The Many Worlds Problem

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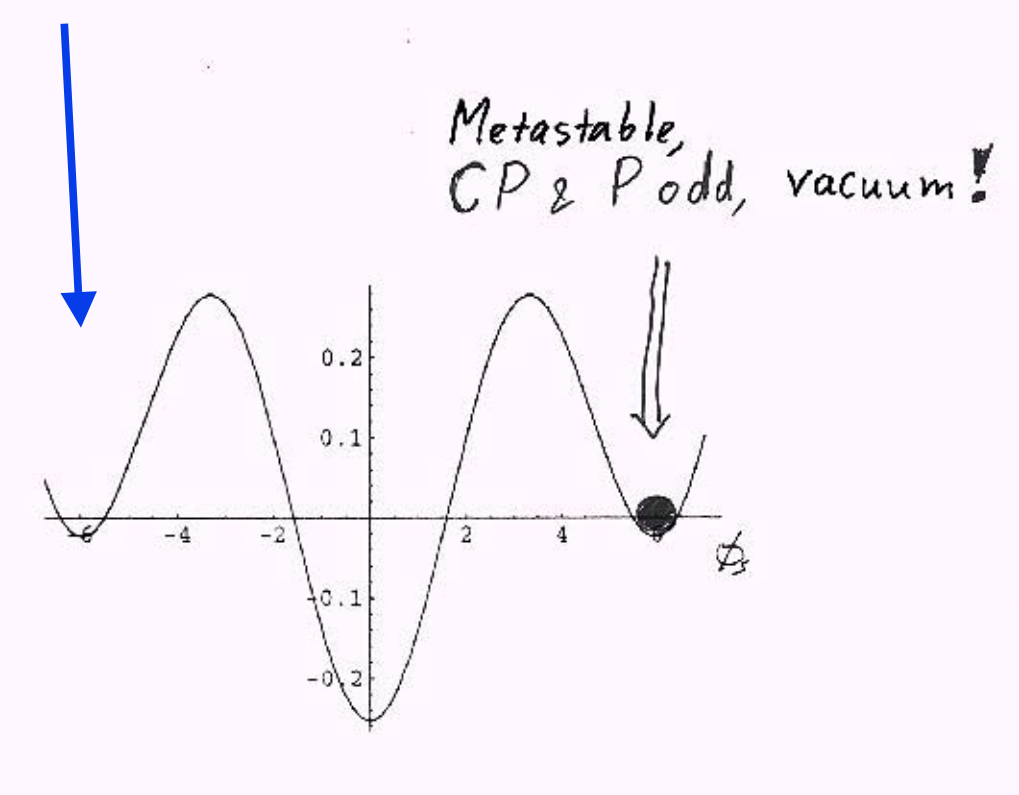
1/20/2000

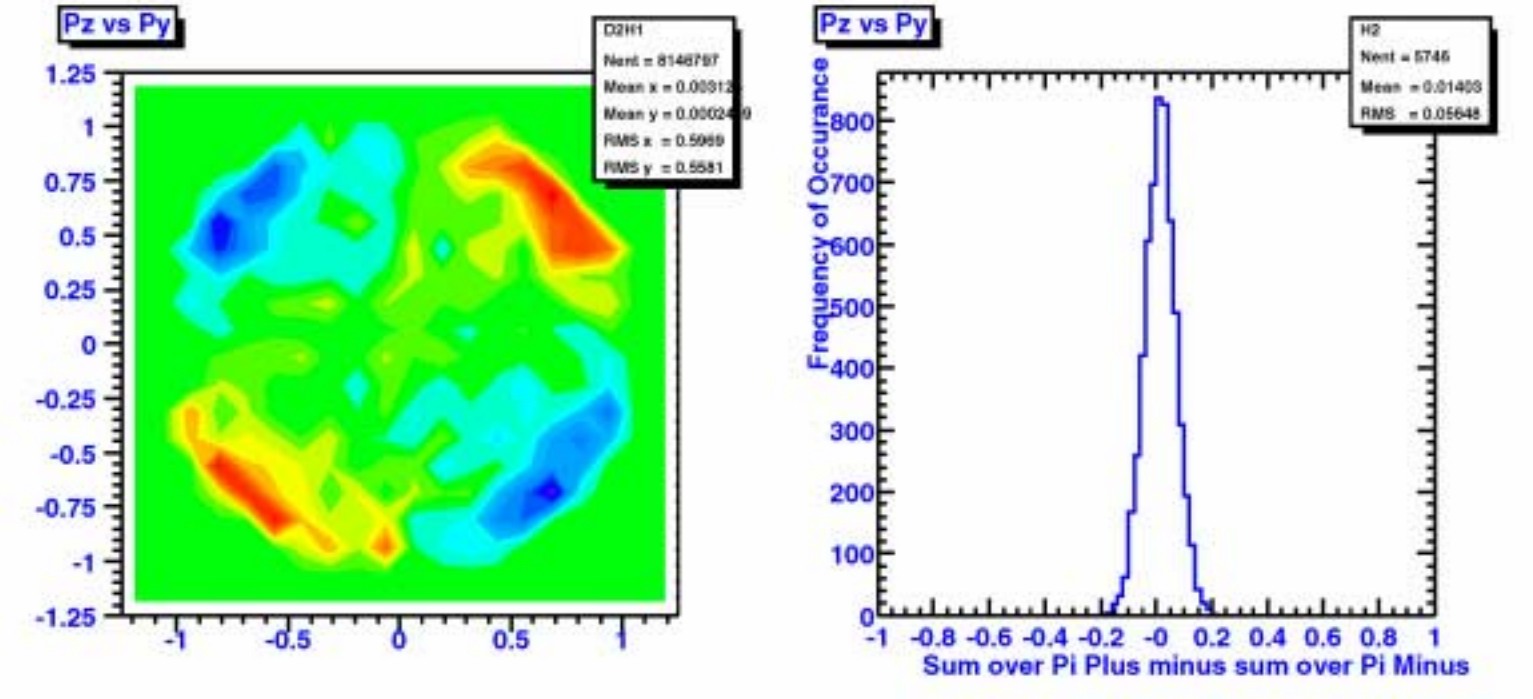
The Many Worlds Problem

Here too!



- RHI Collisions may lead to P and CP odd metastable states
- These states will be Left or Right handed depending into which well they fall into …
- Ochum's razor says half of all events will be L and half R
- How can we identify a mixed world, and won't this wash out any observable effects?
- Yes, almost …

kTwist

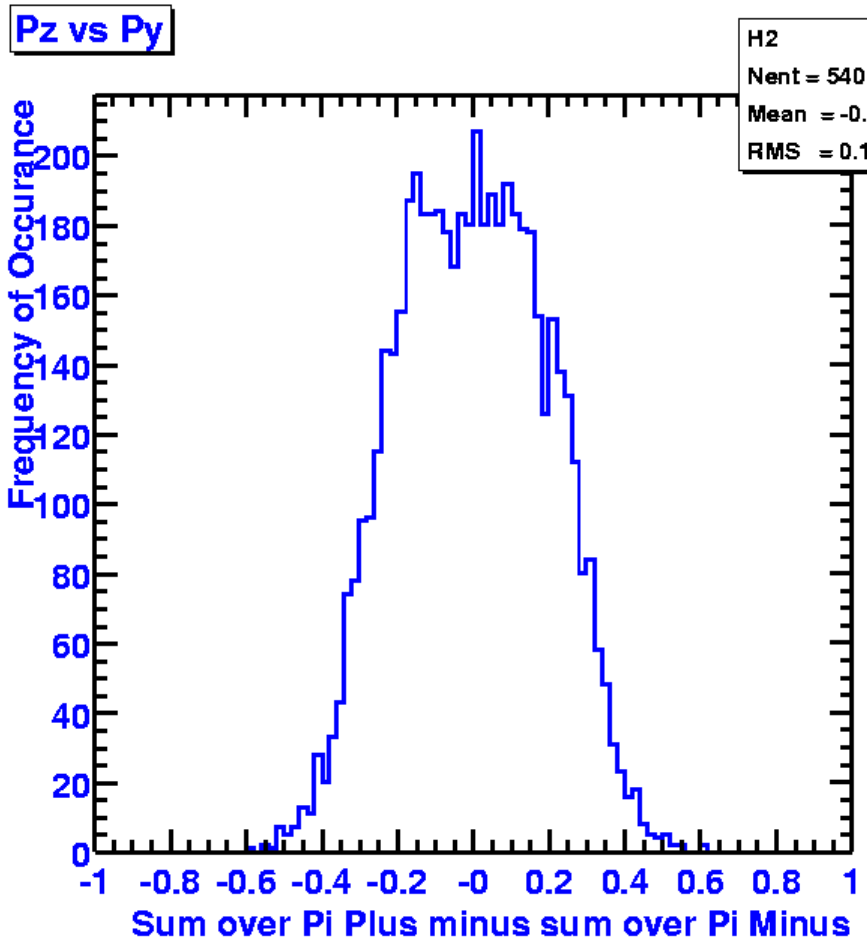


- If the world is strictly Right handed (or Left) then kTwist will pick out the signal.
- These simulations are based on ~6000 events and include all pions with the STAR acceptance (aka full events)
- But a mixed world, L + R, will create two bumps. One negative, the other positive.

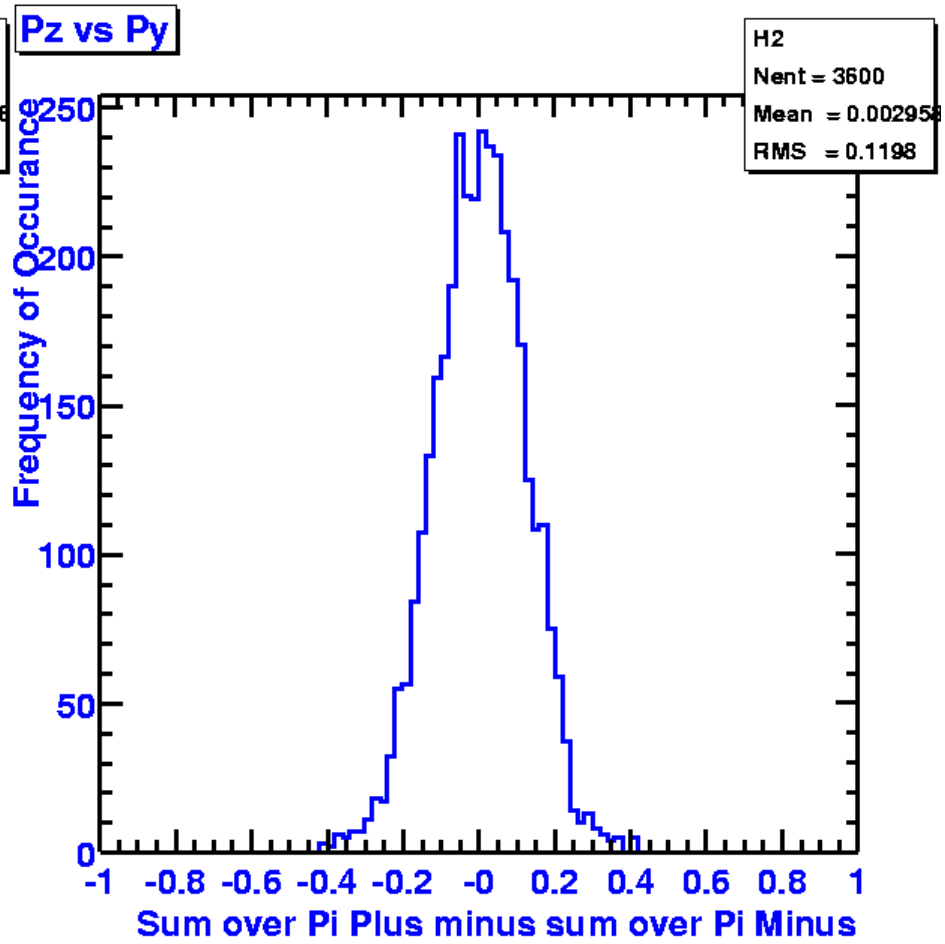
Simulations of the many worlds problem

- **In the following slides, we present simulations done with 50% Left handed events and 50% Right handed events.**
  - **The "Broken" model has a clear CP odd signal which is about 10 times the minimal prediction.**
  - **Broken(90) means the maximum effective Pt kick is 90 MeV per particle. Broken(0) means the fields have been turned off but otherwise the simulations are the same.**
  - **The "Chiral" model has no apparent signature due to its internal isotropic symmetry. So Chiral(90) cannot be observed and Chiral(0) is most definitely zero.**
- **Full events include all pions within the STAR acceptance**
- **Bubble only, means we have selected the pions from the CP odd zone**

Non-Subtracted Events (bubble only)

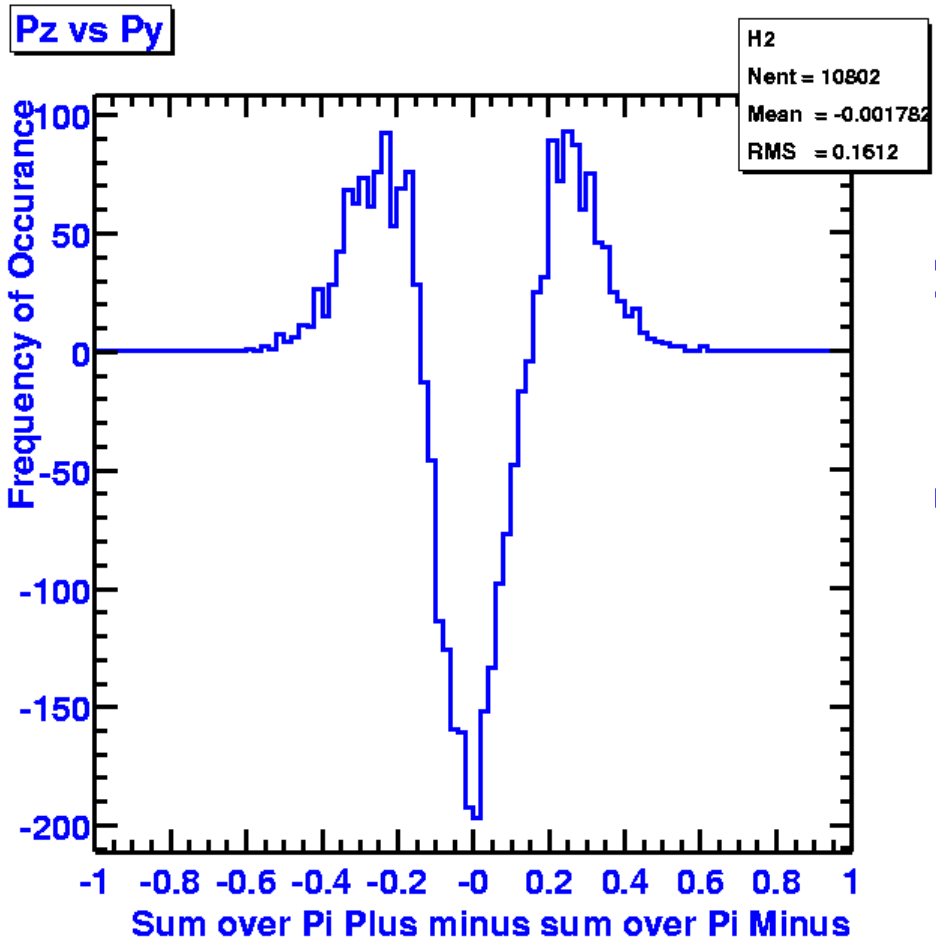


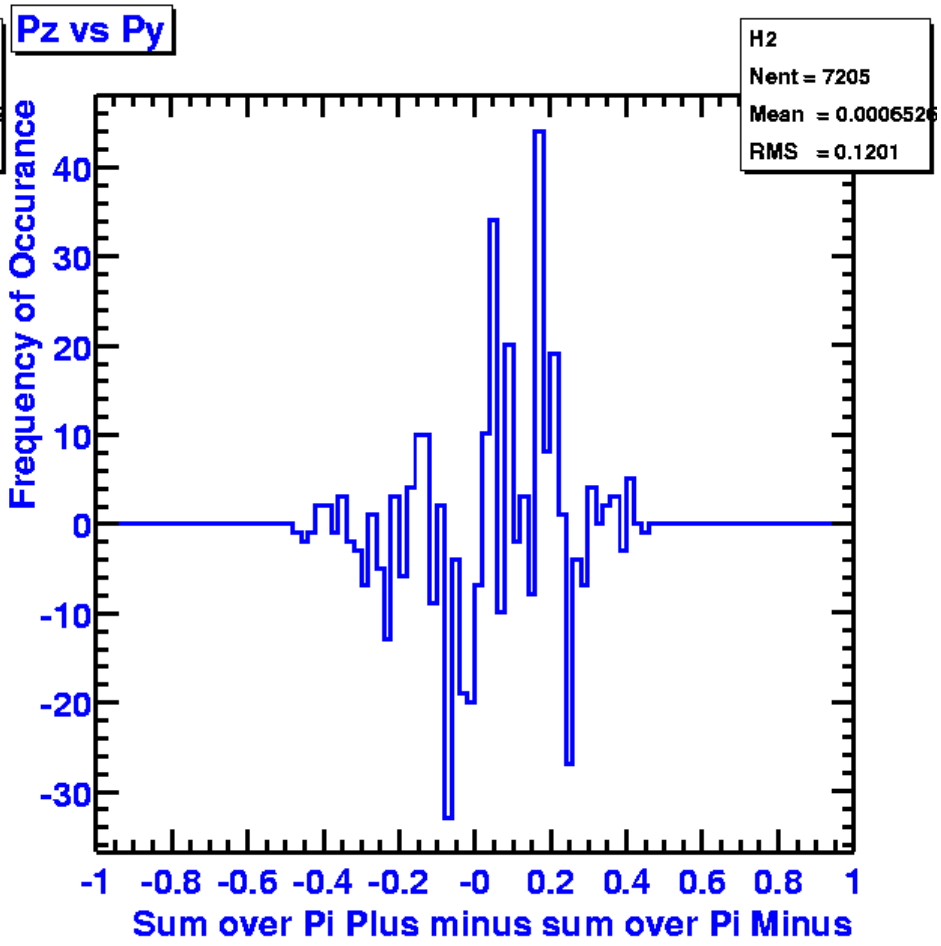
Broken(90)



Chiral(0)

Subtracted Spectra (bubble only)

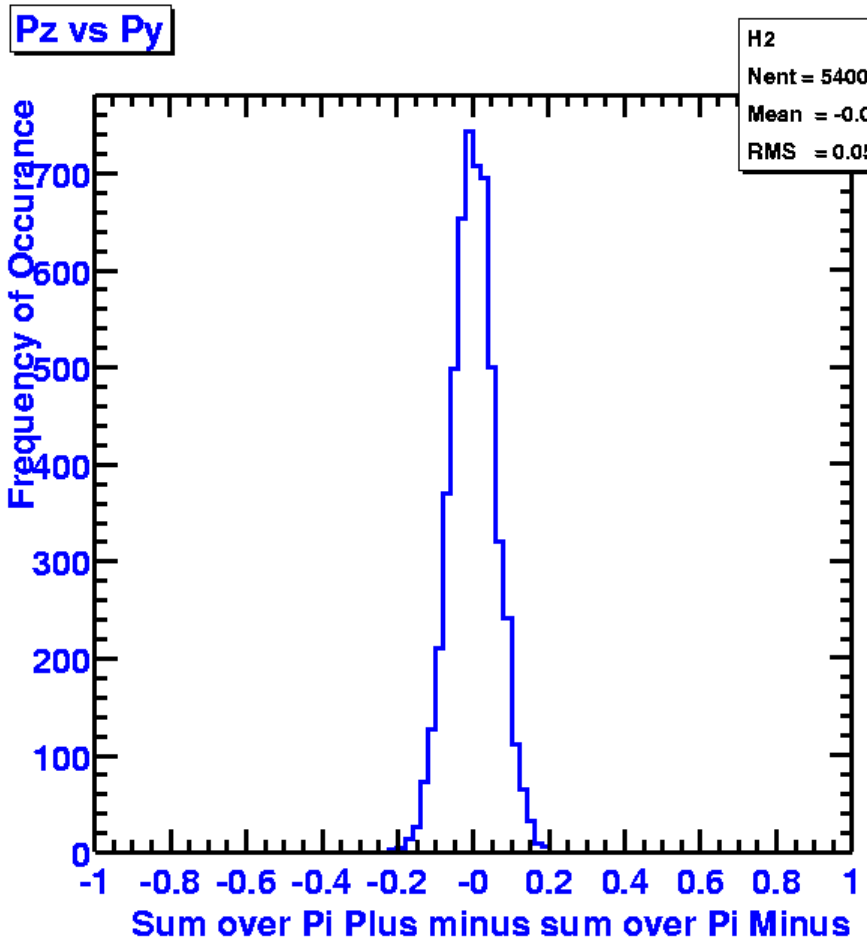




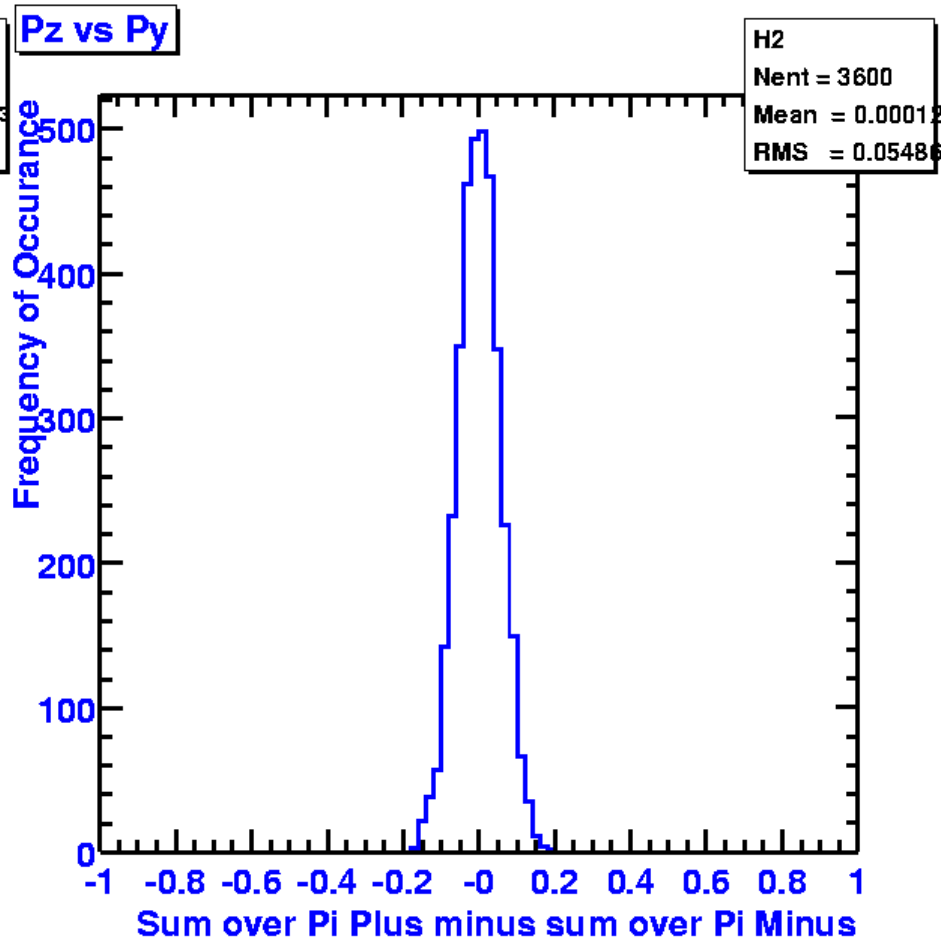
Broken(90) – Chiral(0)

Chiral(90) – Chiral(0)

Non-Subtracted Spectra (full events)

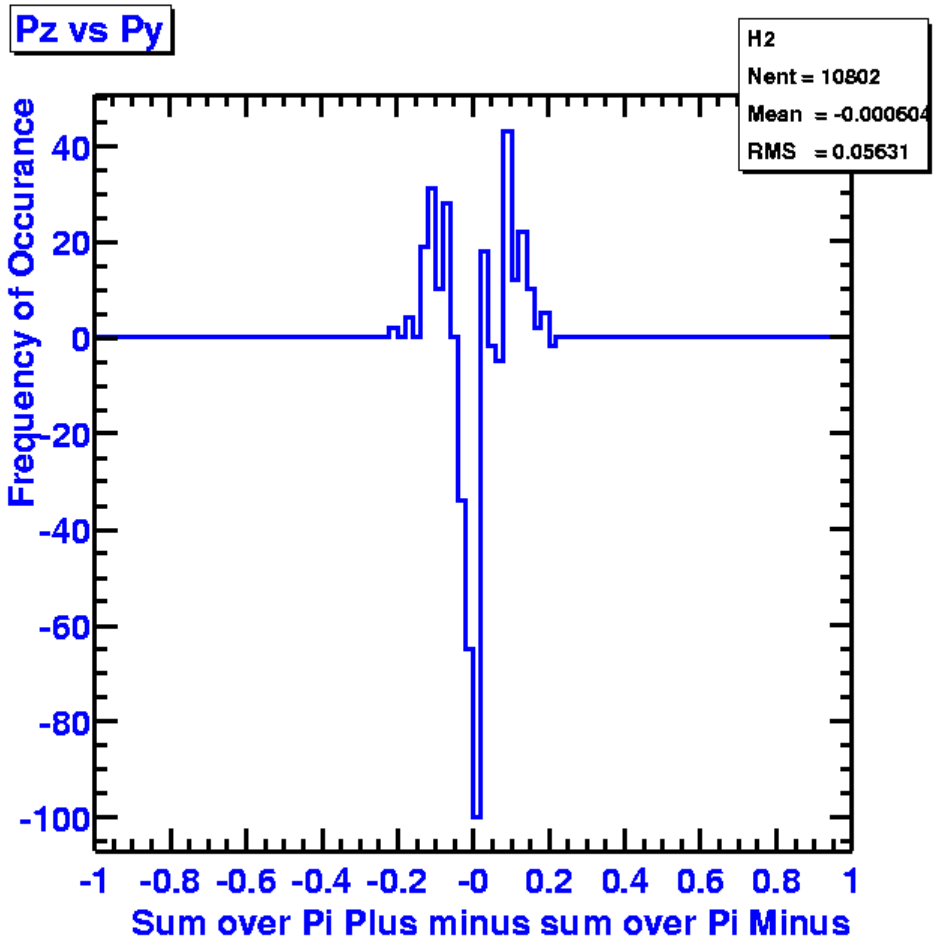


Broken(90)

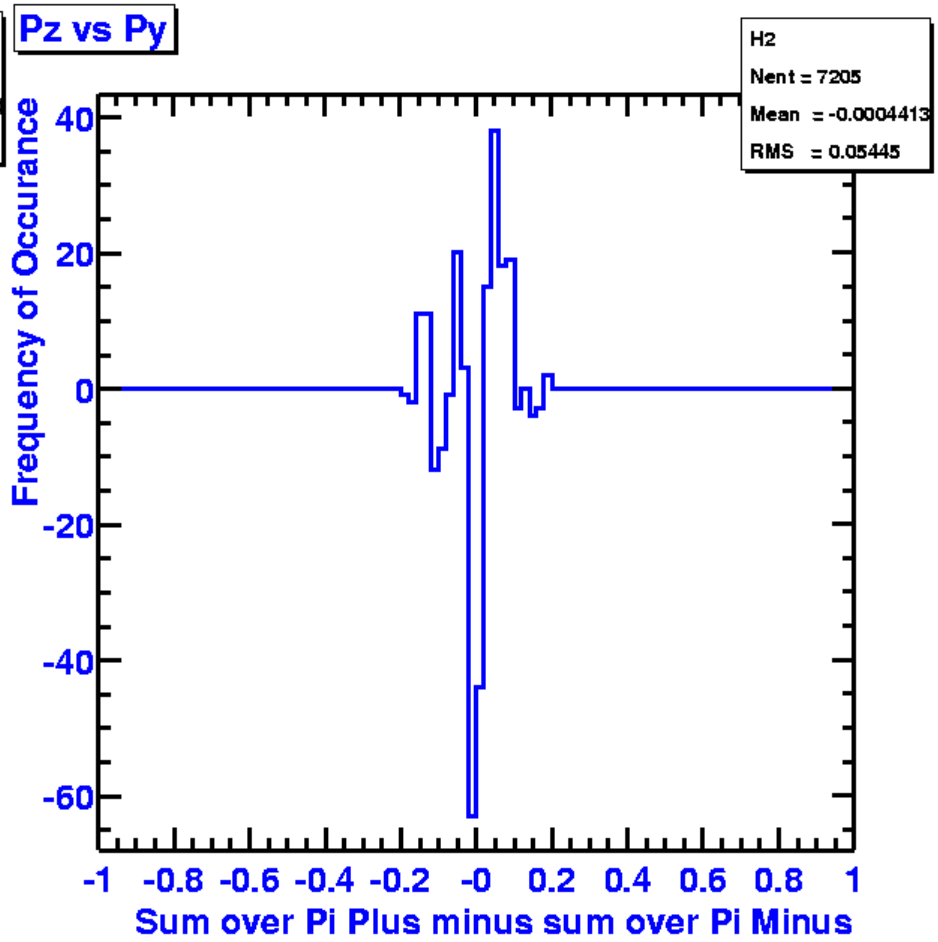


Chiral(0)

Subtracted Spectra (full events)



Broken(90) – Chiral(0)

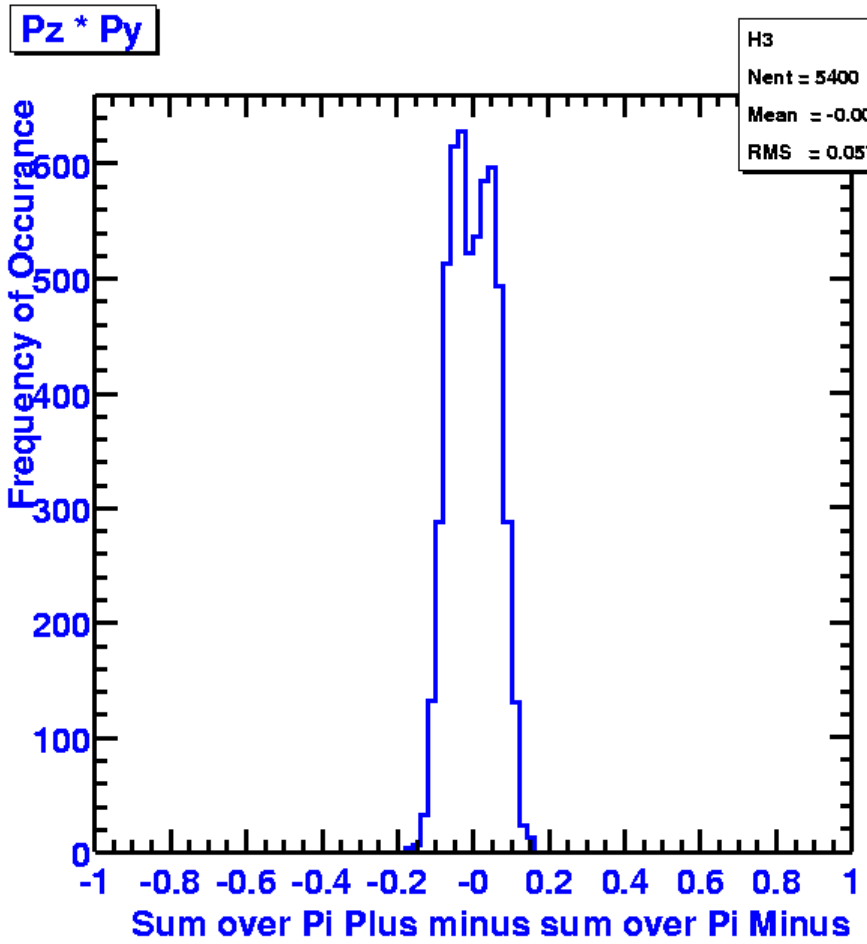


Chiral(90) – Chiral(0)

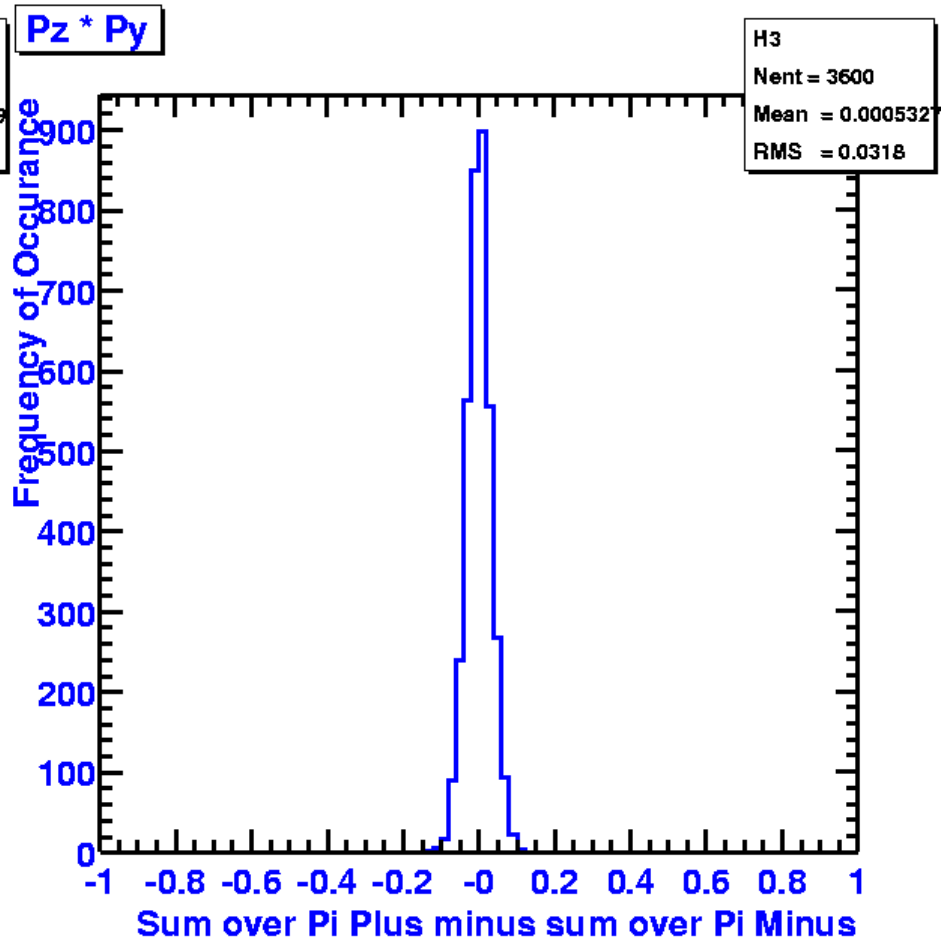
Conclusions

- The mixed L+R CP odd events can be observed
- The experiment will require a large number of events
- And very careful background subtraction using *full* event mixing

Non-Subtracted Events (bubble only)

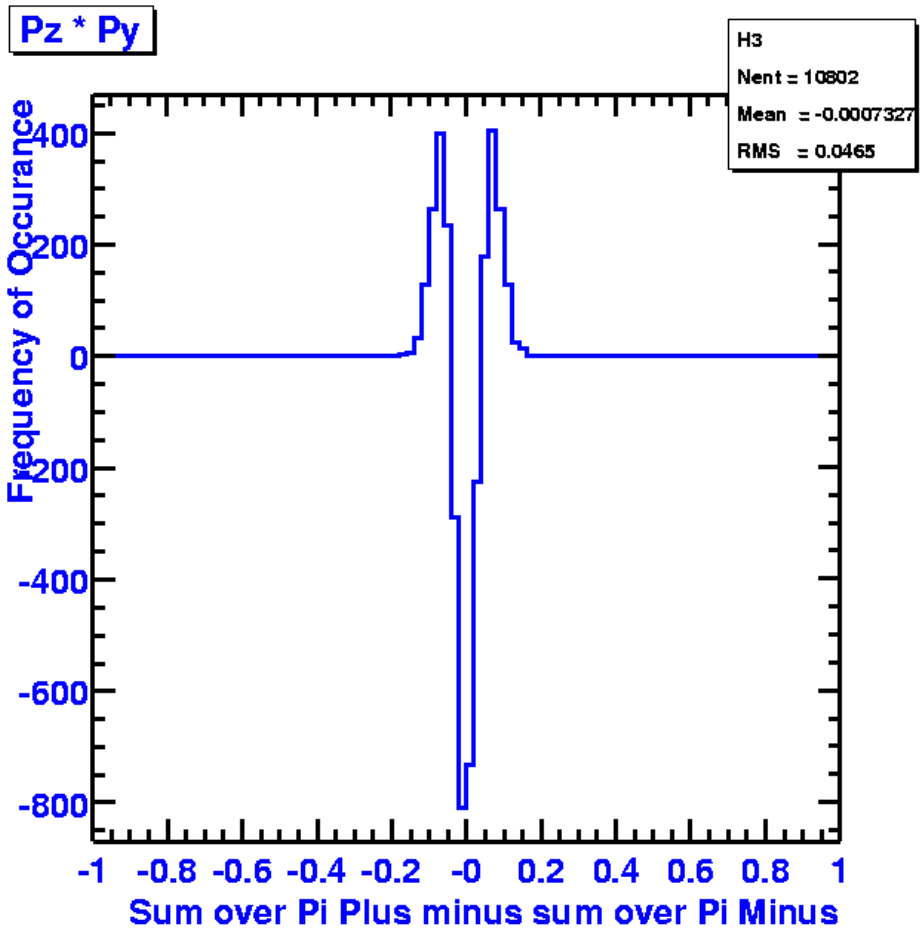


Broken(90)

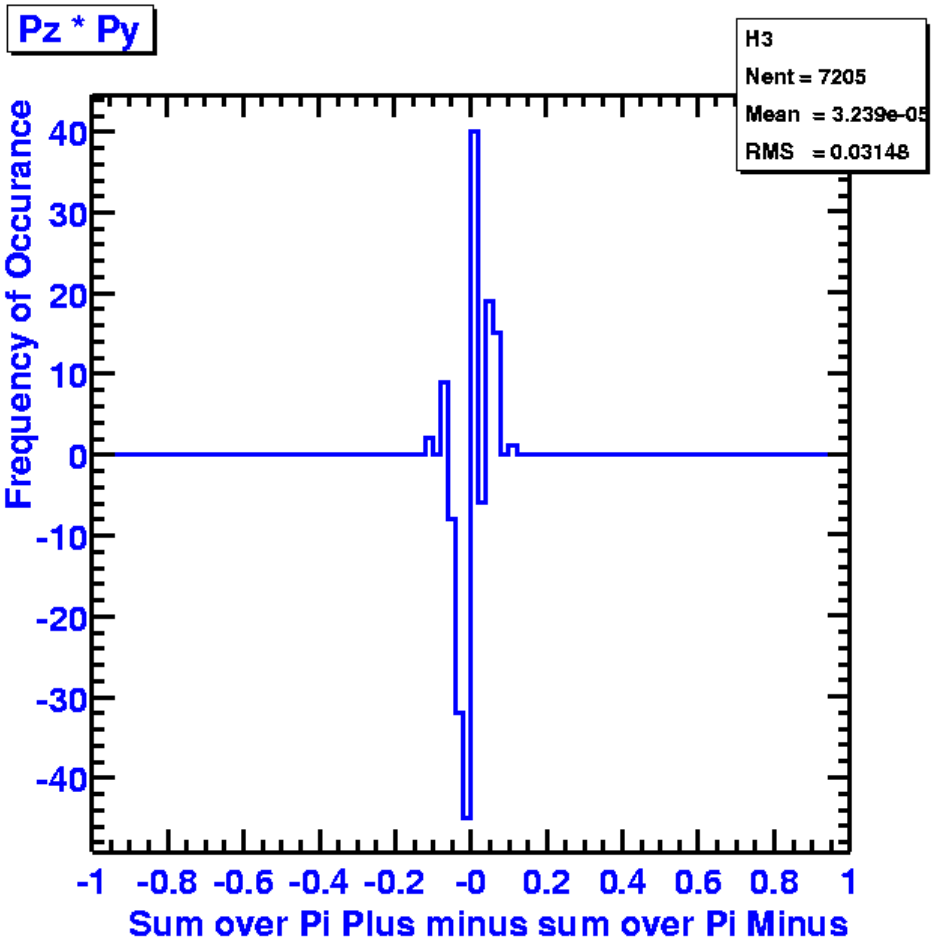


Chiral(0)

Subtracted Spectra (bubble only)

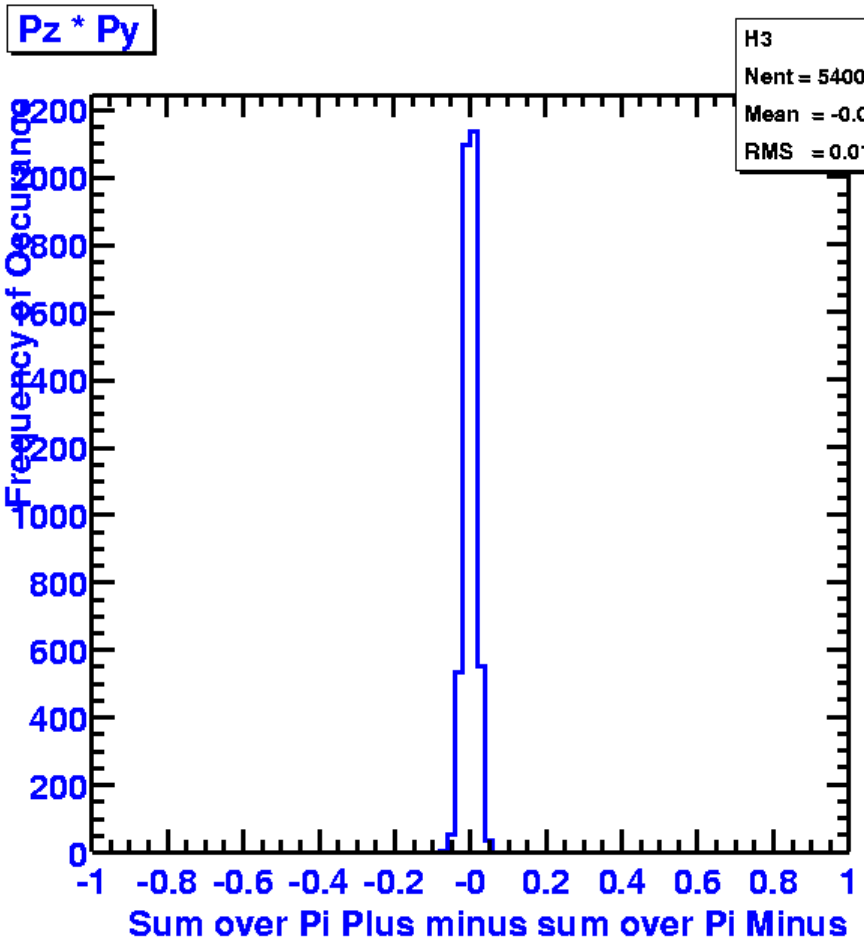


Broken(90) – Chiral(0)

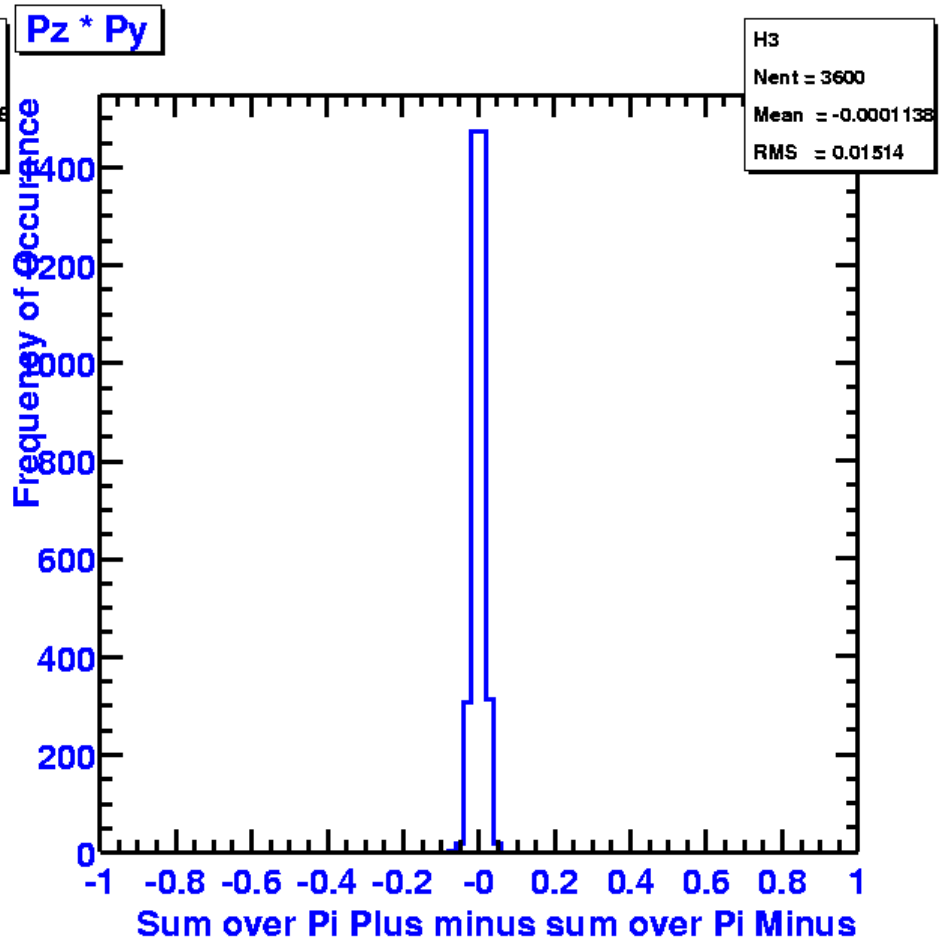


Chiral(90) – Chiral(0)

Non-Subtracted Spectra (full events)

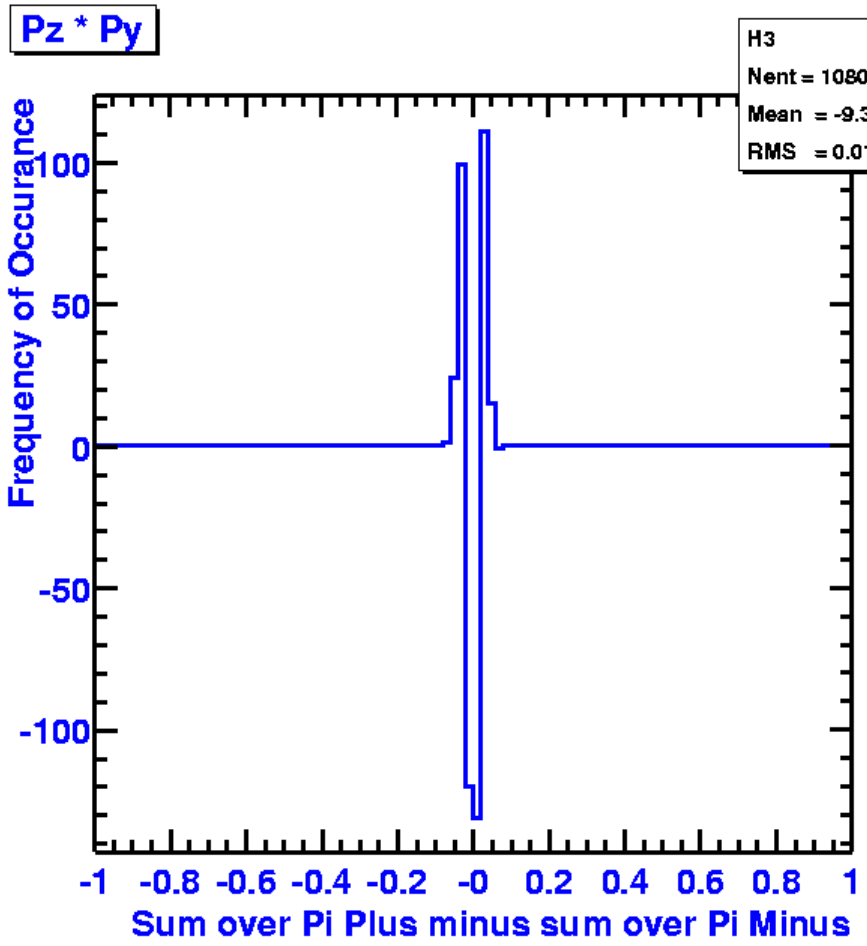


Broken(90)

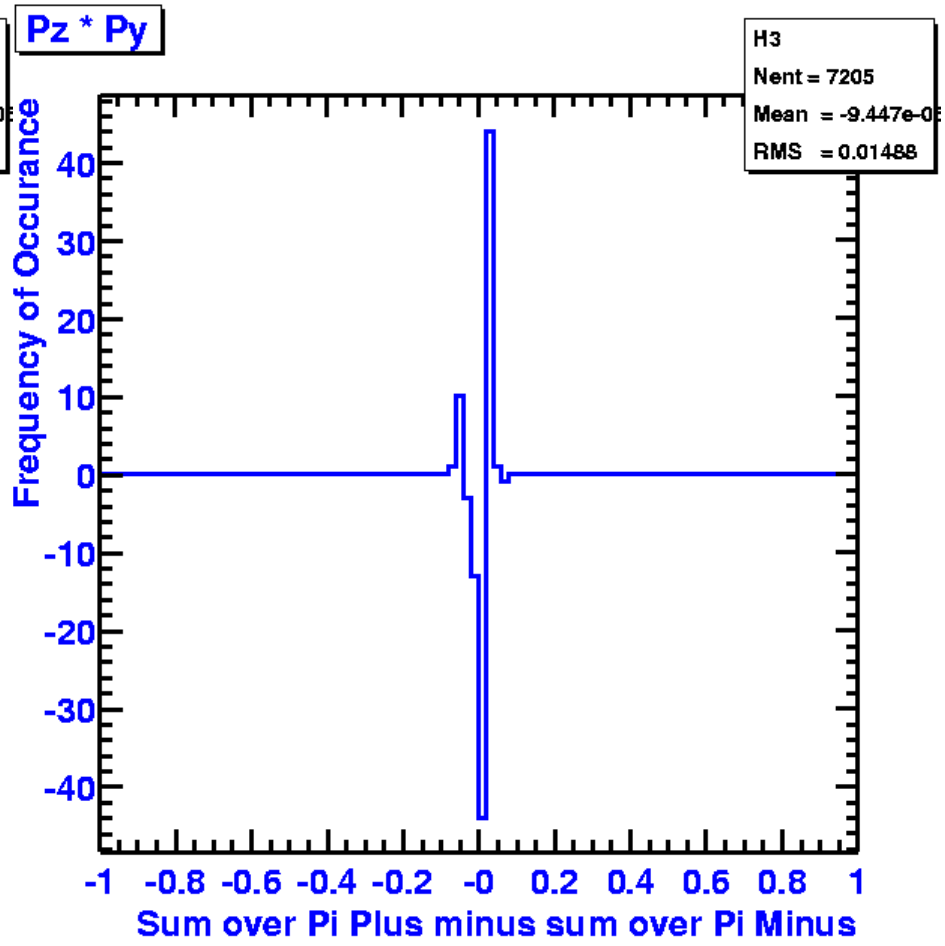


Chiral(0)

Subtracted Spectra (full events)



Broken(90) – Chiral(0)



Chiral(90) – Chiral(0)