"The DAQ100 Project"

or

How to store 100 central events per second.
(And get to analyze them too!)

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I. **Hardware Changes**

II. **Shift of main DAQ paradigm**

III. **Write out only cluster coordinates instead of raw data**

Hardware Changes

- Current main limit is the internal DAQ network to BufferBox/EVB *(Myrinet)* which limits the data rate to about 60 MB/s due to the funnel *(many-to-one)* architecture.

- Proposal: use 2 network interfaces on BufferBox and adapt the software to use both…

- Cost: 10 k$ for the network card and perhaps a new switch

Gain: about 2X

People: J. Landgraf

Shift of main DAQ paradigm

- The main DAQ requirement was *"ship 100 evts/sec to L3 but format only 1 evt/sec"*.

- This greatly influenced the code/protocol design in DAQ and if we move to a paradigm which states *"ship 100 evts/sec to L3 <u>and</u> EVB and format (perhaps) many"* we can gain in latency.

- Proposal: Revamp the DAQ software logic in the I960s and the Detector Brokers and add more buffers, additional pipelining, etc.

- Cost: 15 k$ for more memory on the Detector Brokers

Gain: 1.5 – 2X

People: T. Ljubicic

Write out only cluster coordinates instead of raw data

Instead of writing out the TPC data we'd just write out the cluster coordinates from the DAQ/L3 cluster-finder.

Gain: 5X

1) We know that the size is about 5X less than the zero-suppressed data!!
2) We know that we can run centrals at about 45 Hz right now!
3) We know that even the current (_unoptimized_) DAQ/L3 cluster-finder is "pretty good" (Dominik Flierl)

➔ But more study needs to be done as well as cluster finder optimization!

We need do adapt the offline chain and run the cluster finder on existing events and:

1) adapt the offline chain to either:
   I. use the cluster coordinates in the DAQ files if available
      the final way
   II. run the DAQ cluster-finder on the data if not.
      for evaluation and debugging

2) compare <u>embedded track</u> parameters with the ones obtained from the current "Offline" cluster-finder

3) compare physics variables with the new and old cluster finder and convince PWGs that this works well, ☺

People: J. Landraf
            T. Ljubicic (just for the cluster finder adaptations)
            Other – to help with track embedding, physics variables, PWG contacts etc.

Other modes we can run this:

- write out raw data on every n-th event (just in case…)

- write out raw data vs. clusters depending on the Trigger Word

- write out raw data vs. clusters depending on L3 reconstruction i.e. if L3 sees an anti-alpha candidate we may decide to just write raw data

- write out raw data for the inner sector and clusters for the outer sector

- depending on particular physics goals of the period i.e. we write raw for HBT but clusters for high Pt

- any other decision can be made in real-time on an event-by-event basis based upon any set of variables

And:

The current TPC offline reconstruction chain spends 80% (!) of the time in the cluster-finder

➚ this would vanish altogether!

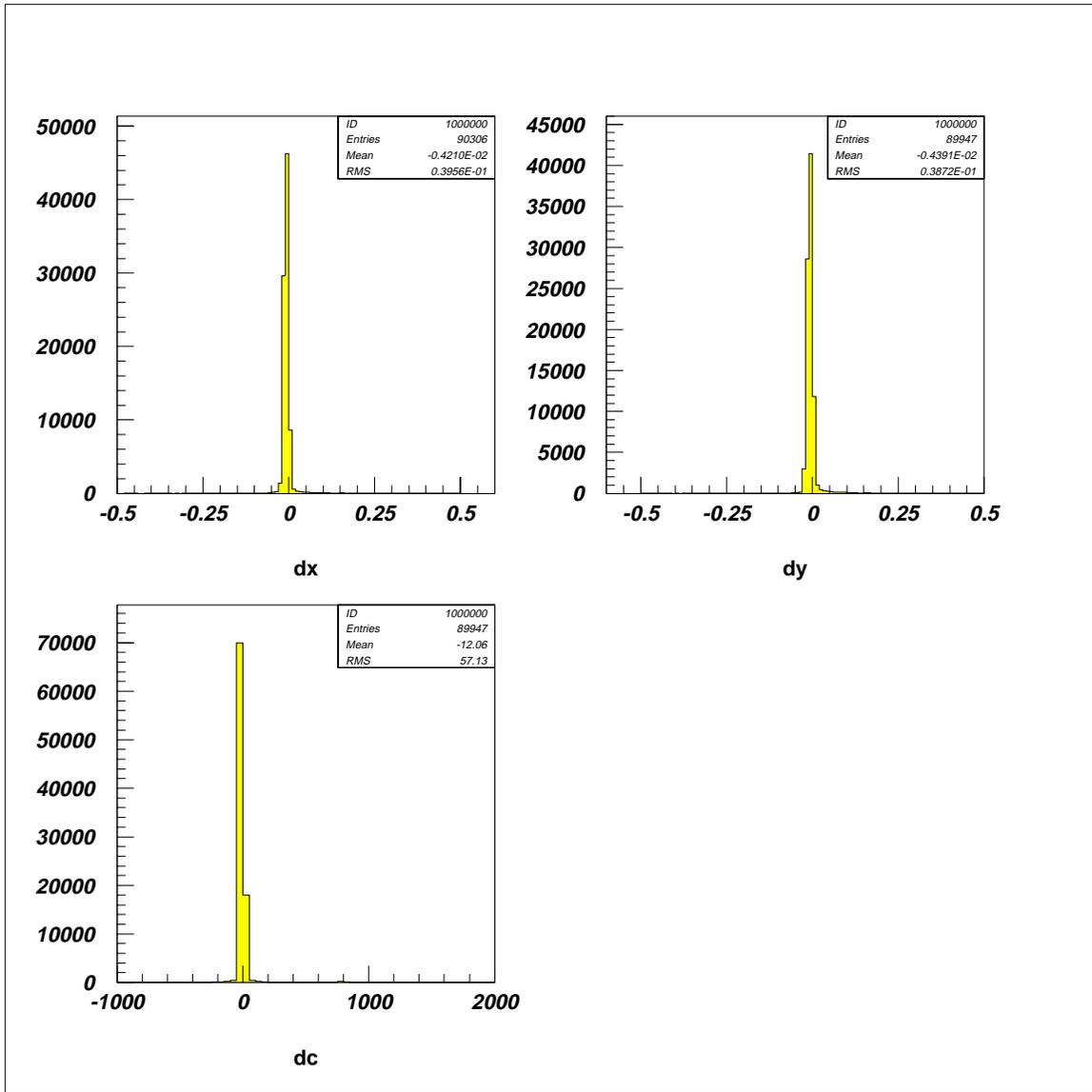# Quick simulation results to stimulate the eye…

Feature: Fixed width gaussians with fixed total charge (800) superimposed at random with a given count (or occupancy) on a typical padrow.
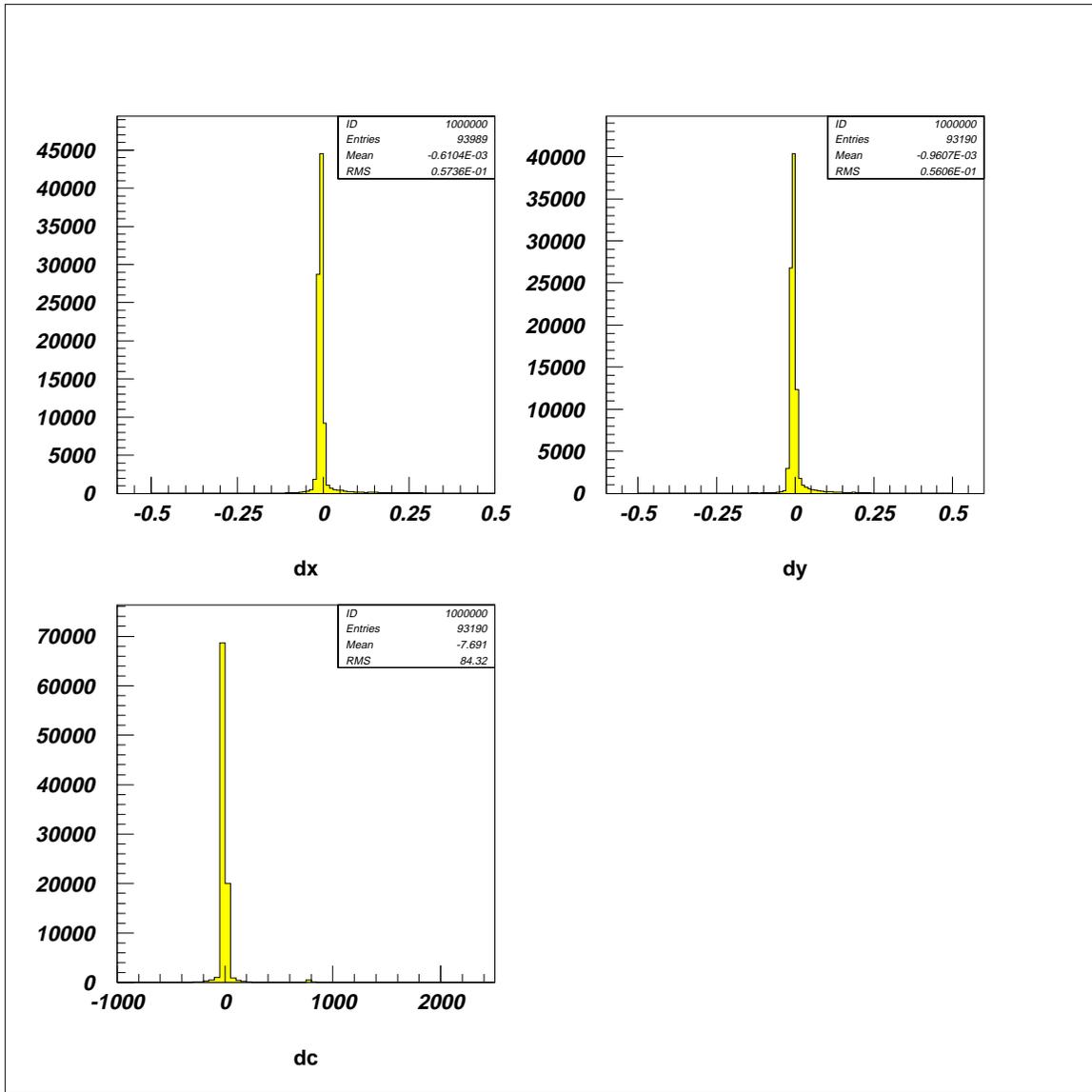
A typical 45% occupancy (!!!) event .
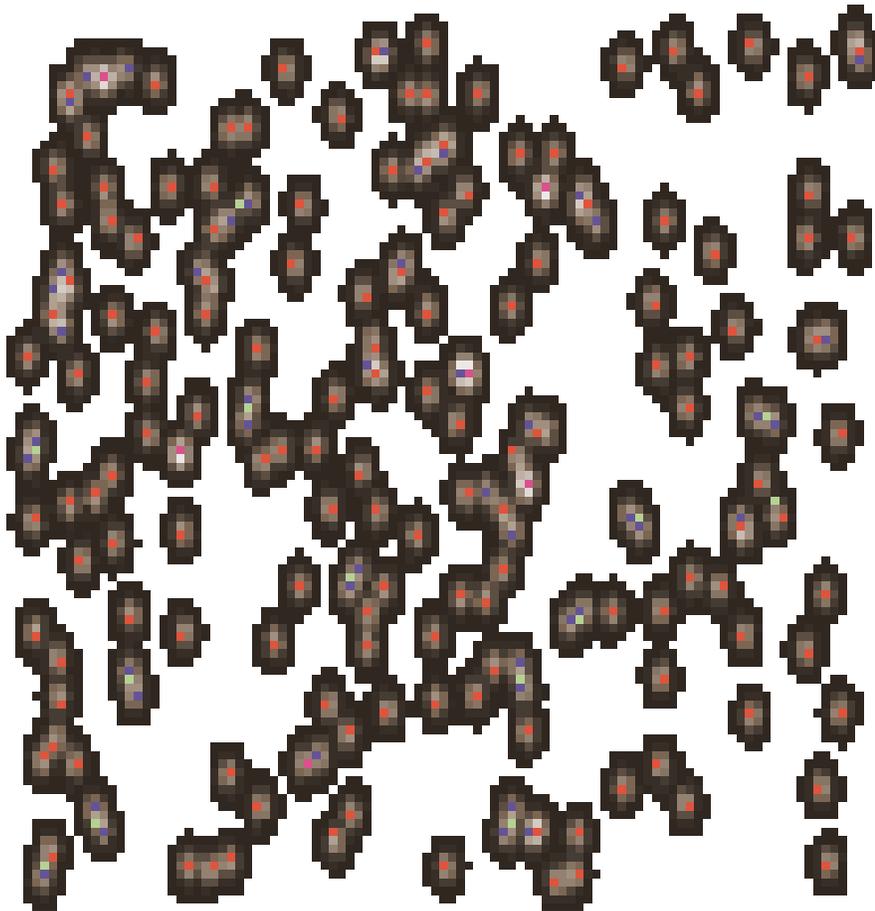
Legend   **Match (or Match)**
             Original hit only
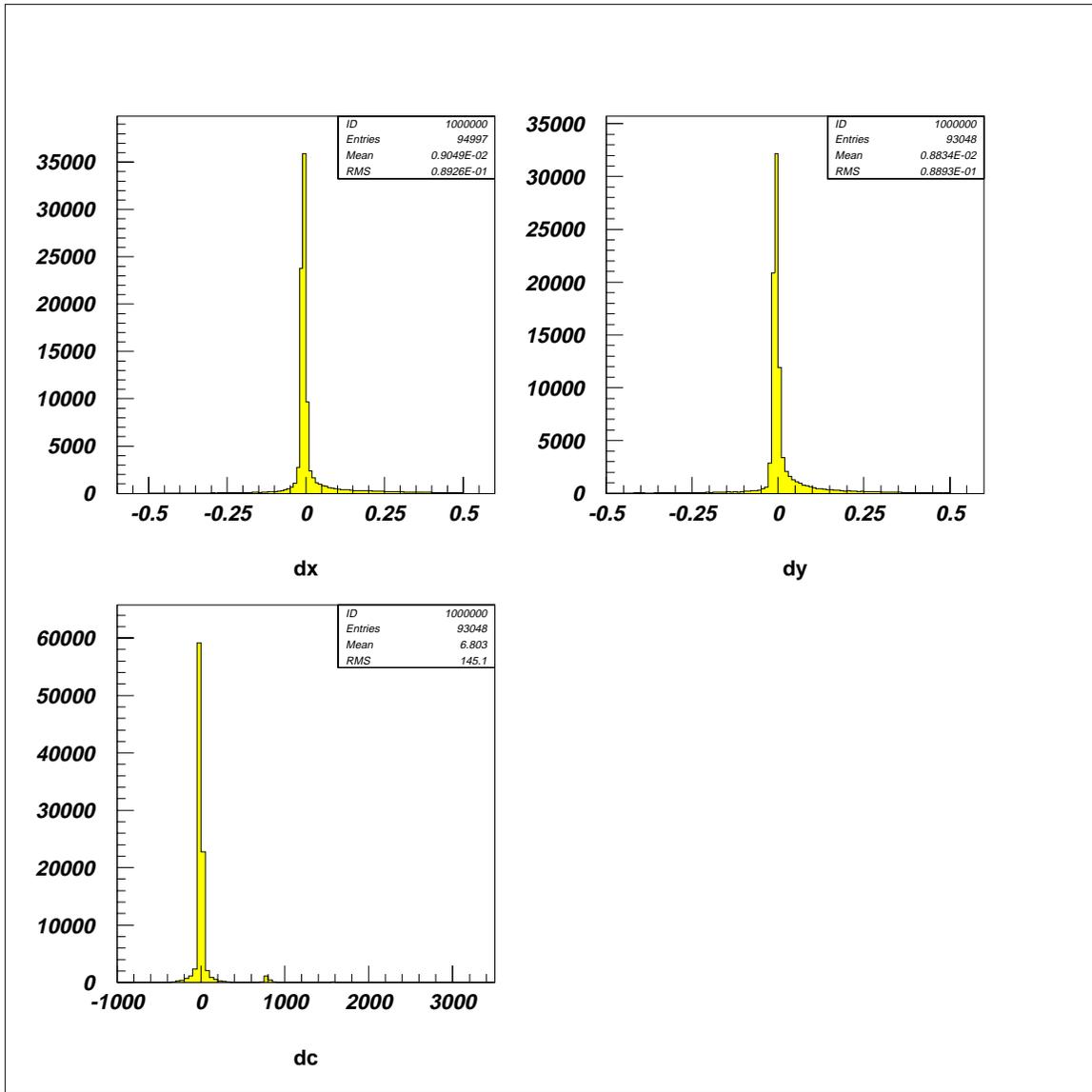   **Spurious Cluster Finder hit**
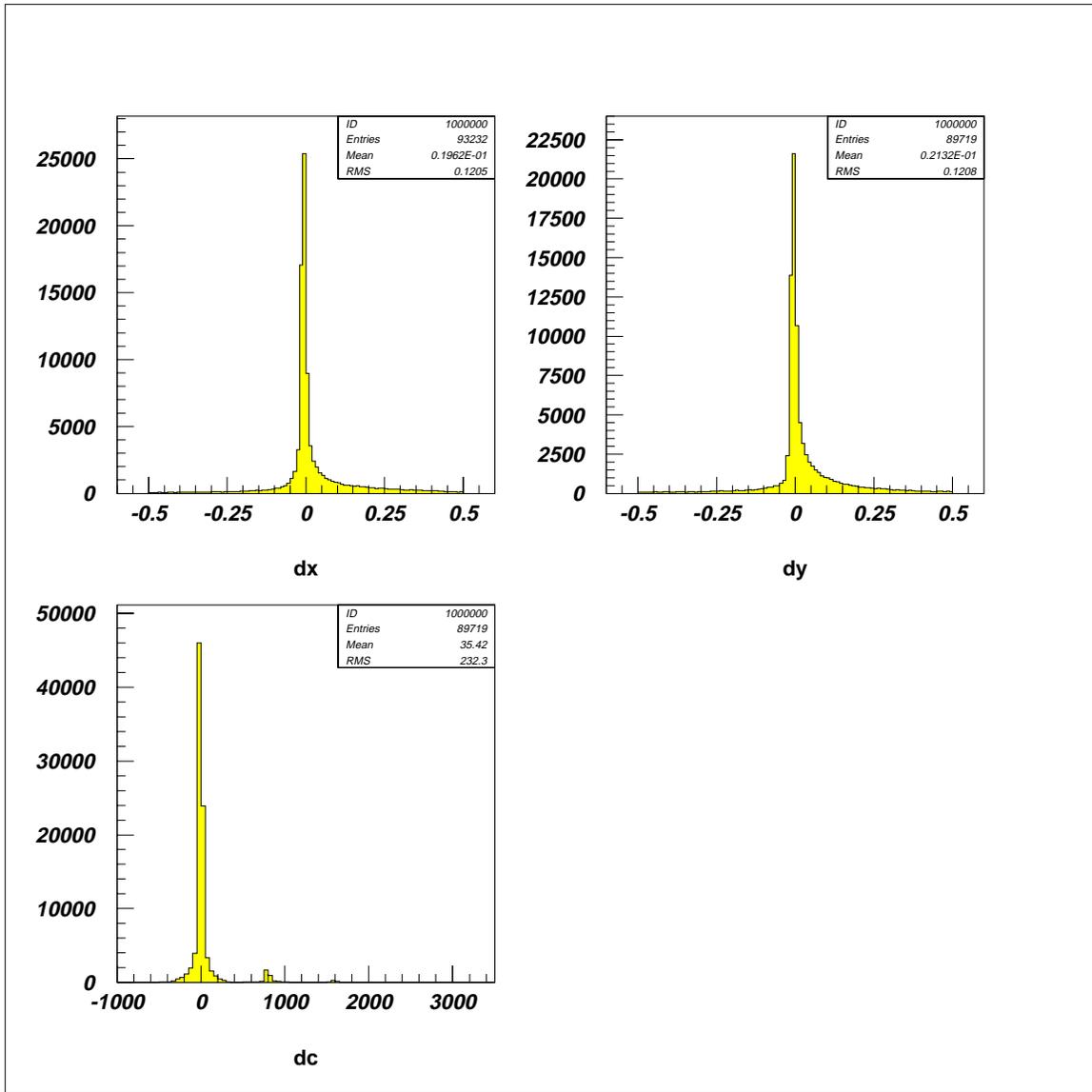
NOTE: TPC has <10% occupancy for central events!

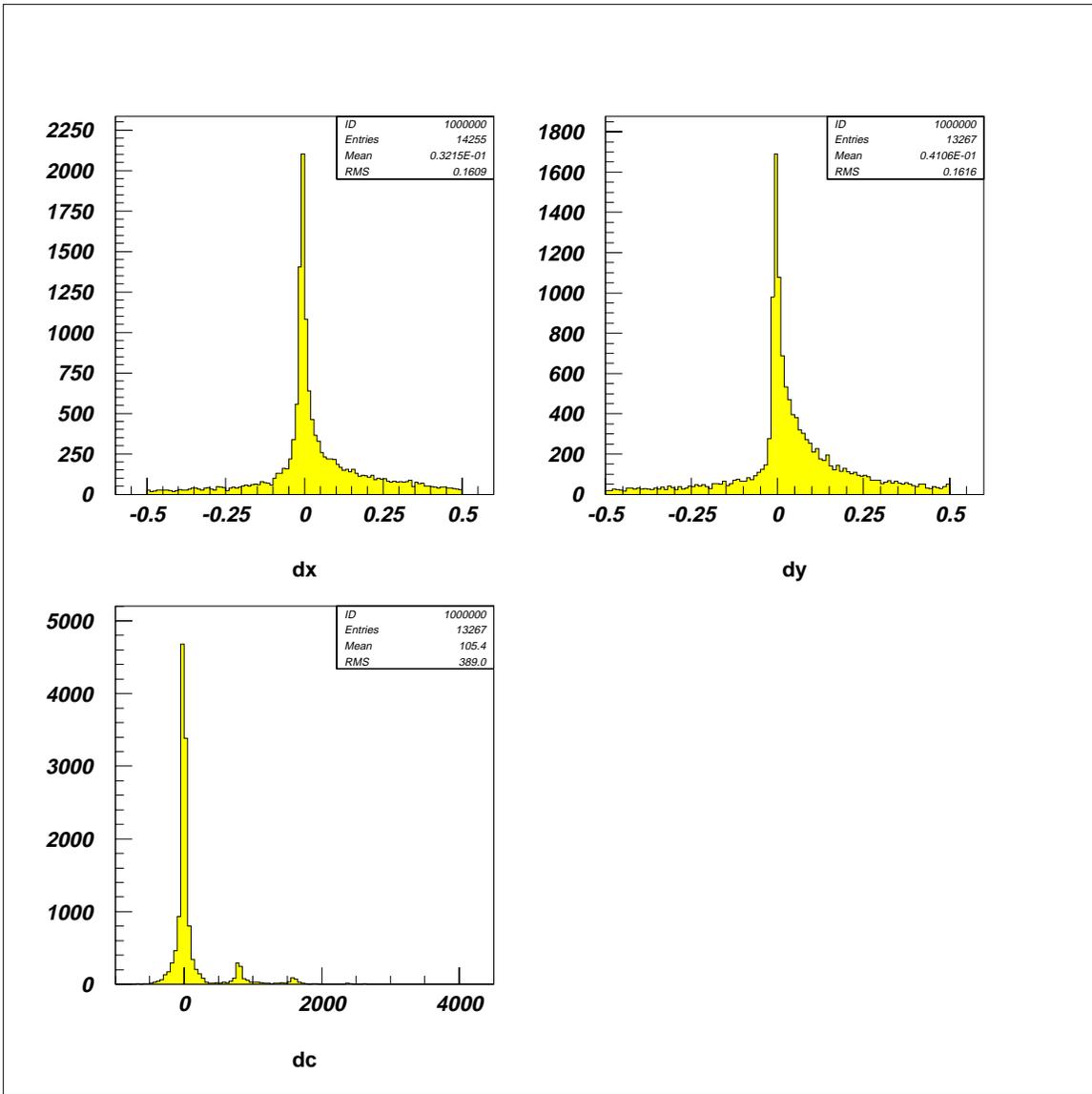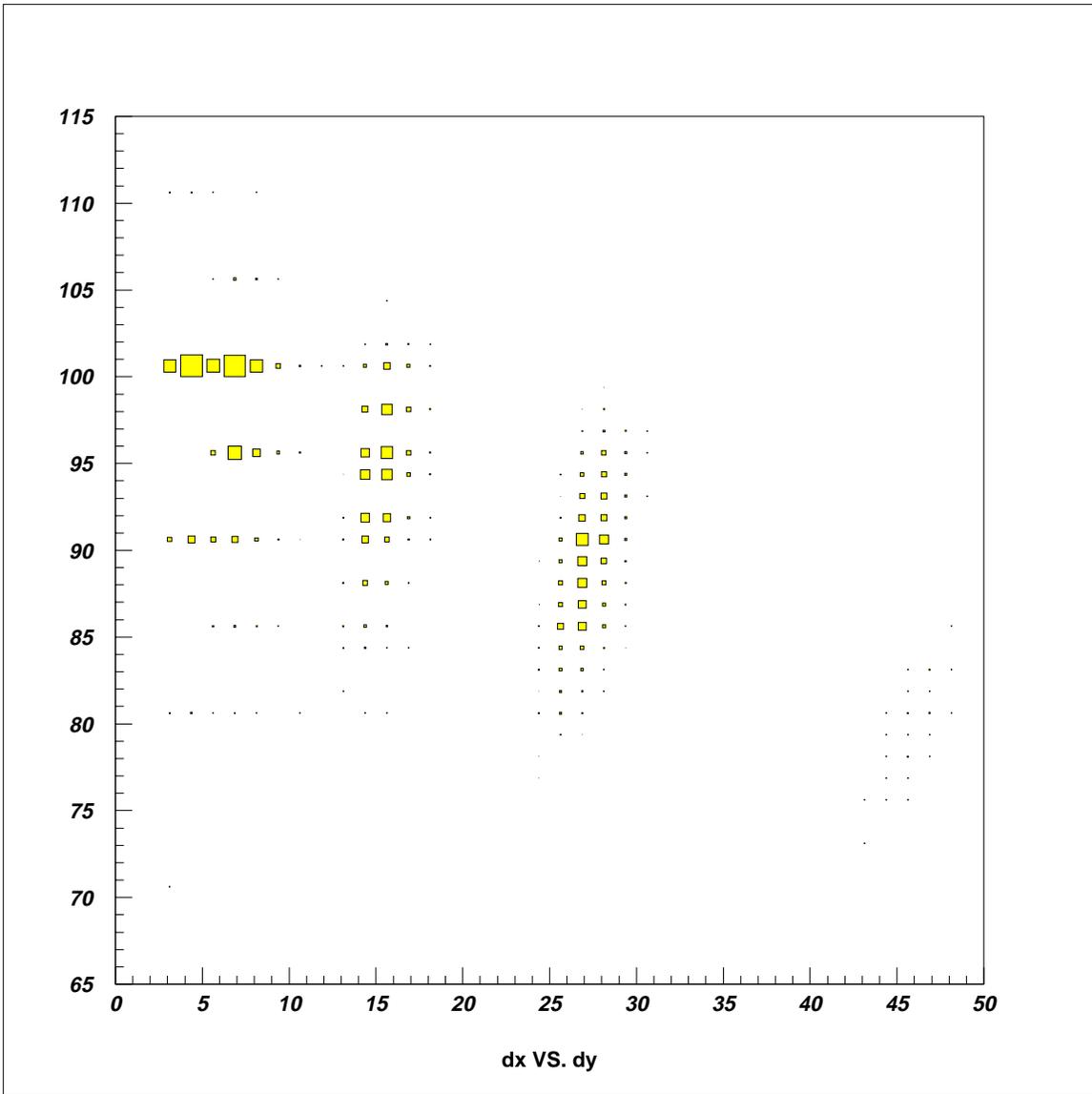**4 % Occupancy**

8 % occupancy

16 % occupancy

25 % occupancy

45% occupancy

Efficiency vs. occupancy