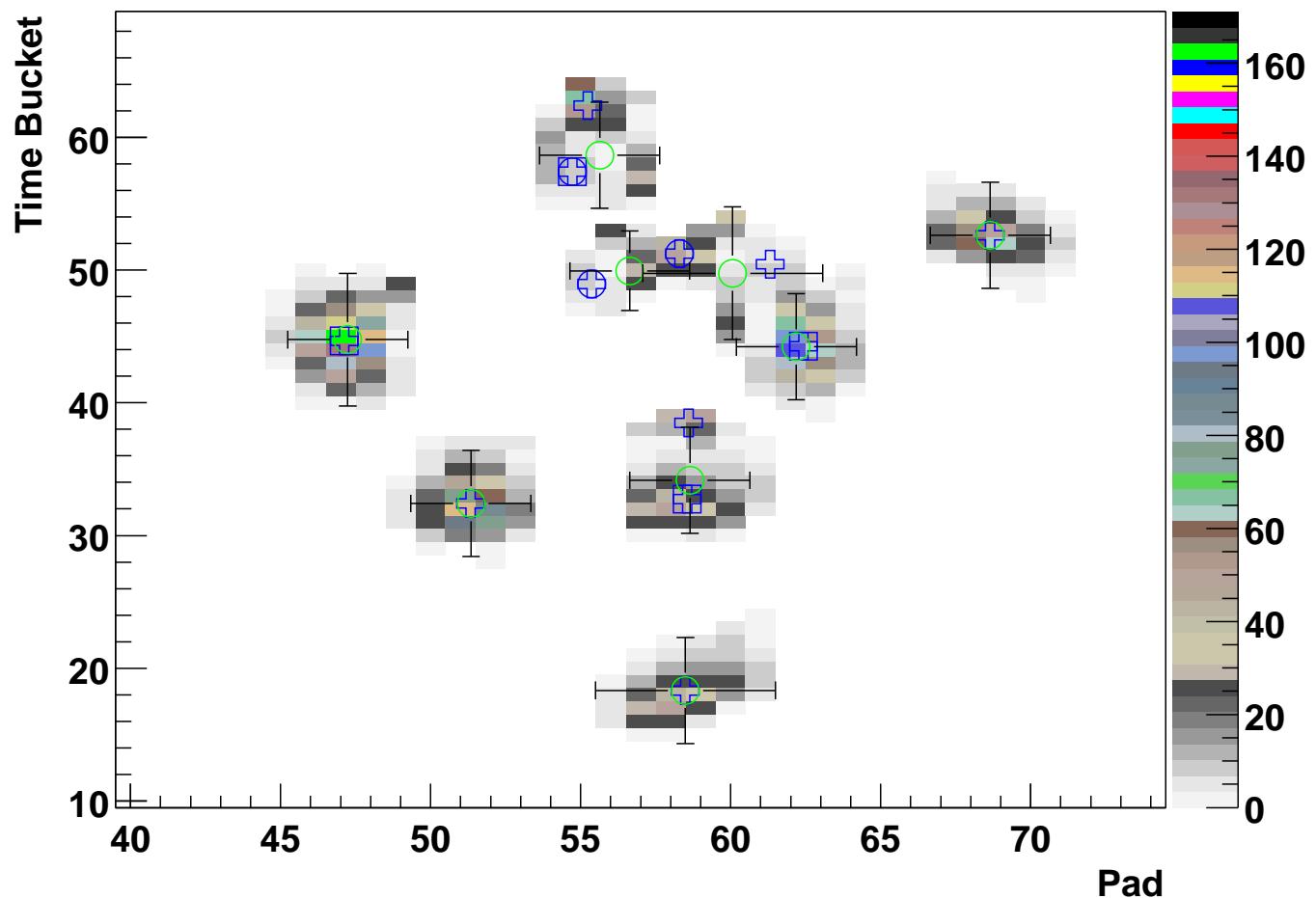


vertex z pos. L3 online vs. offline analysis



Clusterfinding

Slight differences between online and offline analysis.



spots : rawdata

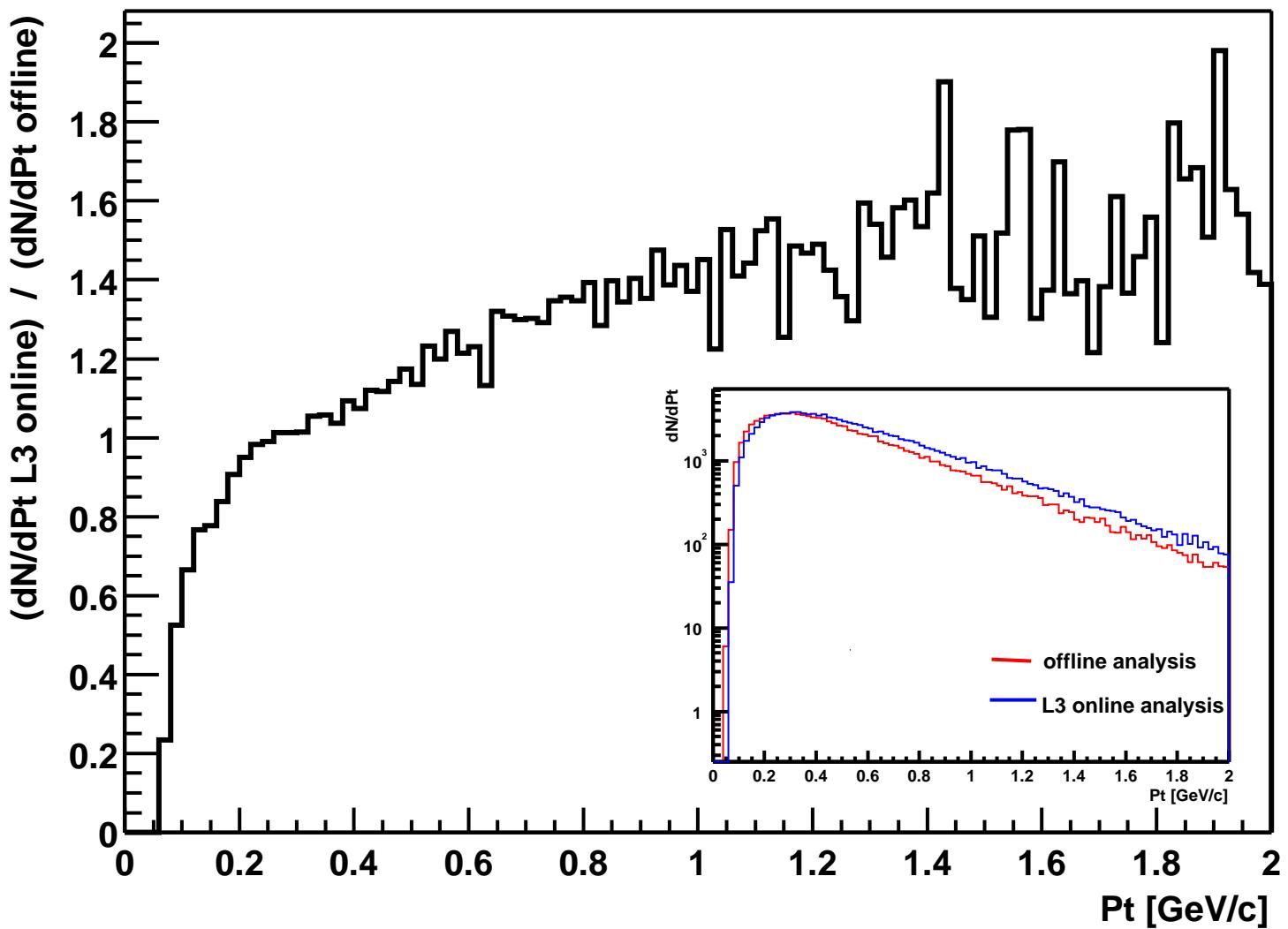
cycle : cluster found offline

error bars: cluster width offline

crosses : cluster found by L3 online

Online vs. Offline Analysis

Online momentum distribution (200ms) shows the same shape as offline reconstructed events (10min). A certain systematical difference is observed.



Summary

- L3 Trigger was applied on Au+Au collisions to trigger on:
 - event vertex
 - ρ^0 in peripheral collisions
- Online tracking / clusterfinding are less accurate than offline. Reconstruction efficiency is already good enough to trigger on simple event characteristics.
- To trigger on more complicated signals, the reconstruction efficiency has to be improved:
 - rare particles, $J/\psi \rightarrow e^+ e^-$
 - heavy fragments, antideuterons
- Other subdetectors will be included in the L3 Trigger.