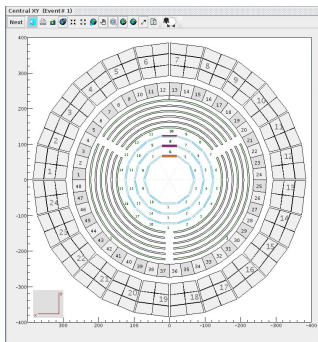
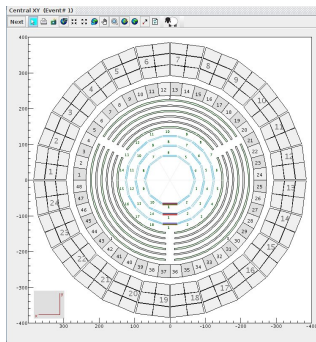


# SVT Geometry Validation - Applying Survey Shifts

- Use the alignment run (2467) to study straight tracks for a subset of sensors in the SVT.
- Use the horizontal sensors only - called Type 1 for cosmic rays.
- For events coming from the target we needed a different classification so these are called Type 3.
- Select events with a track that contains the sensors shown below.

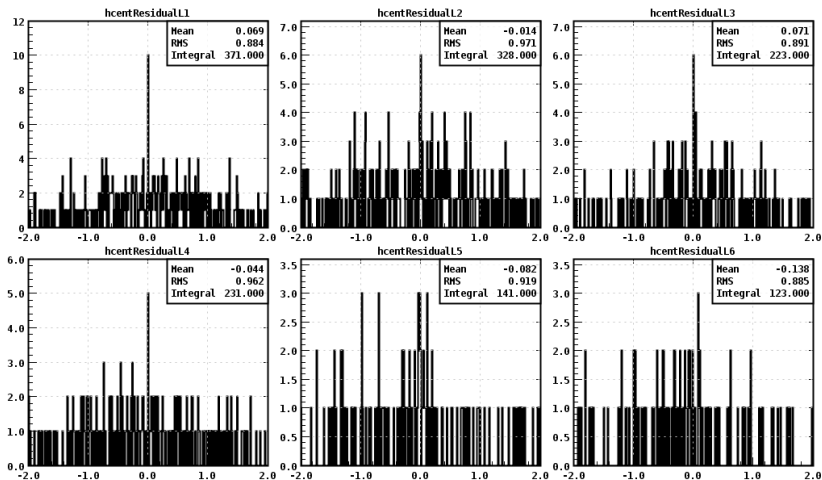


Type 3-1



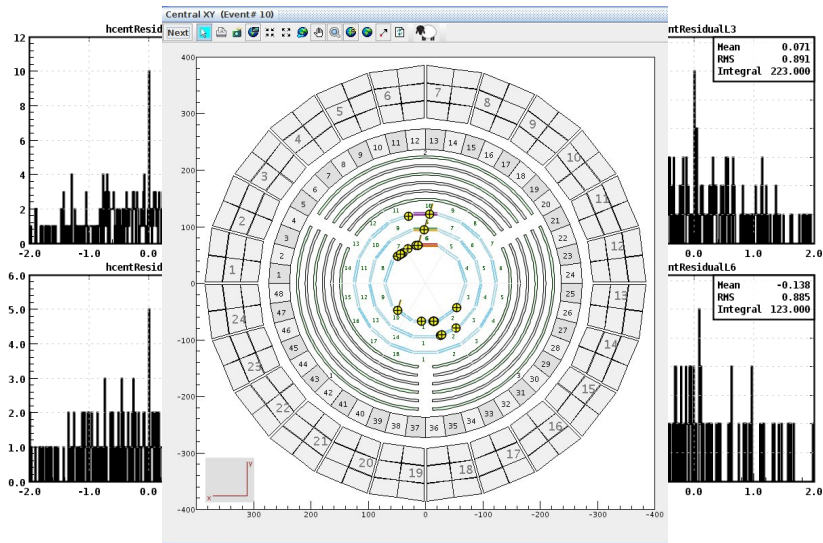
Type 3-2

# Centroid Residuals - Run 2467



COATJAVA Development version March 15 with PD SVT geometry code. About half the data have been cooked by FX.

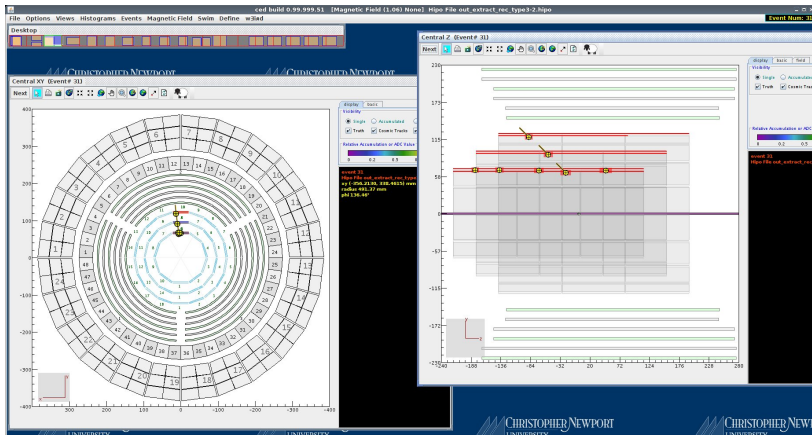
# Centroid Residuals - Run 2467



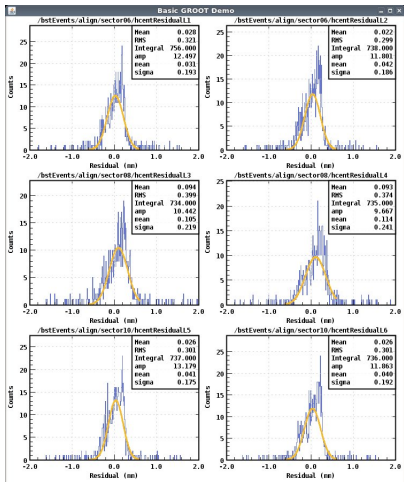
COATJAVA Development version March 15 with PD SVT geometry code. About half the data have been cooked by FX.

# Save only the data from Type 3-1 sensors

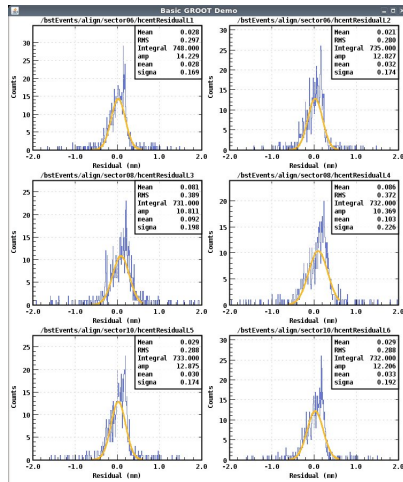
- Select events with a track and the type 3-1 sensors.
- Remove the reconstruction banks.
- Save only the BST::adc banks for the Type 3-1 sensors.
- Re-reconstruct.



# Centroid Residuals for Type 3-1 Events - Run 2467

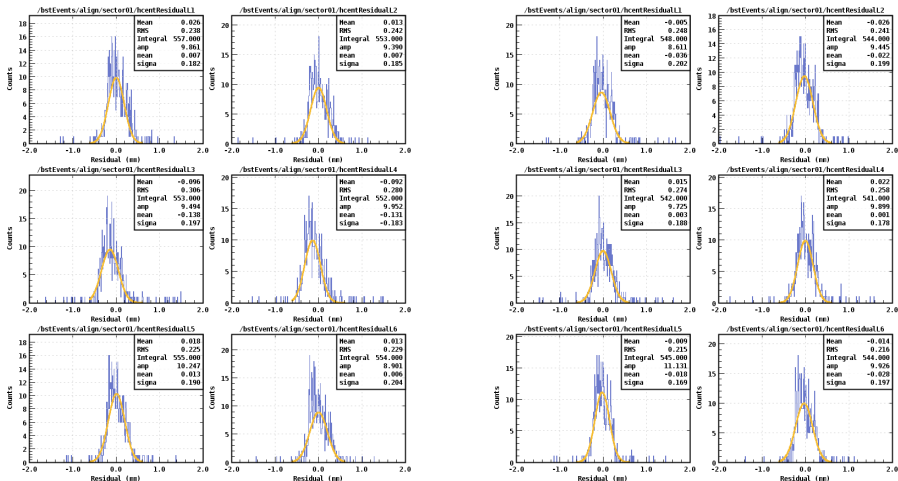


Survey shifts off.



Survey shifts on.

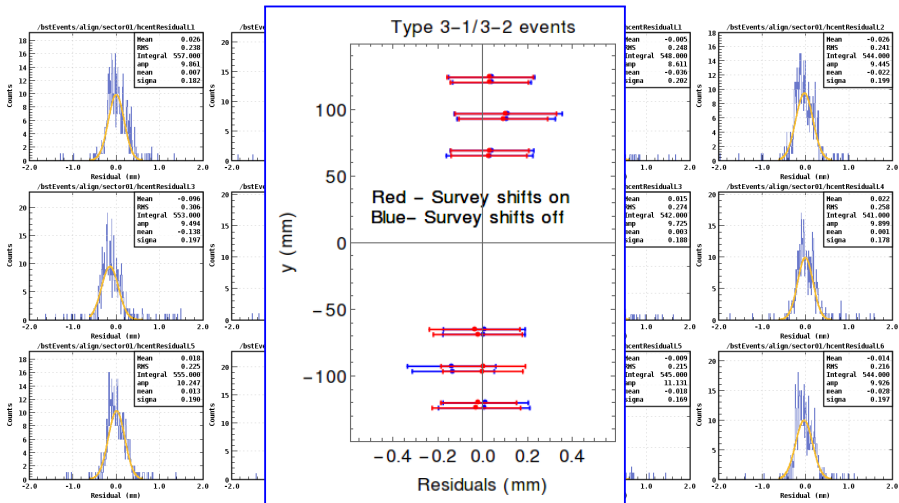
# Centroid Residuals for Type 3-2 Events - Run 2467



Survey shifts off.

Survey shifts on.

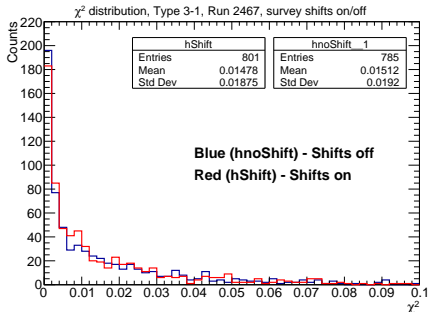
# Centroid Residuals for Type 3-2 Events - Run 2467



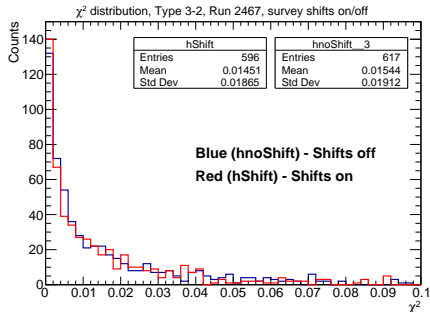
Survey shifts off.

Survey shifts on.

# $\chi^2$ Results for Type 3-2/3-1 Events - Run 2467



Type 3-1 events



Type 3-2 events



# SVT Geometry Validation - Thread Safety

- SVT code was written with wide use of 'public static' keywords which make the geometry data accessible to all the other classes.
- For multi-threaded code different threads can attempt to access the same data simultaneously - leading to 'collisions' between threads.
- Effect of thread contention on CLARA performance.

| Threads | Average processing time (ms) | Average event time (ms) |
|---------|------------------------------|-------------------------|
| 1       | 5.79                         | 4.80                    |
| 8       | 4.05                         | 8.62                    |

Cosmic-ray simulation of the SVT using gemc 2.5 and COATJAVA Development version (March 15) with PD SVT geometry code (0.5M events).

- Effect on reconstruction - event-by-event comparison of a small sample of simulated cosmic-rays with different number of threads.
  - CLARA with 1 thread - 43 type-1 events reconstructed.
  - CLARA with 8 threads - 29 type-1 events reconstructed.
  - Only 11 overlaps among 1-thread and 8-thread reconstructed events.

# SVT Geometry Validation - More on Thread Safety

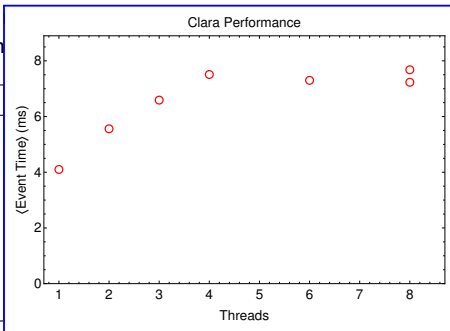
- Downloaded release 5a.1.3, built locally, moved jars to plugins area for Clara.
- Effect of thread number on CLARA performance - 0.5M gemc 2.5 simulated cosmics, SVT only.

| Threads | Average processing time (ms) | Average event time (ms) |
|---------|------------------------------|-------------------------|
| 1       | 5.08                         | 4.10                    |
| 2       | 3.60                         | 5.56                    |
| 3       | 3.86                         | 6.59                    |
| 4       | 4.01                         | 7.51                    |
| 6       | 3.81                         | 7.30                    |
| 8       | 3.74                         | 7.68                    |
| 8       | 3.72                         | 7.23                    |

# SVT Geometry Validation - More on Thread Safety

- Downloaded release 5a.1.3, built locally, moved jars to plugins area for Clara.
- Effect of thread count on SVT on Cosmic 2.5 simulated

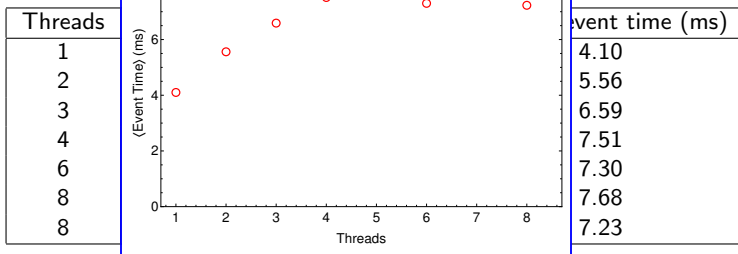
| Threads |
|---------|
| 1       |
| 2       |
| 3       |
| 4       |
| 6       |
| 8       |
| 8       |



| Event time (ms) |
|-----------------|
| 4.10            |
| 5.56            |
| 6.59            |
| 7.51            |
| 7.30            |
| 7.68            |
| 7.23            |

# SVT Geometry Validation - More on Thread Safety

- Downloaded release 5a.1.3, built locally, moved jars to plugins area for Clara.
- Effect of thread safety on SVT geometry validation for 2.5 simulated



- Effect on reconstruction - event-by-event comparison of a small sample (150 events) of simulated cosmic-rays with different number of threads. Same running conditions as above.
  - CLARA with 1 thread - 90 type-1 events reconstructed.
  - CLARA with 4 threads - 89 type-1 events reconstructed.
  - CLARA with 8 threads - 89 type-1 events reconstructed.
  - All events reconstructed with 4 or 8 threads are in the 1-thread sample.

# SVT Geometry Validation - More on Thread Safety

