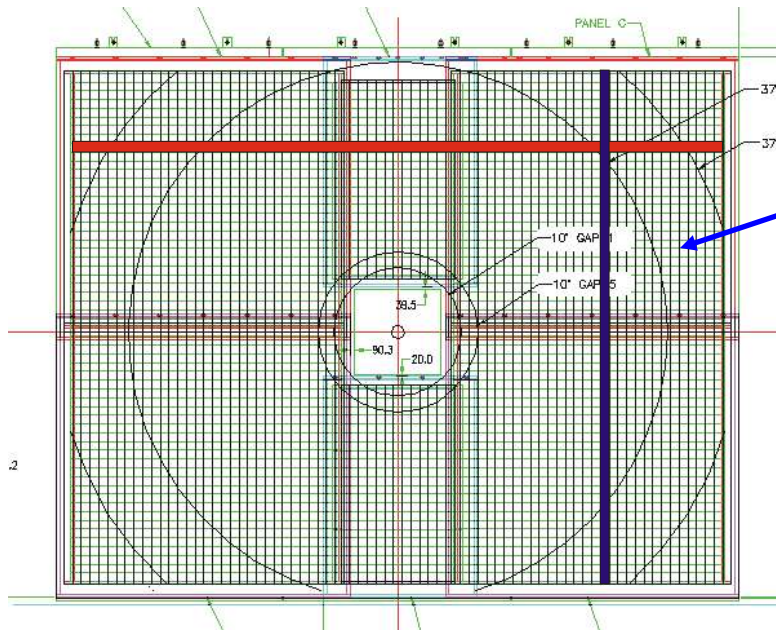


Level-1 Triggers for Run-5

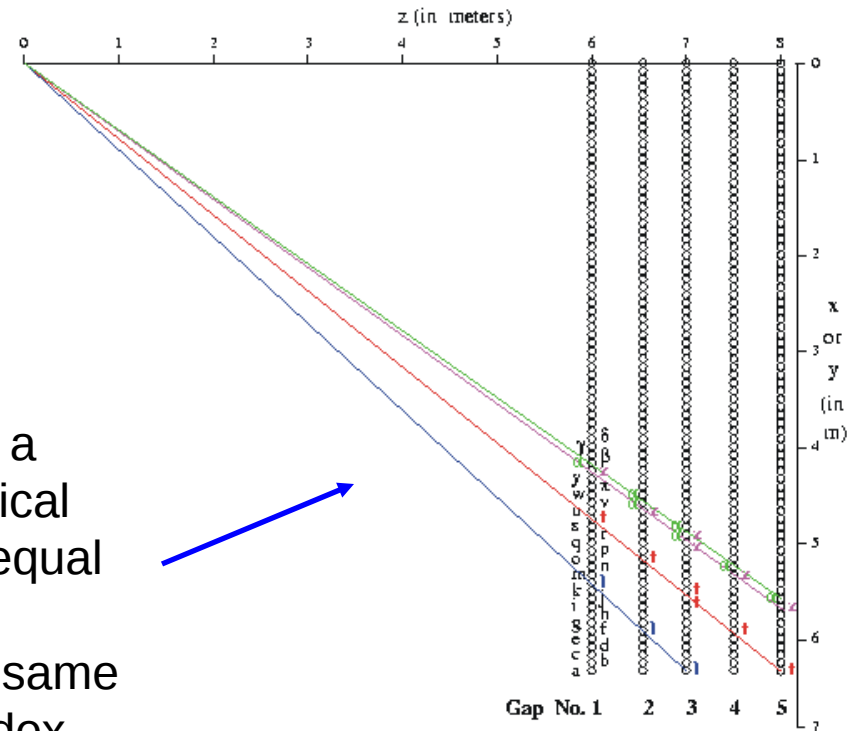
- Outline

- Vertex Triggers : **BBC, ZDC** *(not discussed here)*
 - BBC will have ability for multiple N_{tubes} triggers
- Central Arm Triggers: **ERT LL1** *(not discussed here)*
 - Working to move from ERT blue logic to ERT LL1 (~x2 better rejection)
- Muon Arm Triggers: **MUID LL1**
 - Algorithm (reminder)
 - Update from this time last year
 - MuID LL1 “Efficiency”
 - ROC-to-LL1 communication issues solved!
 - Expected trigger rejection (Au+Au and p+p)
 - Number of required gaps for 1-deep road
 - “Square hole” background rejection
- Remaining work to prepare for Run-5
 - Efficiency checks on algorithm tweaks
 - Trigger rejection in Si+Si (Cu+Cu?)

MuID LL1 Algorithm

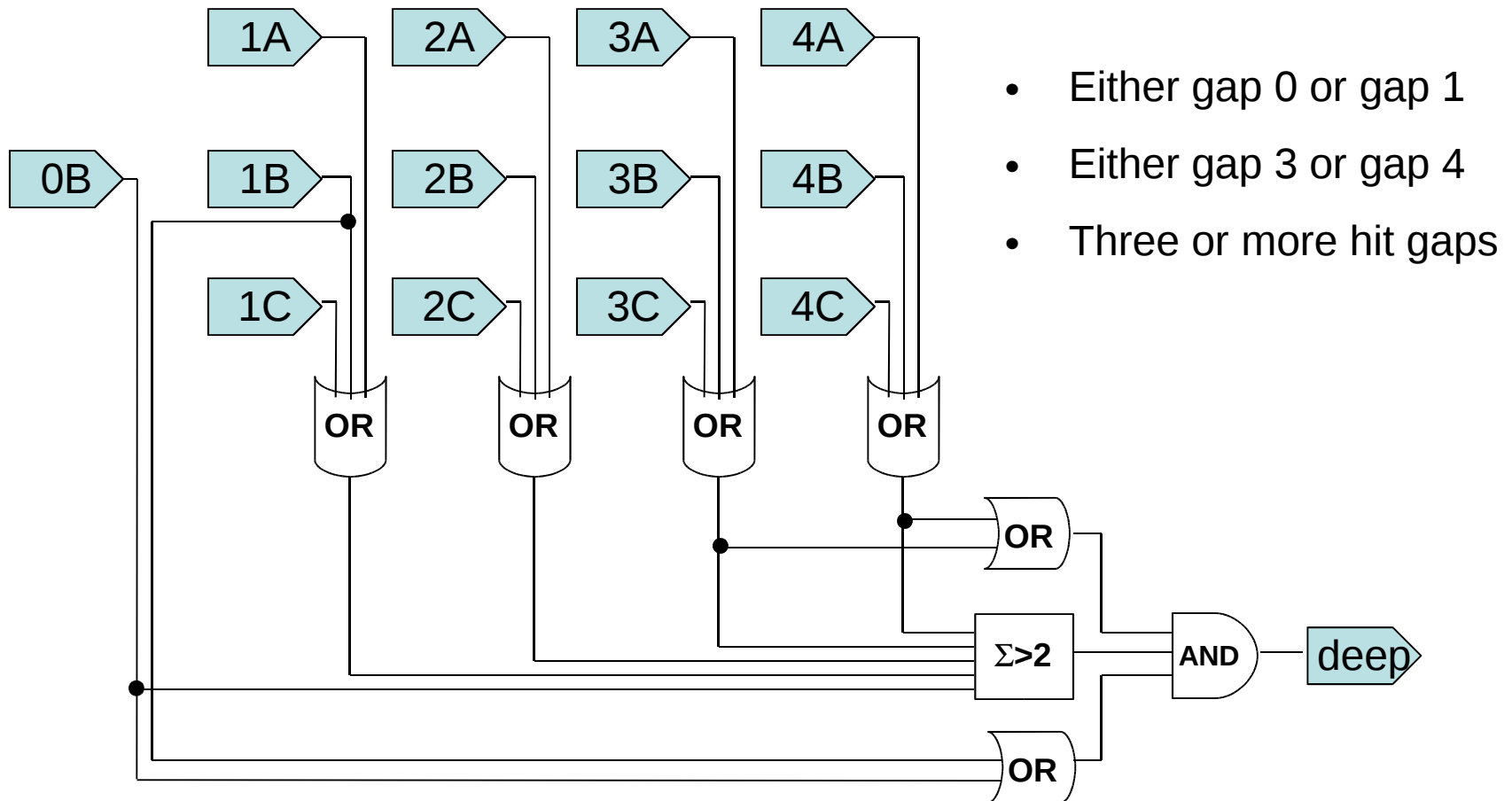


Logical tubes formed by OR of physical tubes across panels in each gap.

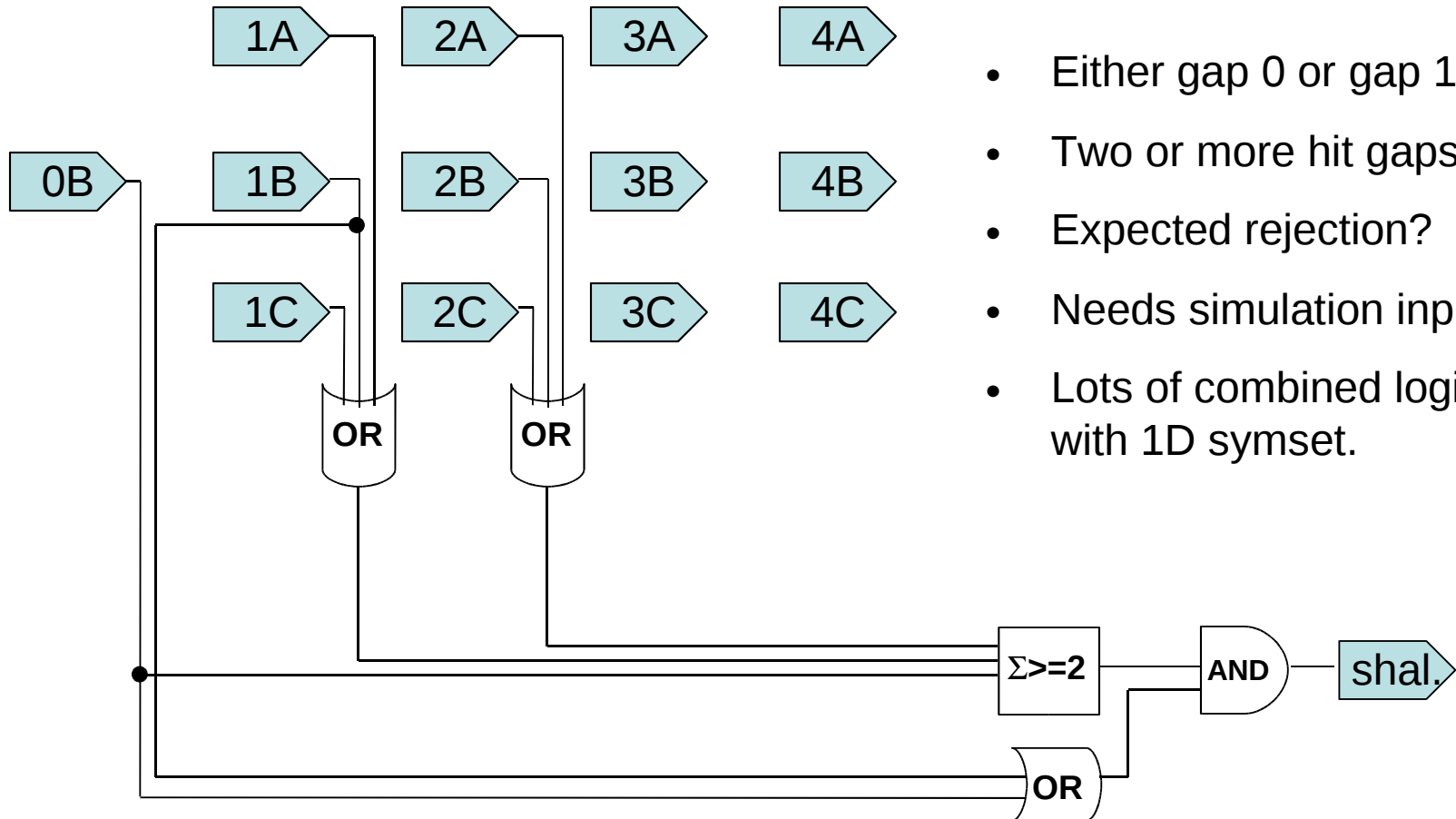


The most probable trajectory for a vertex muon striking a gap-1 logical tube is to continue on a path of equal dx/dz (vertical tubes) or dy/dz (horizontal tubes). Tubes w/ the same dx/dz (or dy/dz) get the same index.

MuID LL1 Deep Symset Logic

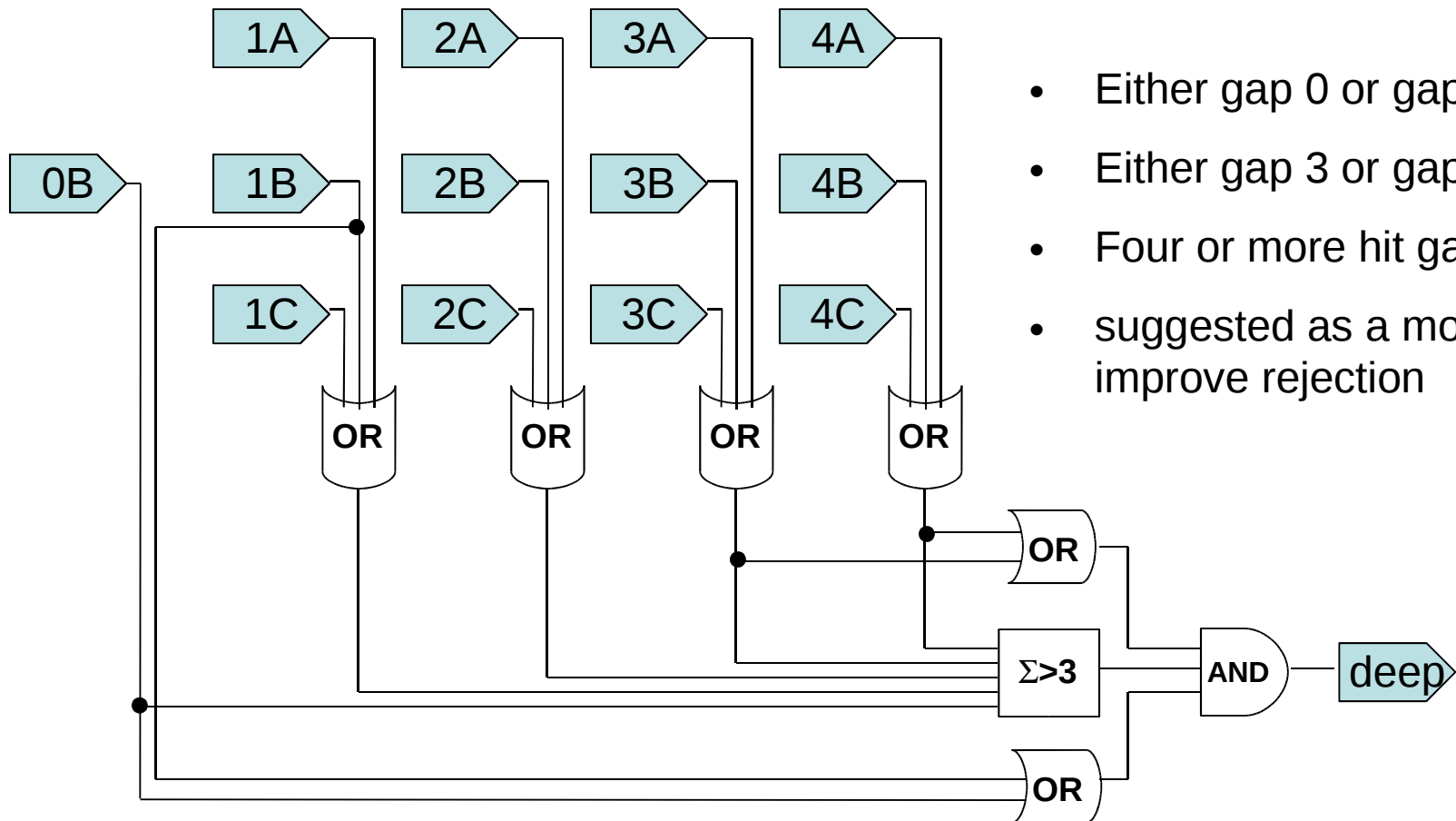


Shallow Symset Logic (Run-4)



- Either gap 0 or gap 1
- Two or more hit gaps
- Expected rejection?
- Needs simulation input!
- Lots of combined logic with 1D symset.

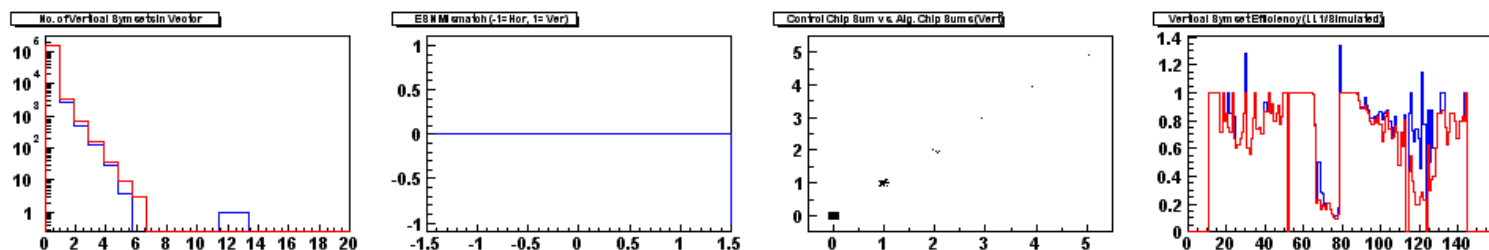
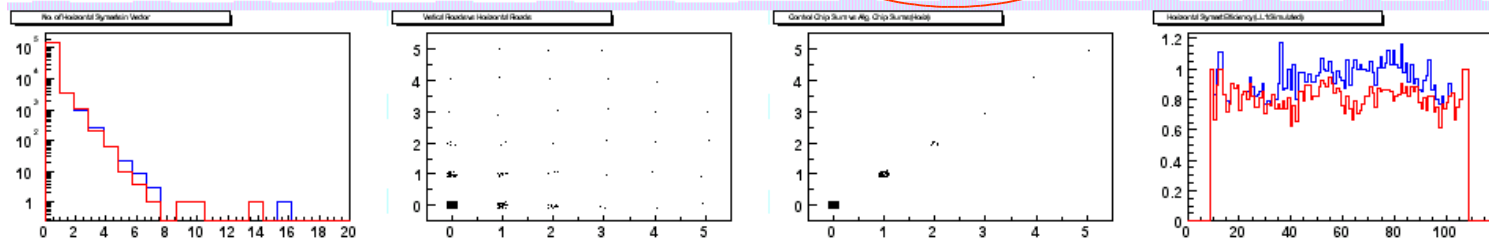
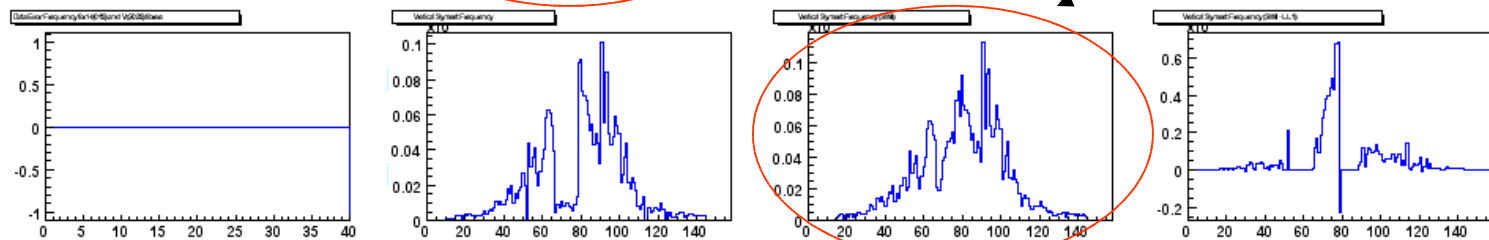
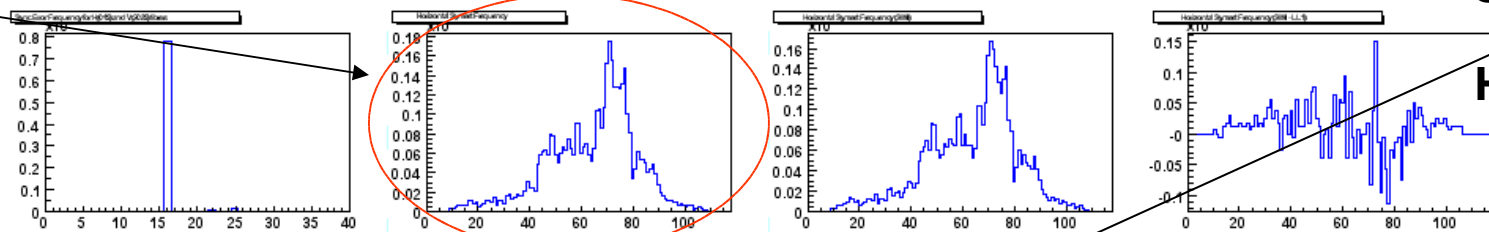
MuID LL1 Deep Symset Logic (4/5)



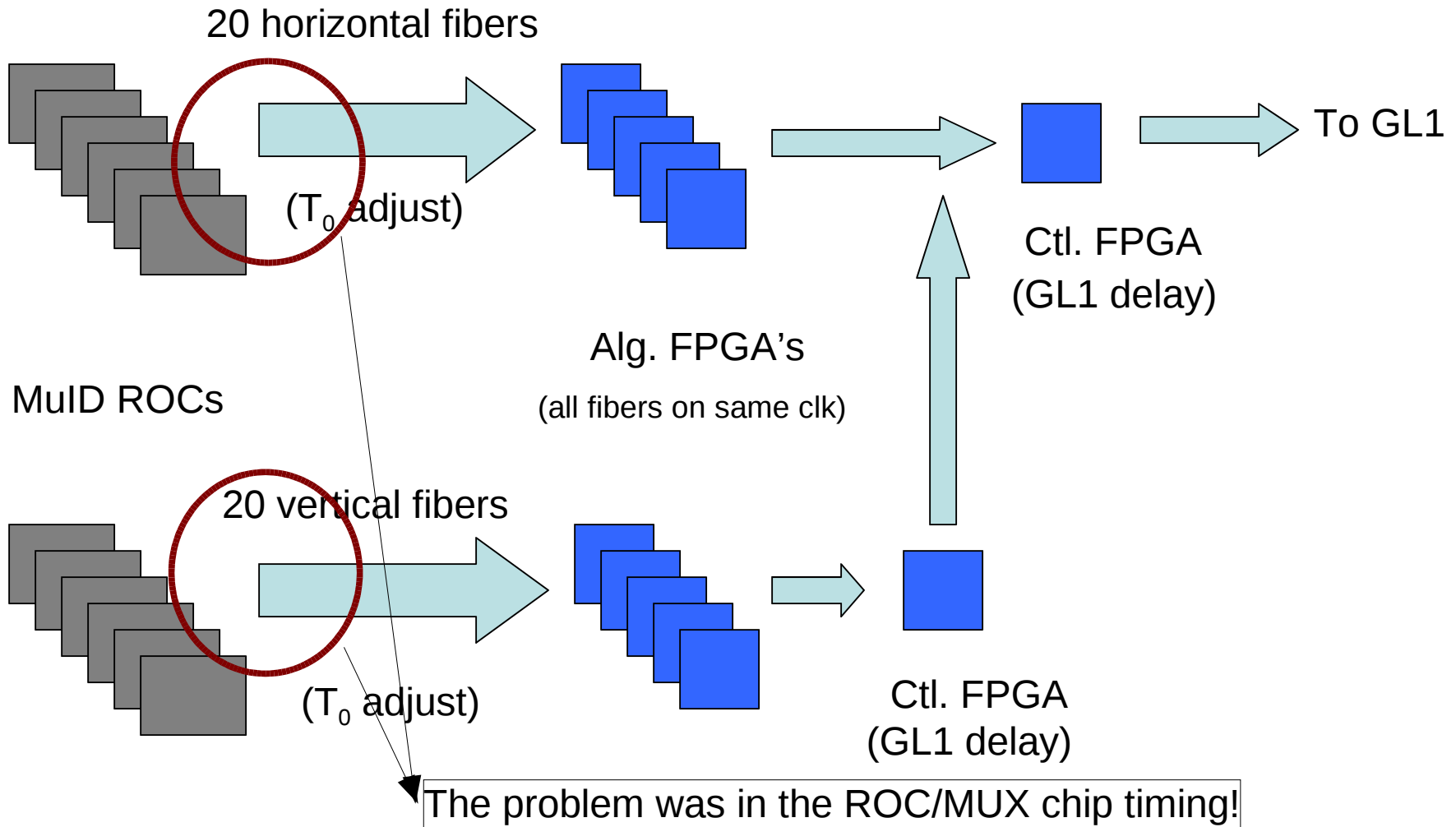
- Either gap 0 or gap 1
- Either gap 3 or gap 4
- Four or more hit gaps
- suggested as a mod. to improve rejection

MuID LL1 Efficiency (June 2003)

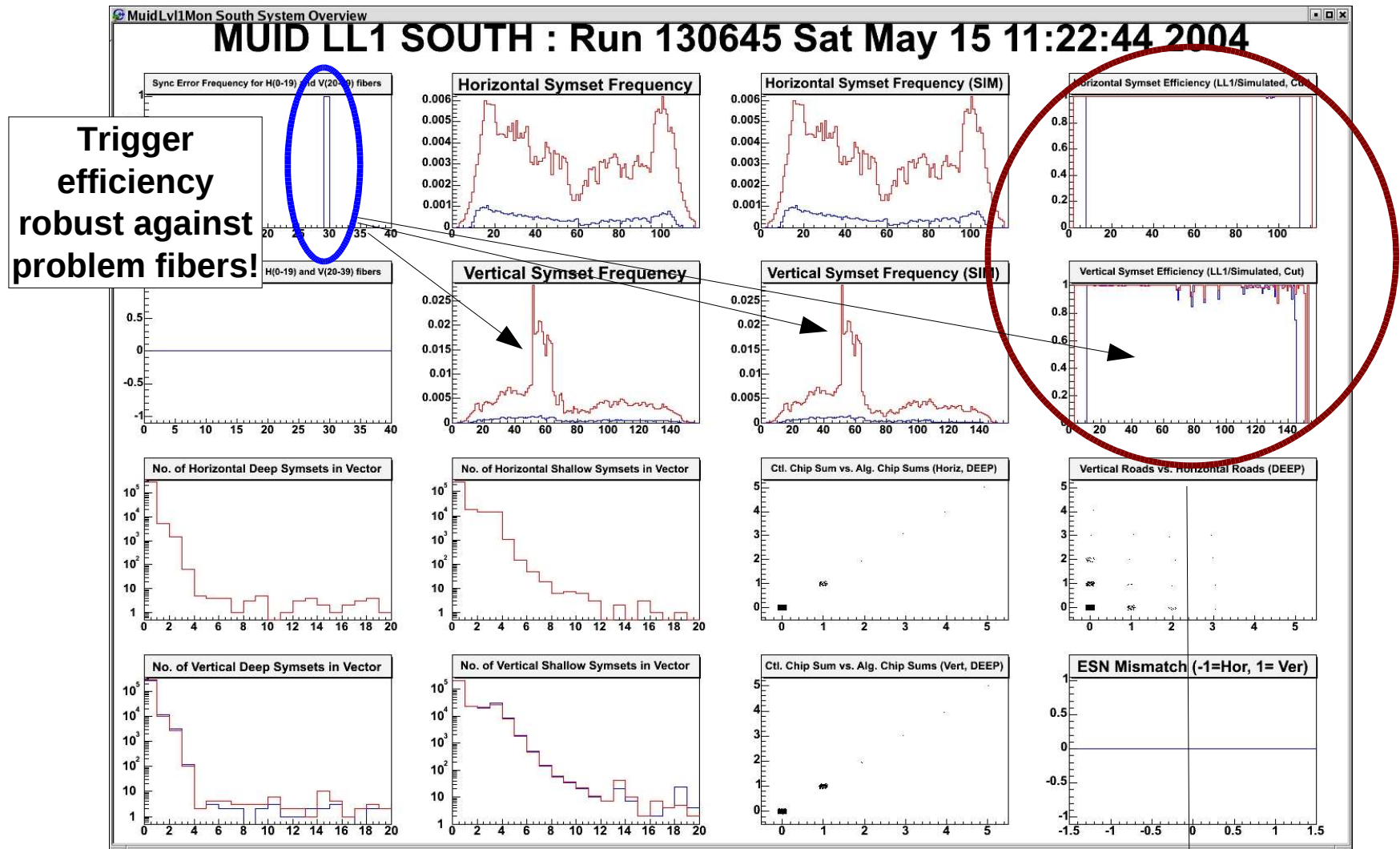
LL1 Data MUID LL1 Monitor: Run 91855 Tue May 27 07:45:32 2003 Simulator



ROC-to-LL1 Communication



MuID LL1 Efficiency (May 2004)



MuID LL1 Rejection Study (AuAu)

- Run MuID LL1 Hardware Simulator on BBCLL1 Events
 - Simulator uses complete trigger hardware description
 - One segment from Run 111714
- First Check – 3/5 and 4/5 gaps required for deep symset:

3/5 gap requirement for deep:

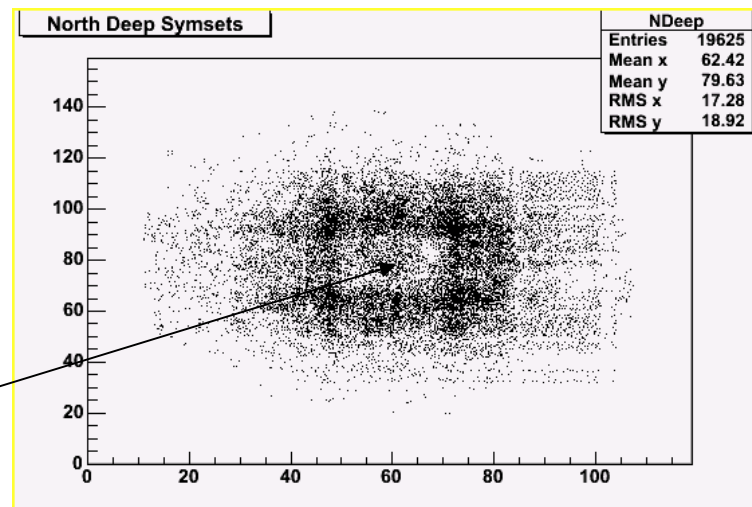
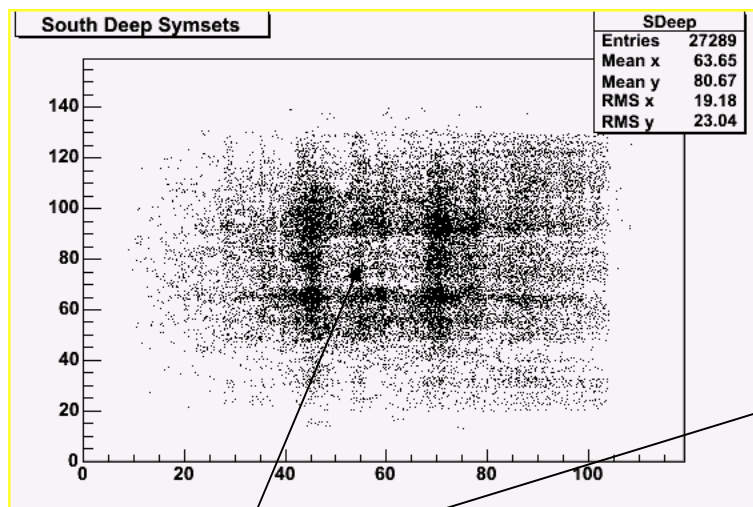
South 1 Deep rejection = **2.83053**
South 1 Deep 1 Shallow rejection = 3.07105
South 2 Deep rejection = 4.65067
North 1 Deep rejection = **3.09632**
North 1 Deep 1 Shallow rejection = 3.53425
North 2 Deep rejection = 6.03491

4/5 gap requirement for deep:

South 1 Deep rejection = **5.06292**
South 1 Deep 1 Shallow rejection = 5.32861
South 2 Deep rejection = 15.3405
North 1 Deep rejection = **4.84805**
North 1 Deep 1 Shallow rejection = 5.38695
North 2 Deep rejection = 16.1133

Why so low?

- MuID LL1 triggers dominated by hits close to square hole
 - Expected from background studies
 - Look at all horiz.,vert. combinations from symsets (all events):



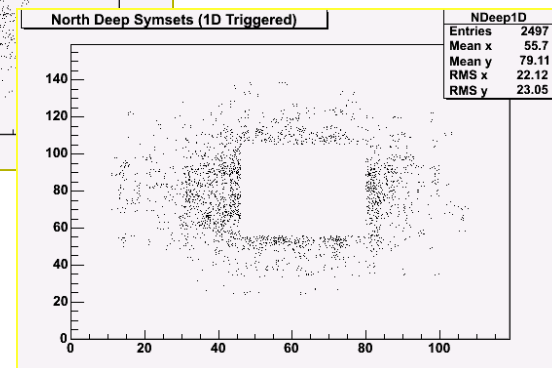
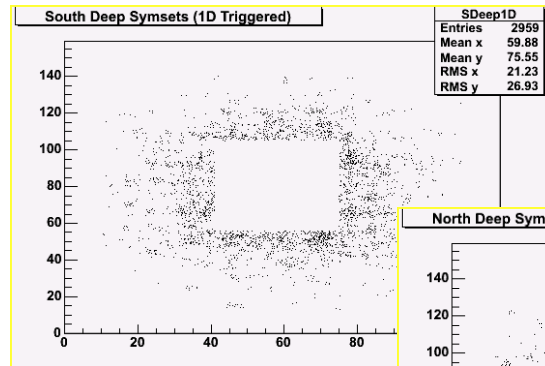
(square hole partly filled in by false combinations)

“Square Hole Rejection”

- Improve rejection by eliminating a region around the square hole
 - Horizontal and vertical tracked independently in MuID LL1!
 - Define strips in symset ranges within square hole region
 - horizontal 40-75, vertical 55-105
 - Reject event if the ONLY fired combinations within square hole
 - Some loss of acceptance at low p_T

4/5 gap requirement for deep w/strip rej:

South 1 Deep rejection = **7.6519**
South 1 Deep 1 Shallow rejection = 8.1180
South 2 Deep rejection = 33.7573
North 1 Deep rejection = **7.9220**
North 1 Deep 1 Shallow rejection = 8.7331
North 2 Deep rejection = 39.2454



MuID LL1 Rejection Study (pp)

- Run MuID LL1 Hardware Simulator on BBCLL1 Events
 - Not enough clock triggers for unbiased study
 - All segments from Run 130553
 - 200903 BBC LL1 events
- 3/5 gaps required for deep symset:

Without square hole rejection:

South 1 Deep rejection = **584.02**
South 1 Deep 1 Shallow rejection = 28700.4
South 2 Deep rejection = 200903
North 1 Deep rejection = **376.929**
North 1 Deep 1 Shallow rejection = 18263.9
North 2 Deep rejection = 66976.7

With square hole rejection:

South 1 Deep rejection = **1014.66**
South 1 Deep 1 Shallow rejection = 50225.8
South 2 Deep rejection = 200903
North 1 Deep rejection = **752.446**
North 1 Deep 1 Shallow rejection = 50225.8
North 2 Deep rejection = 100452

Run-5 Preparation

- Study Trigger Rejection for Light Ions
 - Si+Si (or Cu+Cu)?
 - Straightforward study
 - HIJING with pisaToPRDF (Is this working for MuID?)
 - Run through MuID LL1 simulator
 - Additional algorithm development?
 - Backgrounds?
- Hardware Setup
 - Square hole rejection logic implemented
 - crosscheck with cosmics
 - Run blue logic and MuID LL1
 - switch to MuID LL1 when satisfied

MuID LL1 Ready for Physics in Run-5

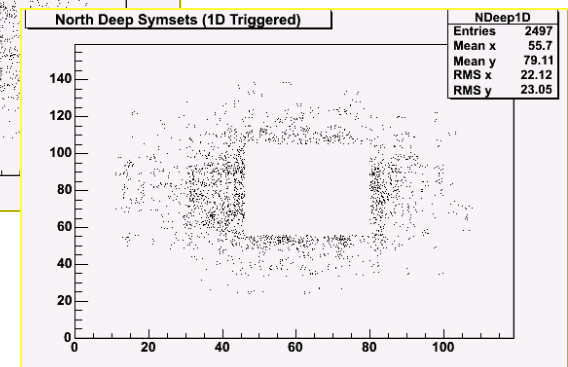
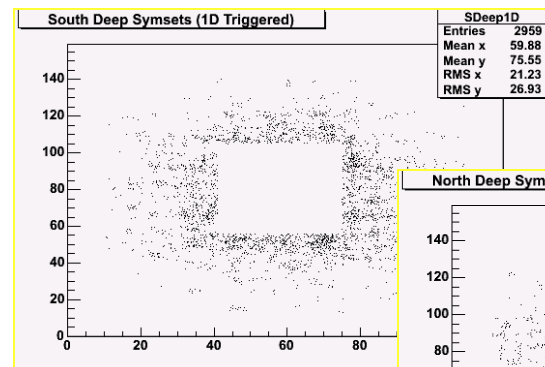
BACKUP SLIDES

“Extreme” Square Hole Rejection

- Improve rejection by eliminating a region around the square hole
 - Horizontal and vertical tracked independently in MuID LL1!
 - Define strips in symset ranges within square hole region
 - horizontal 40-75, vertical 55-105
 - Reject event if **ANY** fired combinations within square hole
 - Some loss of acceptance at low p_T
 - Some loss of efficiency (not quantified)

4/5 gap requirement for deep w/strip rej:

South 1 Deep rejection = **16.4447**
South 1 Deep 1 Shallow rejection = 18.5152
South 2 Deep rejection = 161.949
North 1 Deep rejection = **15.7562**
North 1 Deep 1 Shallow rejection = 19.1241
North 2 Deep rejection = 188.147



Shower Rejection

- Another idea from the original algorithm
 - Reject tracks that shower in the MuID absorber (pions)
 - Sum over all symset elements in gaps 2-5
 - More elements per gap than used in logic
 - Symset doesn't fire if any of these have >5 hits
 - Modest improvement in rejection

4/5 gap requirement for deep:

South 1 Deep rejection = **5.06292**
South 1 Deep 1 Shallow rejection = 5.32861
South 2 Deep rejection = 15.3405
North 1 Deep rejection = **4.84805**
North 1 Deep 1 Shallow rejection = 5.38695
North 2 Deep rejection = 16.1133

4/5 gap requirement for deep, shower cut:

South 1 Deep rejection = **5.65106**
South 1 Deep 1 Shallow rejection = 5.96457
South 2 Deep rejection = 20.9052
North 1 Deep rejection = **5.30211**
North 1 Deep 1 Shallow rejection = 5.93139
North 2 Deep rejection = 21.0428