Run 4 Muon Hardware Performance

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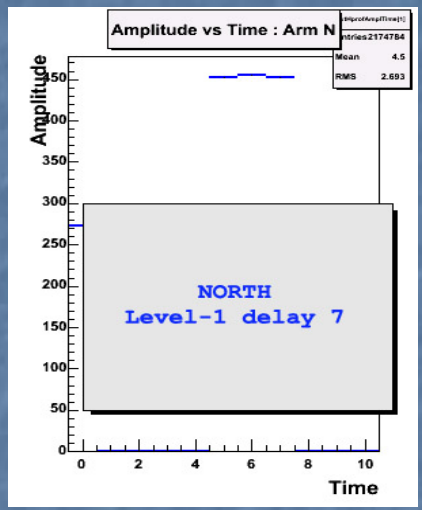
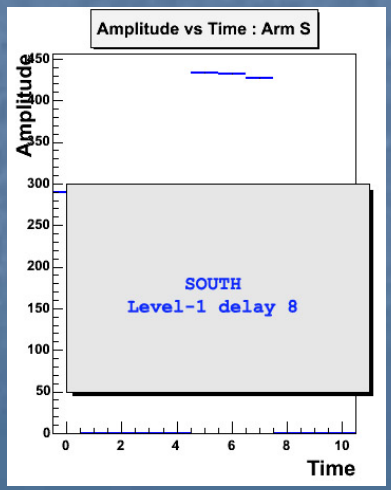
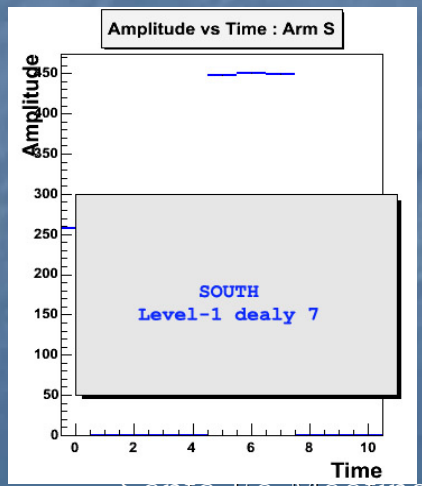
  - mutr HV status
  - muid HV status
- Good data quantity based on hardware performance
- Zerofield data status

Timing Scan for Run4

run3 timing configuration
South Level-1 delay 8
North Level-1 delay 7







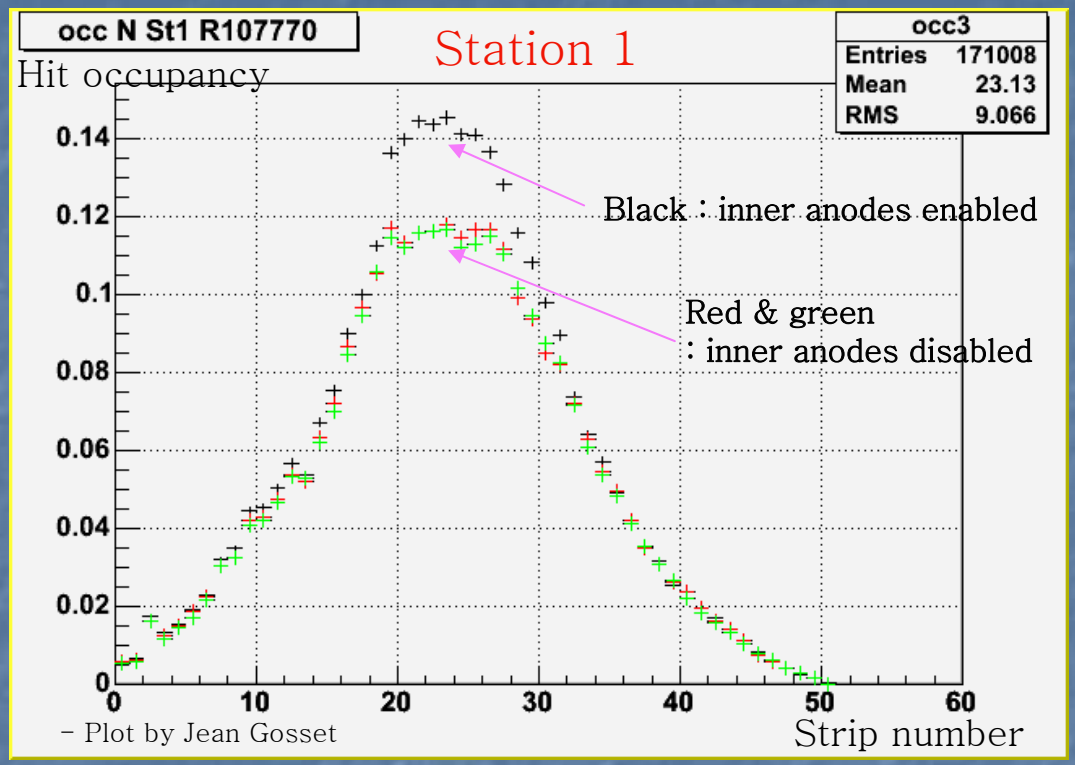
- Study has been done again with BBCLL1 and MUIDS1D&BBCLL1 triggers
- north delay should be same as the run3
- For south, Level-1 delay 7 looks most reasonable

Final run4 timing configuration
South Level-1 delay 7
North Level-1 delay 7

Turn off the inner two anode sections on North

- The muon arms group has proposed that the innermost anode wires of the North Muon Tracker be turned off during the Run-04 Au-Au run.
- The reason to do this is to minimize the occupancy in the tracker while maintaining as much of the acceptance for J/Psi's as possible.
- Several runs were taken to study the strip occupancy with and without the first six wires in North station 1.

Occupancies comparison and decision



On central strips, there is a ~20% increase in occupancy.

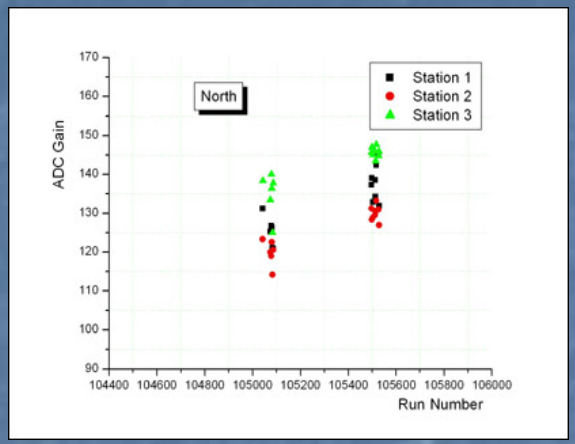
Decision

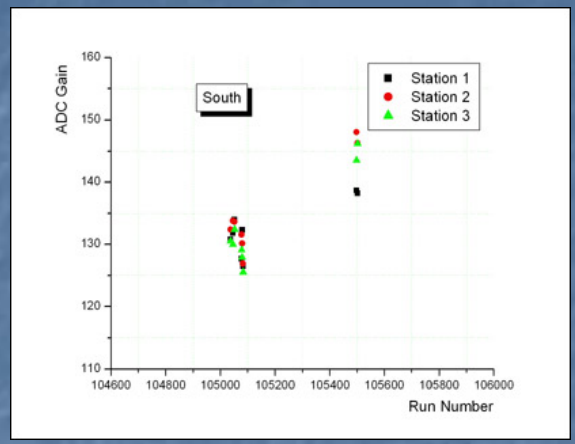
1) One loses a small fraction (~2-3%) of the geometrical aperture.
2) One gains a significant (>20%) reduction in occupancy, with perhaps a much larger gain in central events.
3) Decide to turn off since we need all the help we can get in occupancy and pattern recognition

Mutr DAQ problem and zero suppression issue

- SEB for MUTR.N.S2.0 which has the largest event crashed periodically when running at high rate at the beginning of the run
- The zero-suppression issue came out
  - New DCM code : threshold is pedestal + 3*rms_noise
  - new HV setting would give more extra hits
- Went back to the old DCM code
  - Old DCM code : the run3 code that makes the zero suppression cut at zero
- Tune the number of events for the Jseb buffer
- Finally mutr DAQ showed stable behavior

Gain issue





- Low gain problem
- determined that the HV needs to be raised universally by 25V
  (Jan/29/2004).

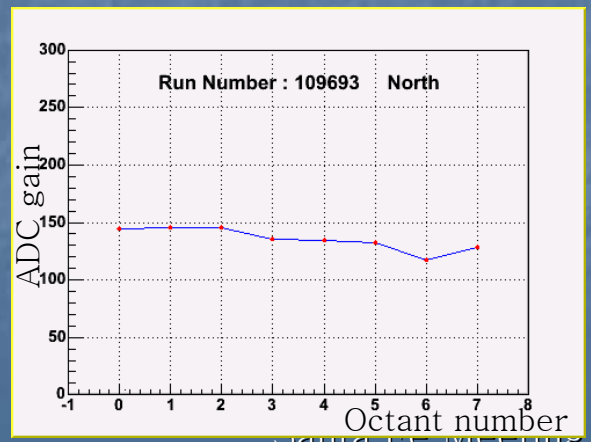
new run4 HV setting

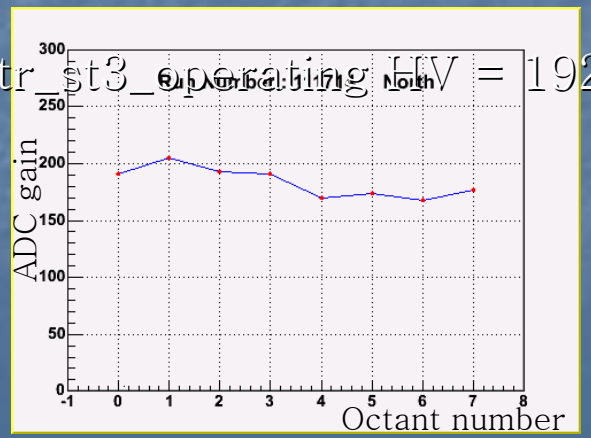
mutr_st1_operating HV = 1875 V

mutr_st2_operating HV = 1900 V

mutr_st3_operating HV = 1925 V

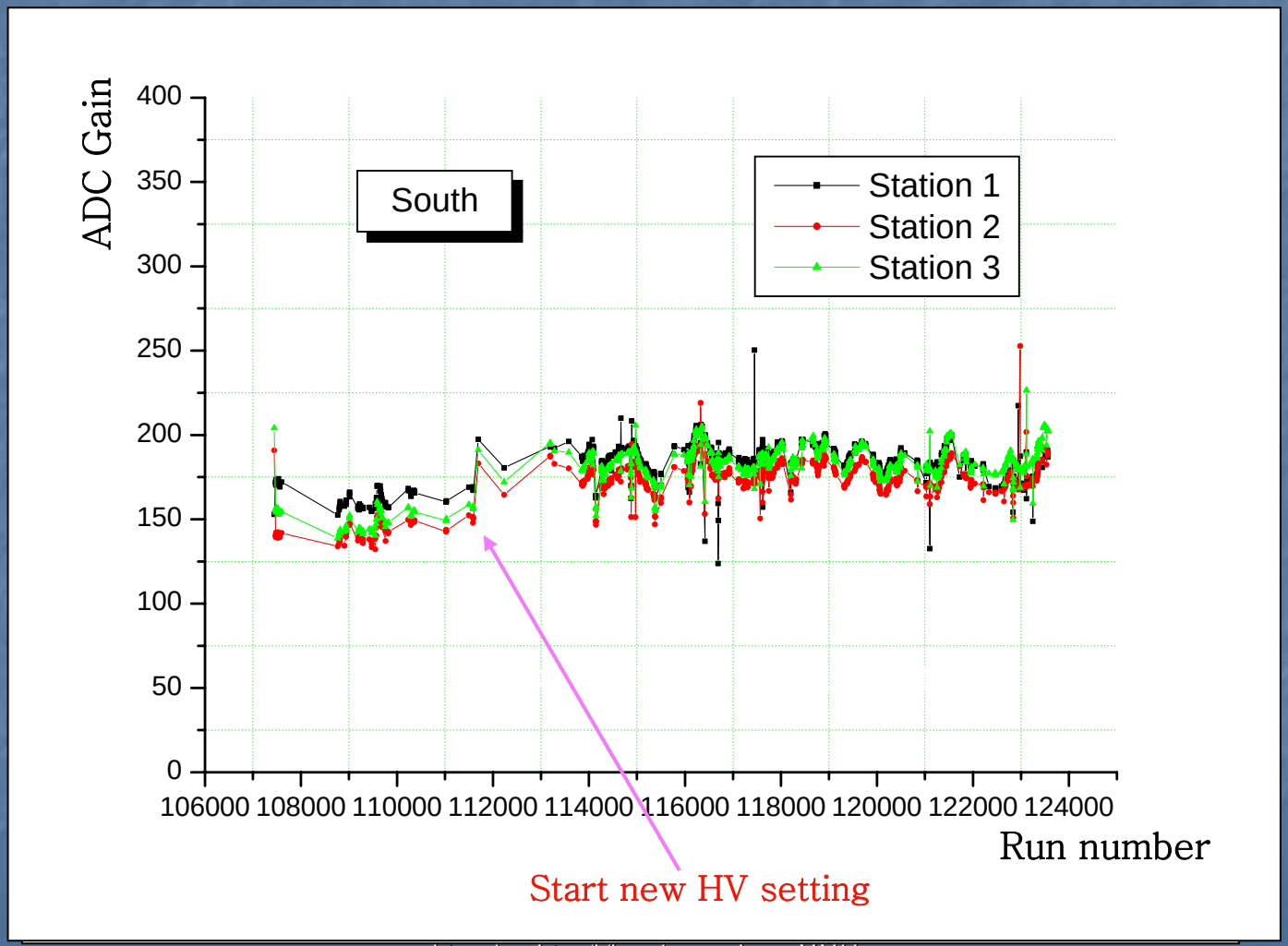
25V up





-plots by WooJin Park

Gain Variation during the run4



-plot by WooJin Park

Electronics Performances

- Troubles during Run 3
  - Duplicated channels
    - 7 FEMs(16, 32 & 64 channels) during Run 3 for both arms
  - AMU Cell errors
  - Other problems(dead channels in CROC or in RX board)

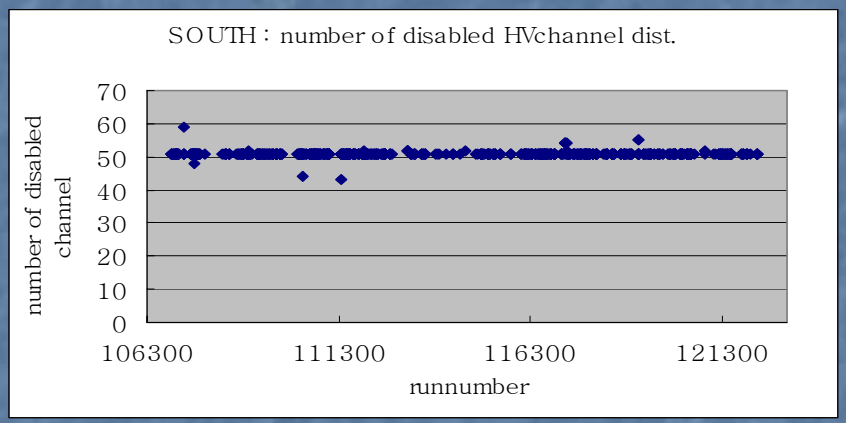


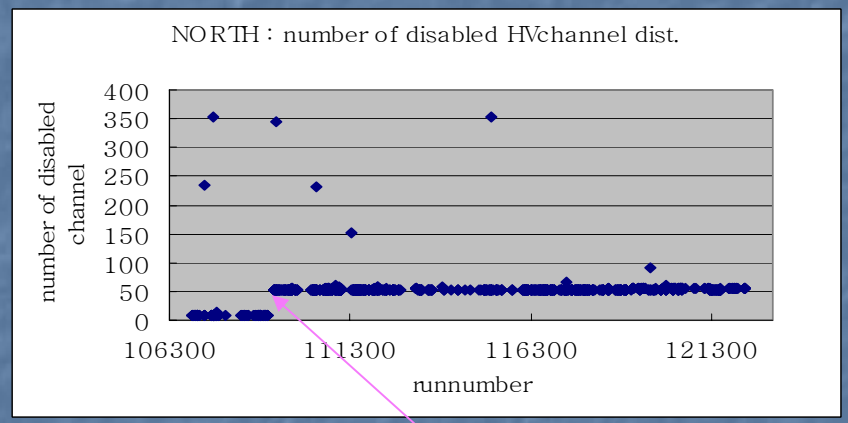
- Run 4 status
  - All of them fixed before the run except for one. This one automatically solved during the run
  - Still from time to time occurred
  - Fixed before the run
  - At the end of the 200GeV run, 16 packets removed from South due to the damaged RX cards

Newly appeared
=> Shutdown work (done)

run by run mutr HV status

We can see the status with the number of disabled HV channels





Only dropped the runs which have no HV log file

Disable station1 inner anodes

Very stable

Number of missing channel = (disabled channels) U (tripped channels)

south : (2x24=48ch st1 inner 2 channels) U (3 bad channels) => 51 channels

north : Beginning ~ 7 disabled channels,

Later (2x24=48ch st1 inner 2 channels) U (7 bad channels) => 53 channels

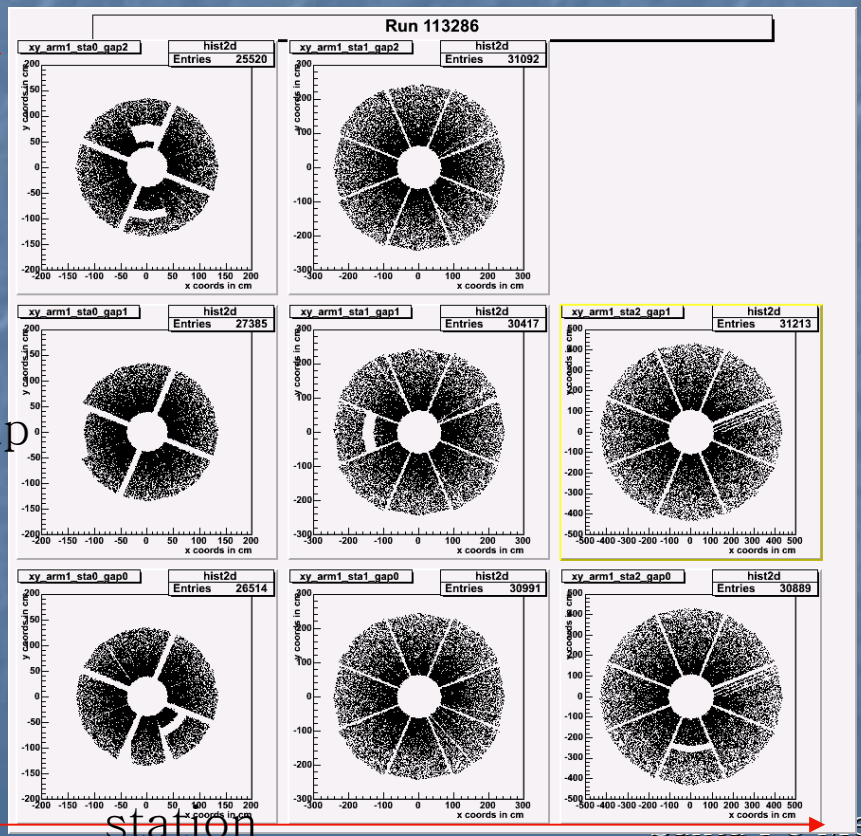
- Analyzed by MinJung, MinKyung, WooJin, DongJo

Compare simulation and real data

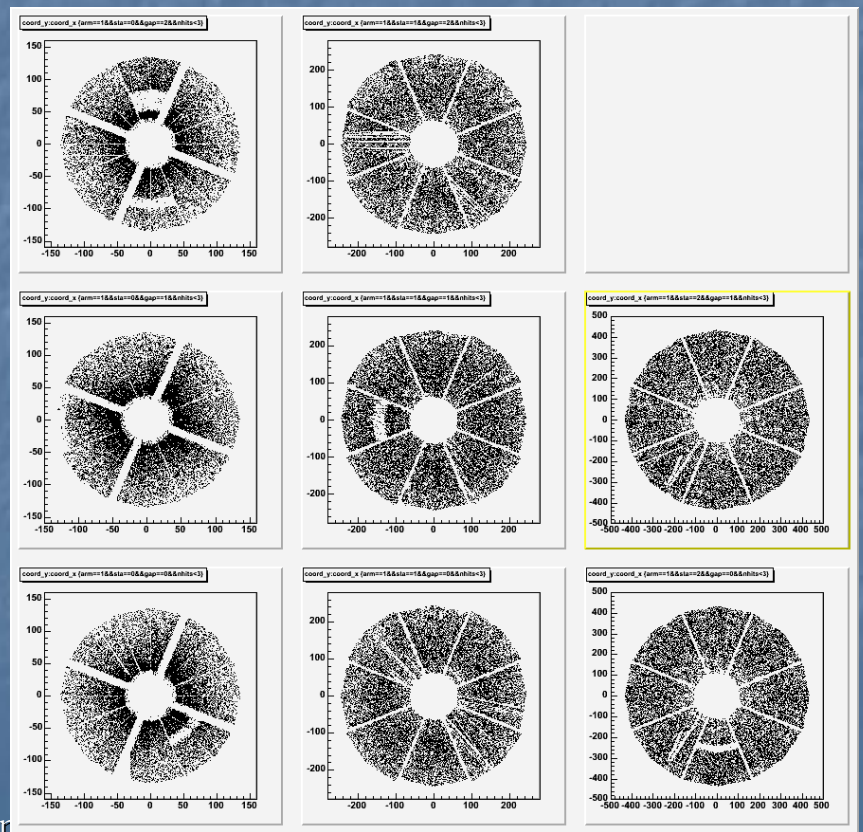
How to compare

Get disabled HV channel info from HV log → put this info (HV config file) at the mc step → MC and real data hit distributions are well matched at the HV channel point of view → we can say the real HV situation is properly reflected to the simulation

North : from MC



North : from Real data

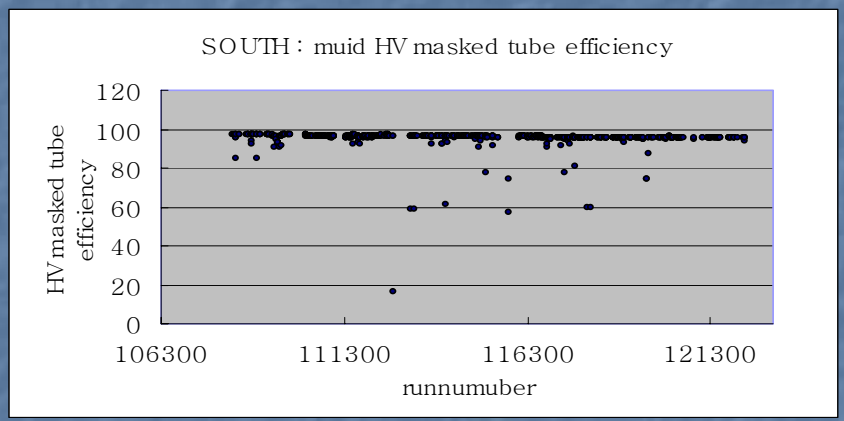


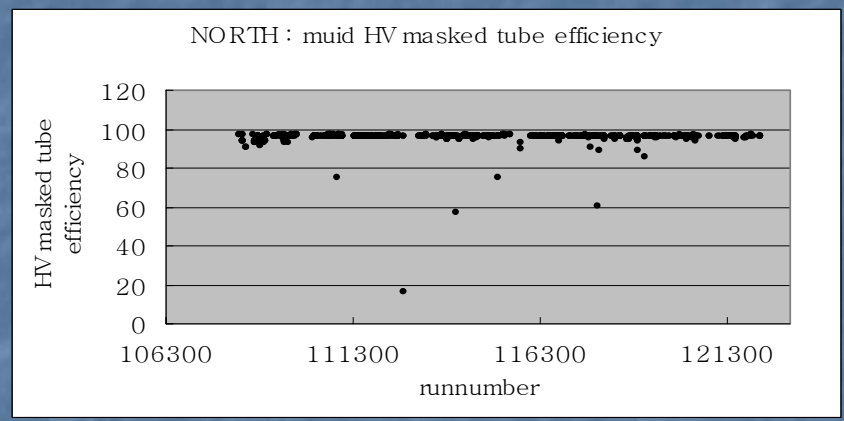
– plot by DongJo Kim

Santa Fe Meeting Jan 22th 2004

run by run muid HV status

We can see the status with the HV masked muid tube efficiency distribution



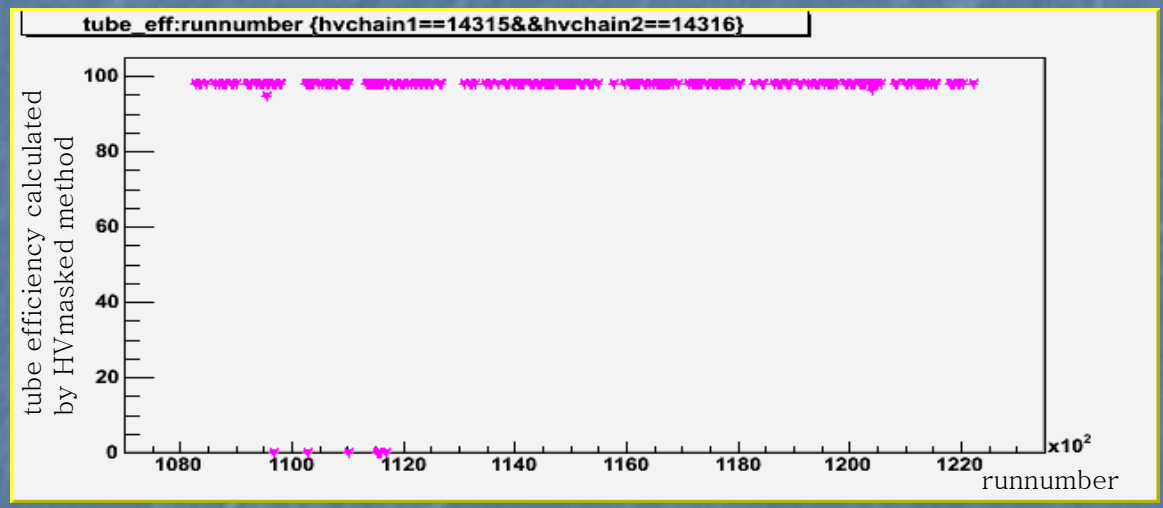


Only dropped the runs which have no HV log file

Very stable

run by run muid HV status per two HV chains

- Most of chains look quite stable during the whole run.



hvchain==14315

[arm(0-south,1-north),

gap(0~4),pannel(0~5),

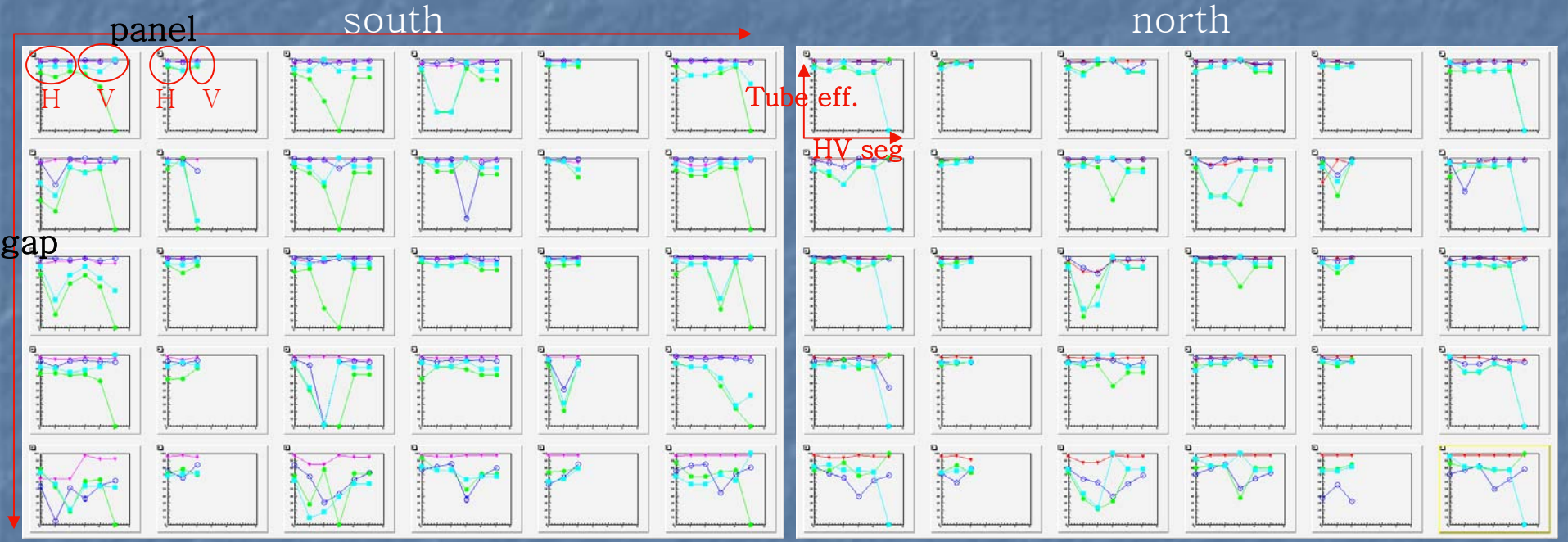
Orientation(0-h,1-v),chain(1~6)]

Input valuse for Hvmasked calculation is based on cosmic run analysis

- There are some chains which show fluctuation but the percentage is very low

Muid Tube efficiency

- 80 runs(~ 150M events) from pro.54 production
- These 80 runs are good runs in the muid point of view
  (over all muid tube efficiency calculated by HVmasked method > 92%)



pink,red:HVmasked, blue:run4AuAu, green:run3pp, skyblue:run3dAu from Colorado method

- We have much improved efficiency than those of run3 except for last gap (need calculation code tuning) and only a few of other segments.
- Most of the parts show high efficiency and also even good agreement with the HVmasked method.

How many and good data did we get during run4AuAu?

-Total alive number of events
from the mutr and muid HV performance point of view

- Total BBCLive events before applying HV status cut

  SOUTH
  1467040394 (i.e. 1.47 billion)
  NORTH
  1488157524 (i.e. 1.49 billion)

- Total BBCLive events after applying HV status cut

  SOUTH
  1391994408 (i.e. 1.39 billion)
  NORTH
  1410437325 (i.e. 1.41 billion)

HV status Cut
muid HV masked tube efficiency > 70 %
mutr number of disabled channel < 60

- South : losing 5.1% of total BBCLive events by this HV status cut
  north : losing 5.2% of total BBCLive events by this HV status cut

Started pro.54 production based on this information

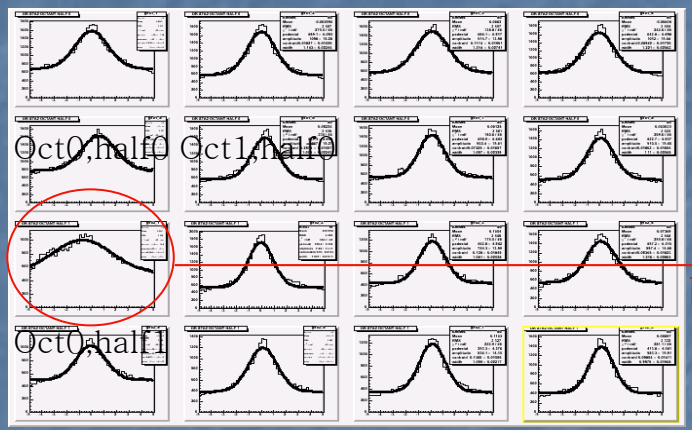
Zerofield data

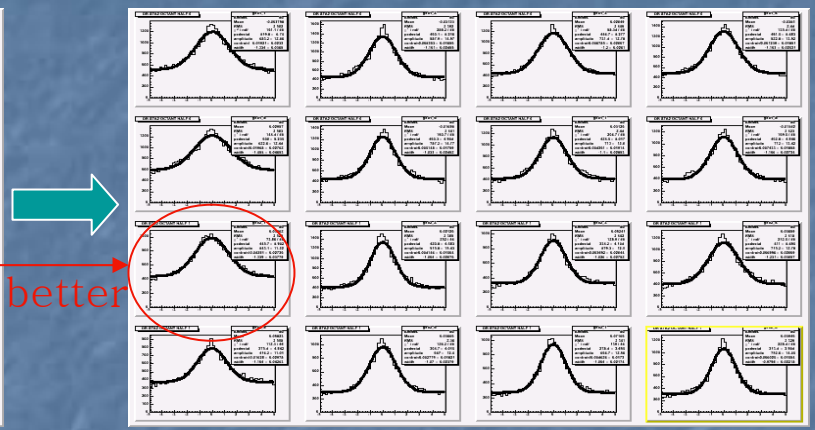
- Run4AuAu Zerofield run status
  - During the AuAu run, we got about 16 zerofield runs and the total number of events came to ~1.5M.
- Alignment data analysis module
  - It has been developed with newframe work
- zerofield data analysis for alignment
  - Done at CRS farm with new alignment module
  - About 2.1M events were analyzed in run 115378(total segments) and we got about ~4.4M alignment tracks for both arm.
    Also we got dAu run(65905) and run3pp(83663) output and made a comparison with the last year's ouput with old alignment module.

New framework alignment analysis status

South dr :

Offset distributions

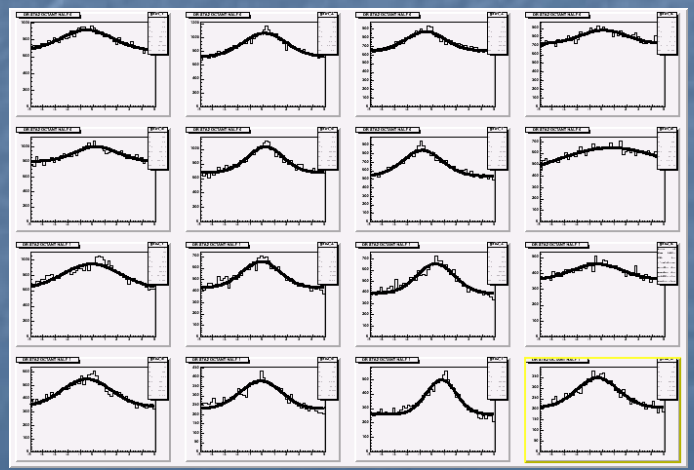


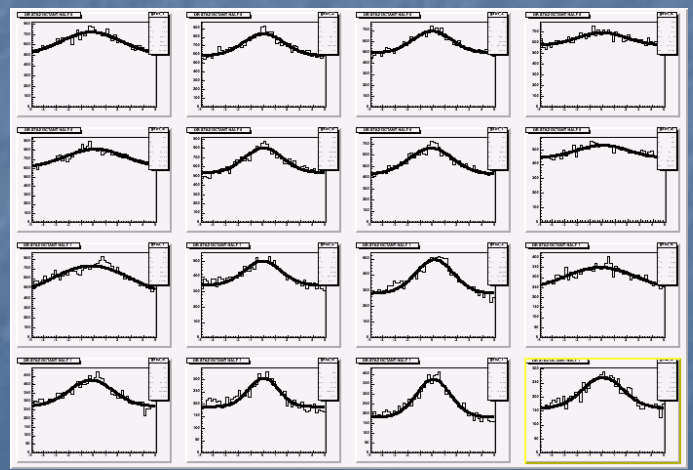


from current db alignment values

from new alignment values

North dr :





from current db alignment values

from new alignment values

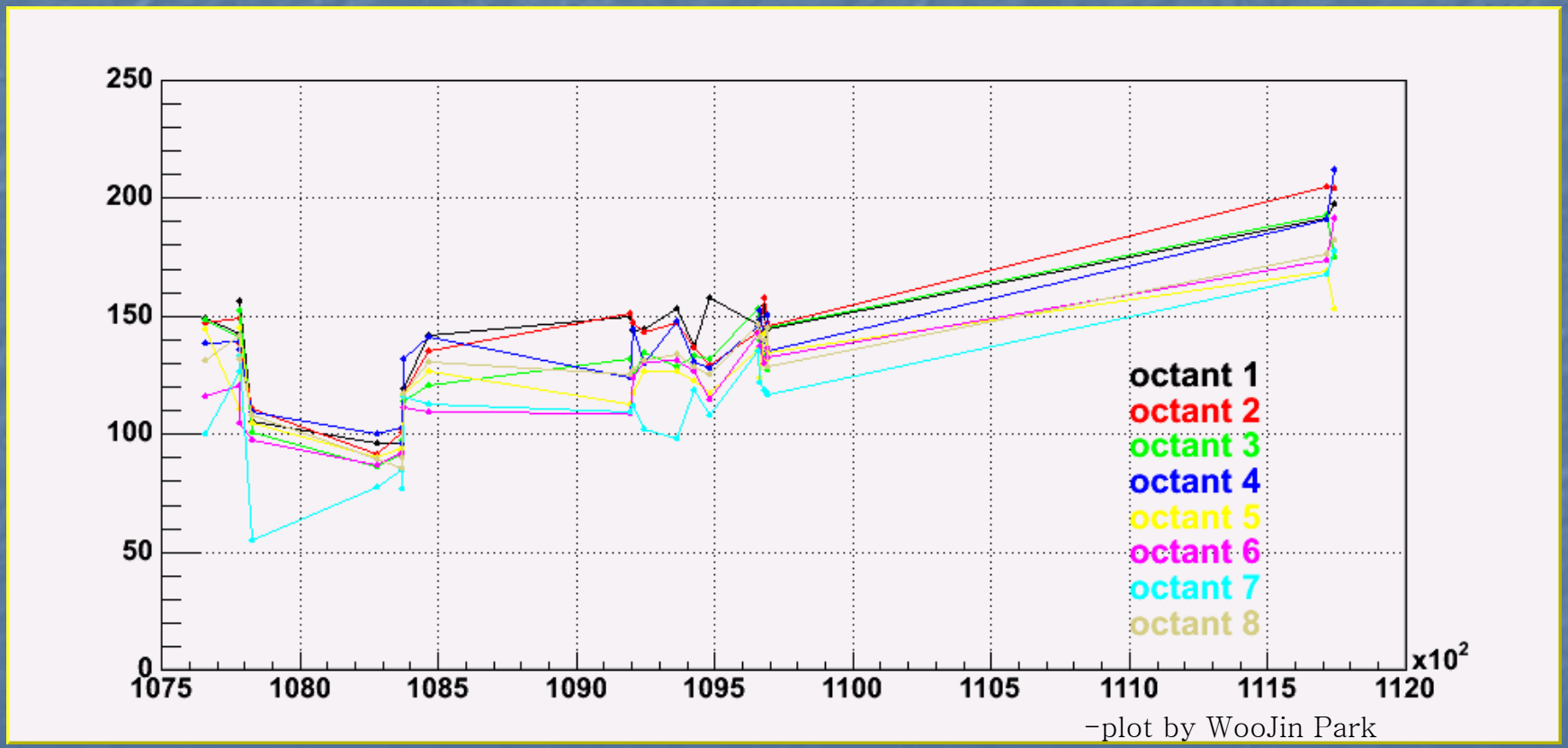
- For the most of half octants of both arm ds offset < 100um
- South dr offset is 100um order except for a couple of half octants
- North dr offset is 1mm order except for some half octants

summary

- Run4 muon hardware performance is better than Run3

Backup slide

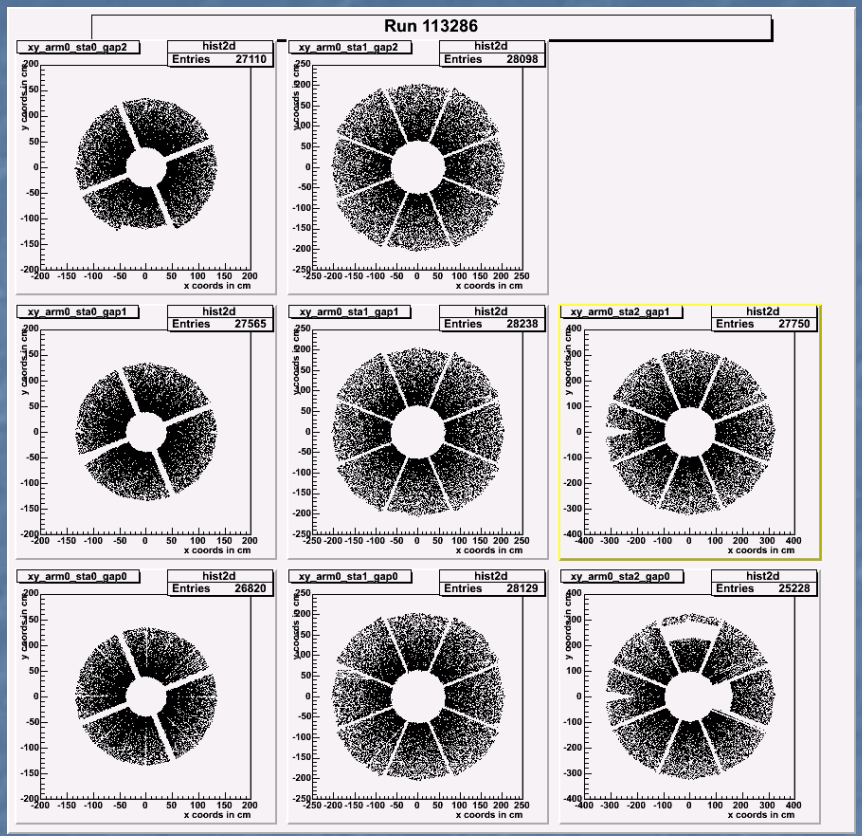
Octant by octant gain variation



-plot by WooJin Park

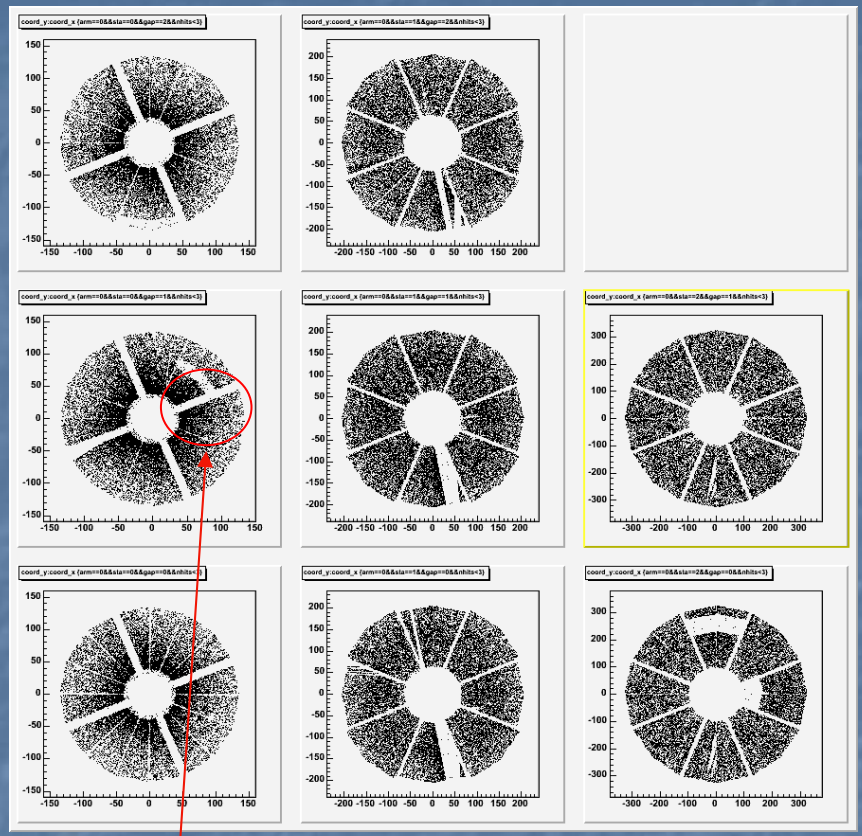
Compare simulation and real data – SOUTH

South : from MC



– plot by DongJo Kim

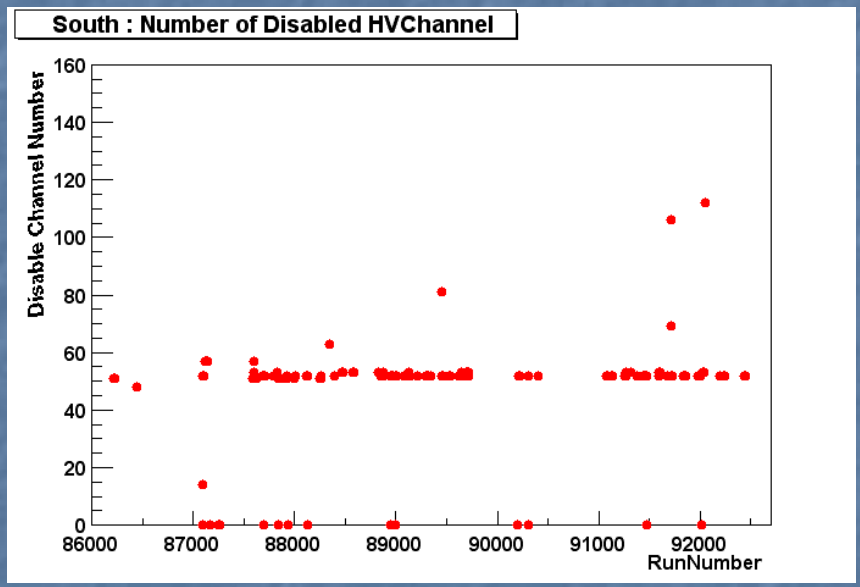
South : from Real data

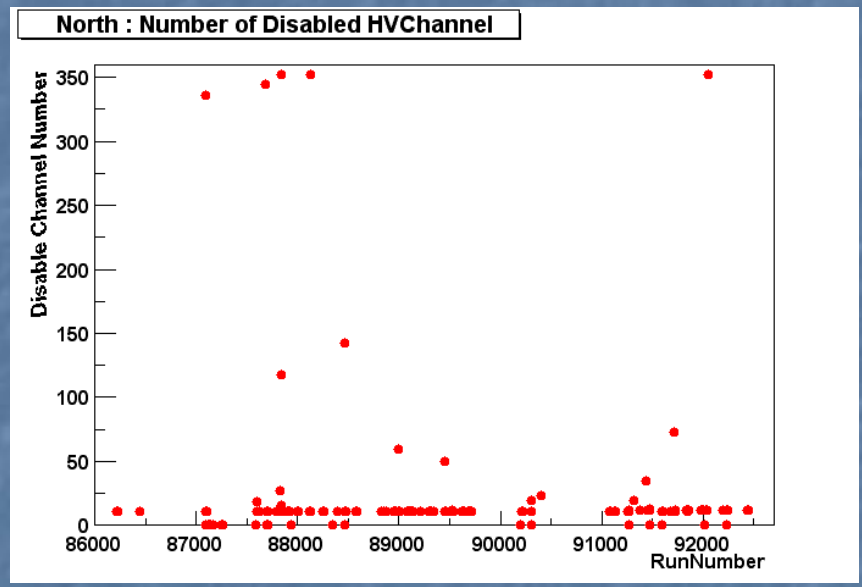


There are two anode cards permanently disabled in North and one in South due to faulty connections at the cards. The North anodes do not correspond to an entire HV channel, so Nicki made them turned off in simulation in a different way in Run3. However, the South anode S1225 should have to be added to the HV config files. So the HV files should be fine after adding S1225

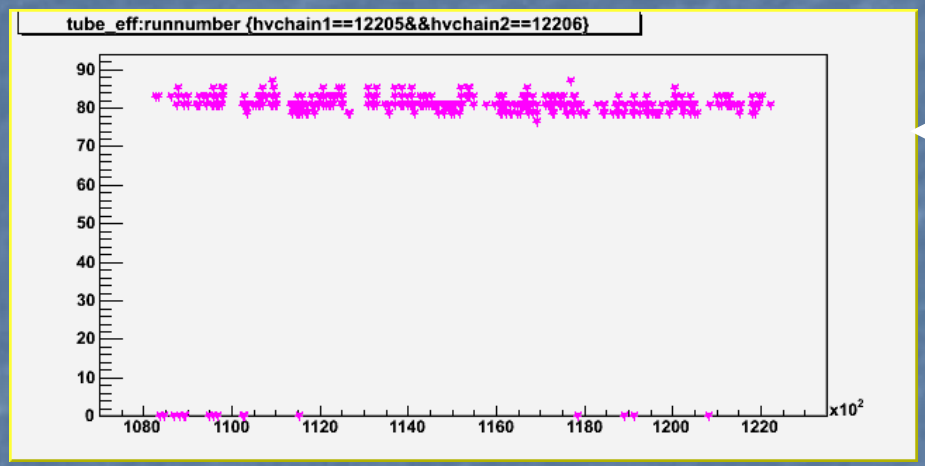
Ref) http://www.phenix.bnl.gov/phenix/WWW/pub/keitch/dc/dc_10jan03/

Run3 p+ p HV status





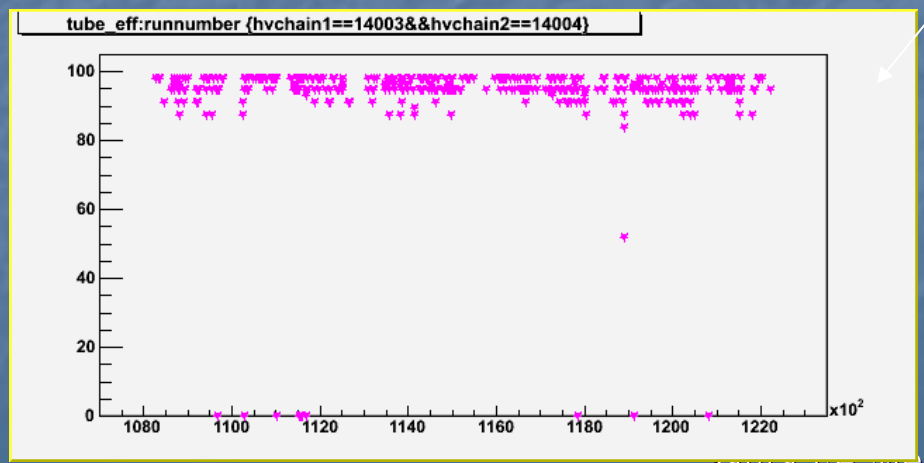
there are some chains which used to have high current or be disabled.

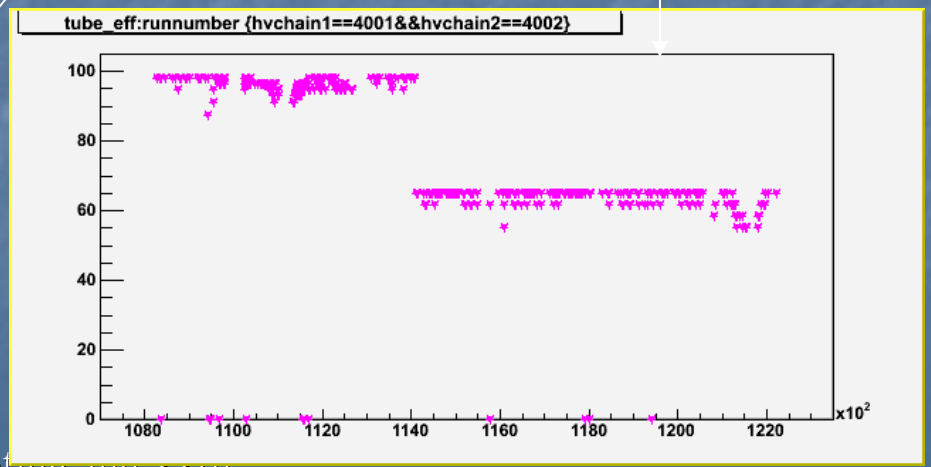


1. used to suffer high current and make the tube efficiency drop down.(~2%)

2. sometimes have high current but sometimes not. ->have fluctuation(~6%)

3. one or two chains used to be disabled. .(~3%)





Input value for Hvmasked tube efficiency

When we calculate HVmasked efficiency,

- if both of two chains have no problem=> give 98% efficiency value,
- if one chain is disabled => gives 65%
- if one of chain has high current => give dropped efficiency.
- These values are based on cosmic run analysis

Muid Tube efficiency plot description

	Pannel 0	Pannel 1	Pannel 2	Pannel 3	Pannel 4	Pannel 5
GAP 0	00001+00002 00003+00004 00005+00006 00011+00012 00013+00014 00015+00016	00101+00102 00103+00104 00111+00112	00201+00202 00203+00204 00205+00206 00211+00212 00213+00214 00215+00216	00301+00302 00303+00304 00305+00306 00311+00312 00313+00314 00315+00316	00401+00402 00403+00404 00411+00412	00501+00502 00503+00504 00505+00506 00511+00512 00513+00514 00515+00516
GAP 1	01001+01002 01003+01004 01005+01006 01011+01012 01013+01014 01015+01016	01101+01102 01103+01104 01111+01112	01201+01202 01203+01204 01205+01206 01211+01212 01213+01214 01215+01216	01301+01302 01303+01304 01305+01306 01311+01312 01313+01314 01315+01316	01401+01402 01403+01404 01411+01412	01501+01502 01503+01504 01505+01506 01511+01512 01513+01514 01515+01516
GAP 2	02001+02002 02003+02004 02005+02006 02011+02012 02013+02014 02015+02016	02101+02102 02103+02104 02111+02112	02201+02202 02203+02204 02205+02206 02211+02212 02213+02214 02215+02216	02301+02302 02303+02304 02305+02306 02311+02312 02313+02314 02315+02316	02401+02402 02403+02404 02411+02412	02501+02502 02503+02504 02505+02506 02511+02512 02513+02514 02515+02516
GAP 3	03001+03002 03003+03004 03005+03006 03011+03012 03013+03014 03015+03016	03101+03102 03103+03104 03111+03112	03201+03202 03203+03204 03205+03206 03211+03212 03213+03214 03215+03216	03301+03302 03303+03304 03305+03306 03311+03312 03313+03314 03315+03316	03401+03402 03403+03404 03411+03412	03501+03502 03503+03504 03505+03506 03511+03512 03513+03514 03515+03516
GAP 4	04001+04002 04003+04004 04005+04006 04011+04012 04013+04014 04015+04016	04101+04102 04103+04104 04111+04112	04201+04202 04203+04204 04205+04206 04211+04212 04213+04214 04215+04216	04301+04302 04303+04304 04305+04306 04311+04312 04313+04314 04315+04316	04401+04402 04403+04404 04411+04412	04501+04502 04503+04504 04505+04506 04511+04512 04513+04514 04515+04516

Explanation about the lower efficiency of the last gap

- the last gap's lower efficiency is suspicious part.
- in Au-Au events a real particle penetrating to gap 3 will quite often 40% or more of the time have one randomly associated gap 4 hit. Since the gap 4 hit is random, when we look for the other view hit, it often is not and thus the efficiency appears low

.

- centrality information could give a help since we could look specifically at lower centrality events to reduce this effect. Also, when looking at the gap 4 horizontal efficiency, we could put a tight requirement on the distance agreement of the gap 4 vertical hit (thus reducing randoms) and also put a higher momentum cut on the muons.

– mentioned by Jamie

How many and good data did we get during run4AuAu?

-Number of events status with the mutr and muid HV performance point of view

- total BBCLive count before applying HV status cut

  SOUTH
  1467040394 (i.e. 1.47 billion)
- NORTH
  1488157524 (i.e. 1.49 billion)

- total BBCLive count after applying HV status cut

  SOUTH
  1391994408 (i.e. 1.39 billion)
  NORTH
  1410437325 (i.e. 1.41 billion)

HV status Cut
muid HV masked tube efficiency > 70
mutr number of disabled channel
< 60

- in case south, we are loosing 5.1% of total BBCLive count by this HV status cut
  in case north, we are loosing 5.2% of total BBCLive count by this HV status cut

- Individually,
  - by south mutr HV performance we lose about 2.4% (1432222322)
  - by north mutr HV performance we lose about 2.8% (1446670762)
  - by south muid HV performance we lose about 4.9% (1394810311)
  - by north mutr HV performance we lose about 4.8% (1416413378)

How many and good data did we get during run4AuAu?

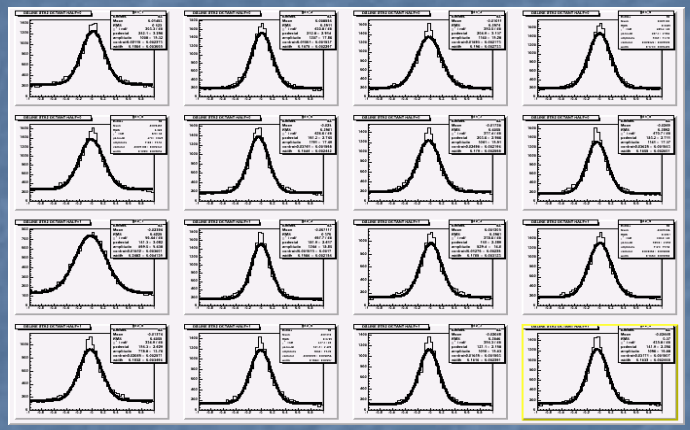
-Number of run status
with the mutr and muid HV performance point of view

- Officially, we have 1136 physics runs
- categorize runs with the mutr and muid HV performance point of view to give a priority during the production
  - 1. muon good runs by below cut(797 runs)
    - Cut : muid tube eff>70 & mutr number of disabled channel<60 for each arm
    - couldn't include some HVlog missing runs here
  - 2. remaining muon ok runs (215 runs)
    - in case HVlog missing runs, got the info from online monitoring and radiograph and checked the performance. If these two are fine, put those runs in this category
  - 3. muon bad runs at the HV performance(124 runs)
    - The runs in the 3rd case are not bad for both arm. some of the runs are only bad for south and some of runs are only bad for north. I mean 25 runs in 3rd list still ok for one arm so not all runs in 3rd list are garbage runs.
- Started pro.54 production from 1 to 3.
- More precise check could be done by offline QA including all the performance info

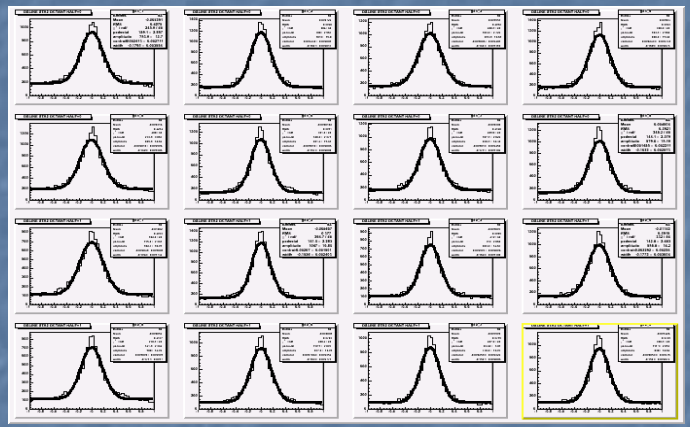
New framework alignment analysis status :ds

South ds :

Using current db align



Using new align



North ds :