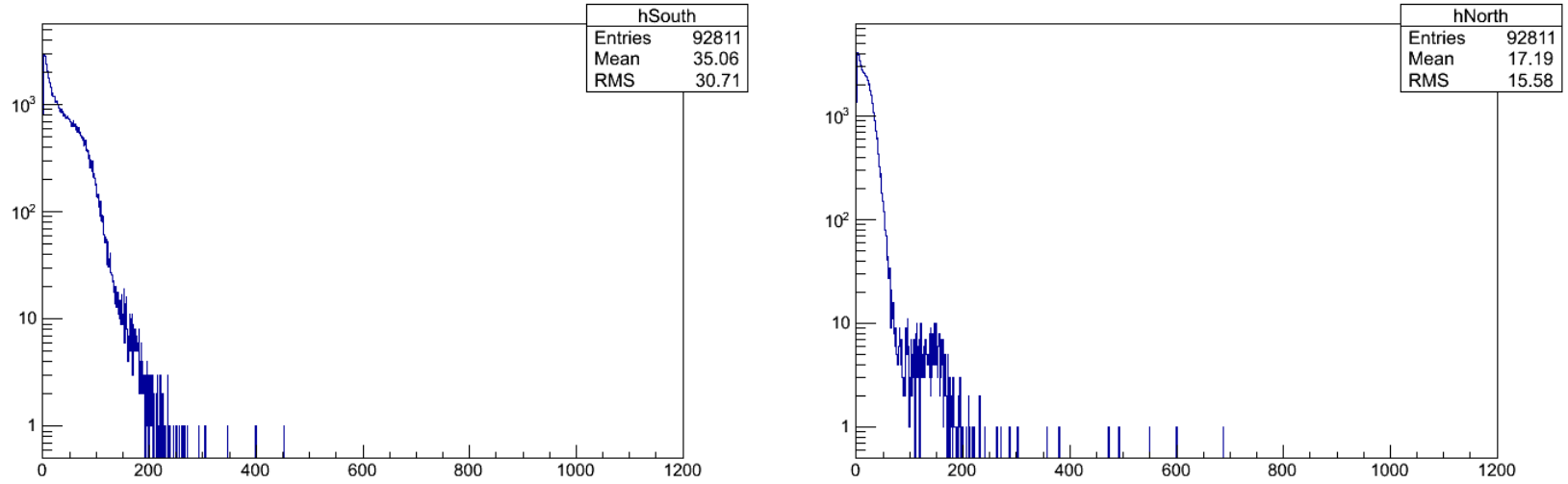
MUID noisy events rejection
status update : January 16, 2014

A fraction of events show very large activities in MUID, and could be caused by either electronics noise (ringing) and/or large beam backgrounds. These events slow down the production/reconstruction, due to many false road candidates as input for MUTR etc. The events would need to be rejected for any physics analysis involving the muon arms. (The MUIDLL1 trigger has a rejection for these sort for events, but for users of other triggers, the noisy events have to be rejected.)

See talk.pdf, update.pdf, update2.pdf in this dir. for presentations in early 2013. In this presentation (update3.pdf) I focus on CuAu data (run 377309).

Total number of hits per event - CuAu All

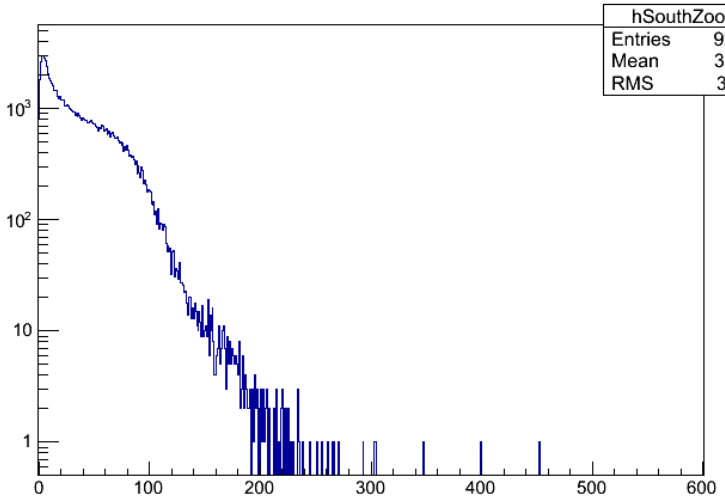
First we look at the total number of hits per event. Note the y-axis log scale. You can see that the amount of hits per event go out to about 200 hits for the North arm. The South has less hits (< 100), but note though the significant bump and extended tail for the South arm.

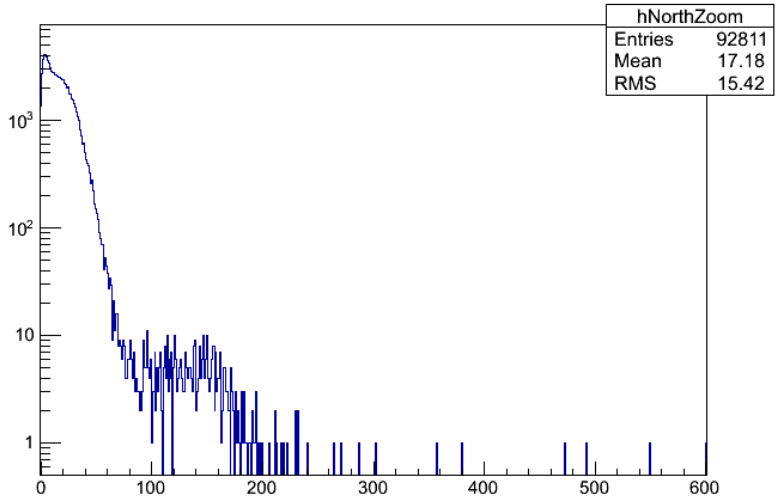


[South left, North right]

Total number of hits per event - CuAu All : Zoom 3

Same plots as on the previous slide, but now somewhat zoomed in on the x-axis.

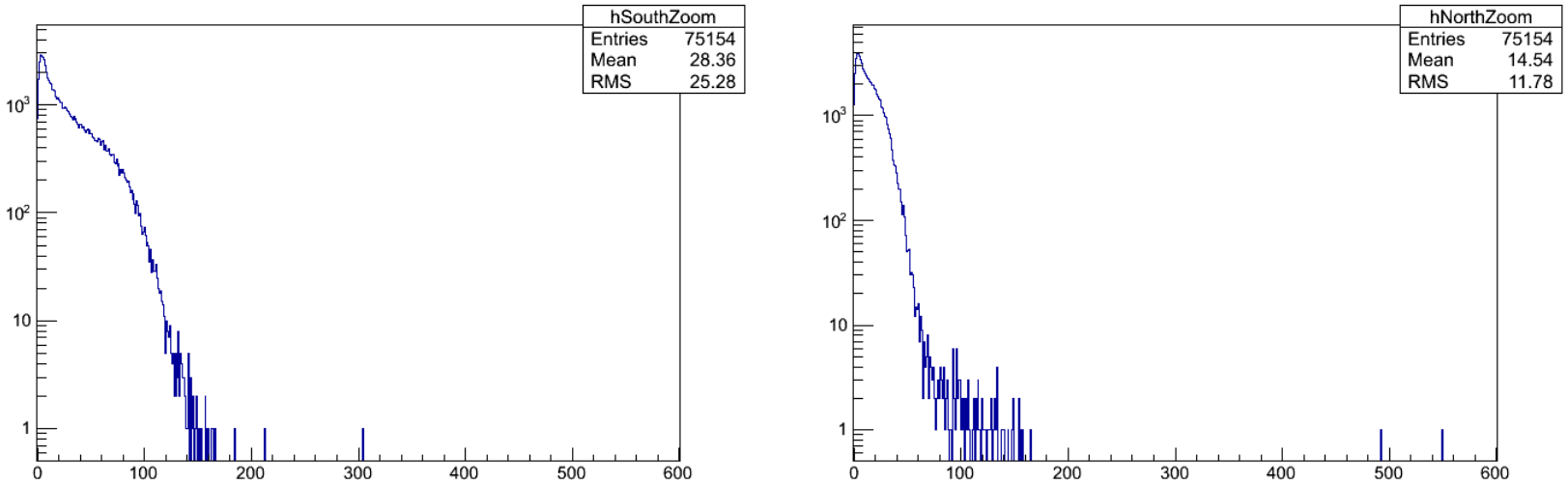




[South left, North right]

Total number of hits per event - CuAu MB : Zoom 4

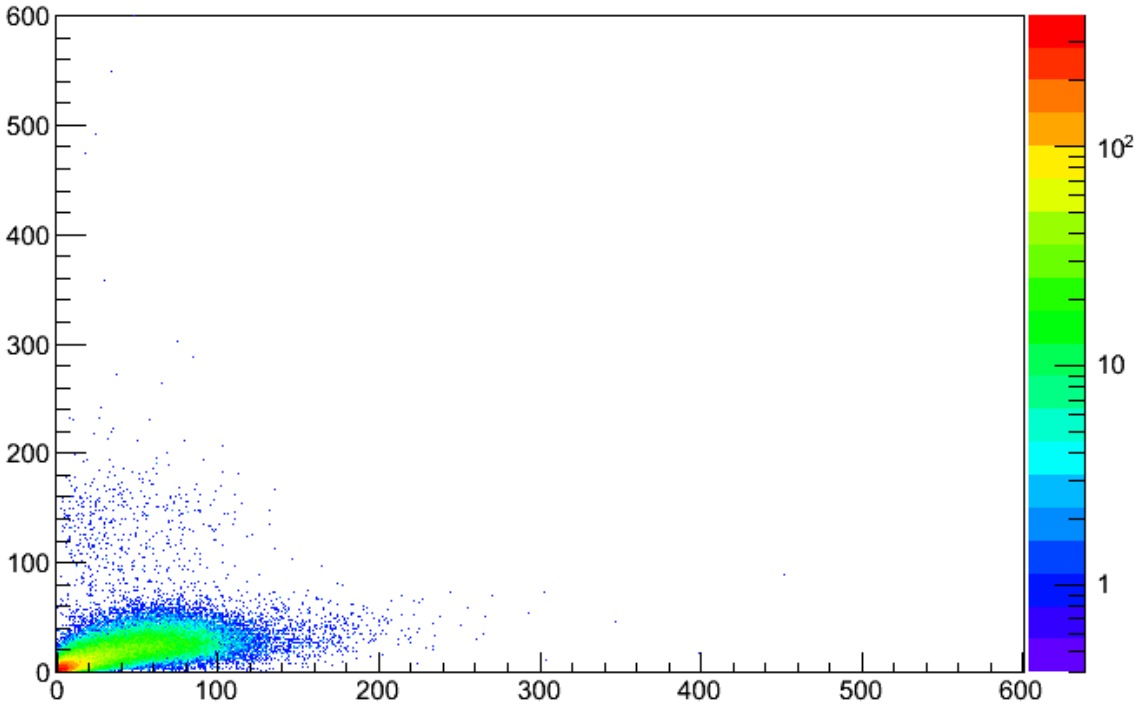
Same plots as on the previous slide (zoomed in), but now I also select only Min Bias events (BitMask 0x26 - should pick narrowvtx and novtx BBCLL1 only). Note that the bump seen on the previous slide for the tail of the South distribution seems significantly reduced... (triggers can be a good way to enchance noise)



[South left, North right]

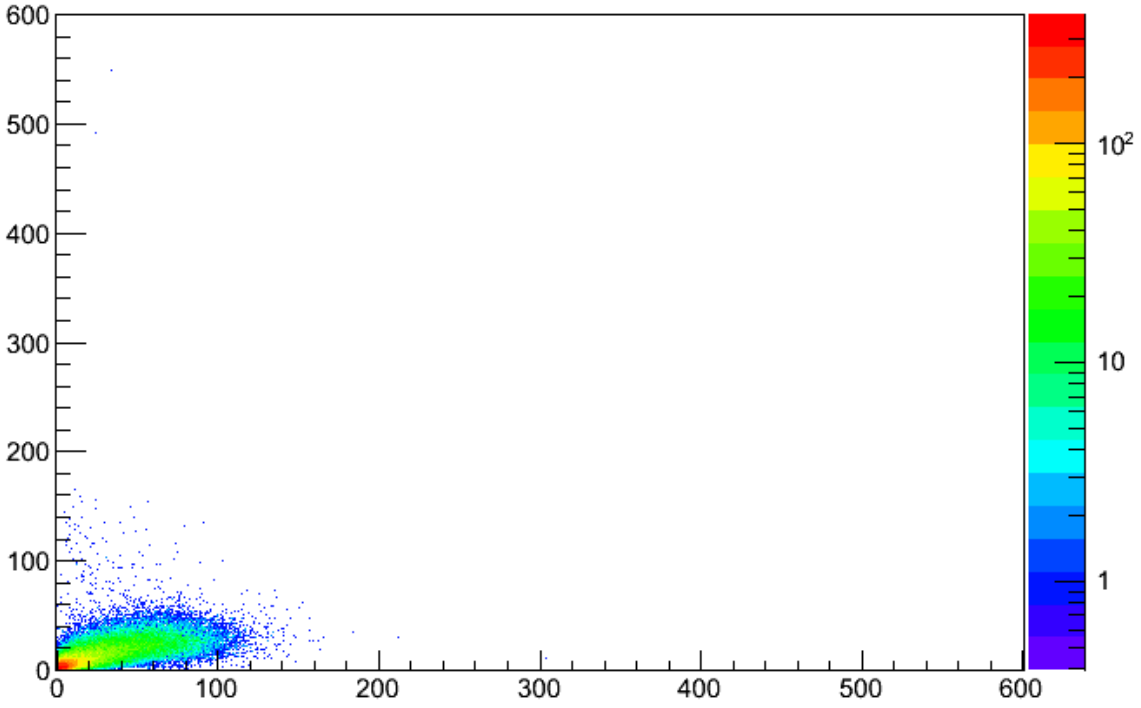
Total number of hits per event - CuAu All : 2D

In the plot below, the number of hits in North (y-axis) vs South(x-axis) is shown. One can see that besides the normal wide-correlation of hits in the two arms, there is an extra band, with more hits in the South (x) than in the North (y) arm.



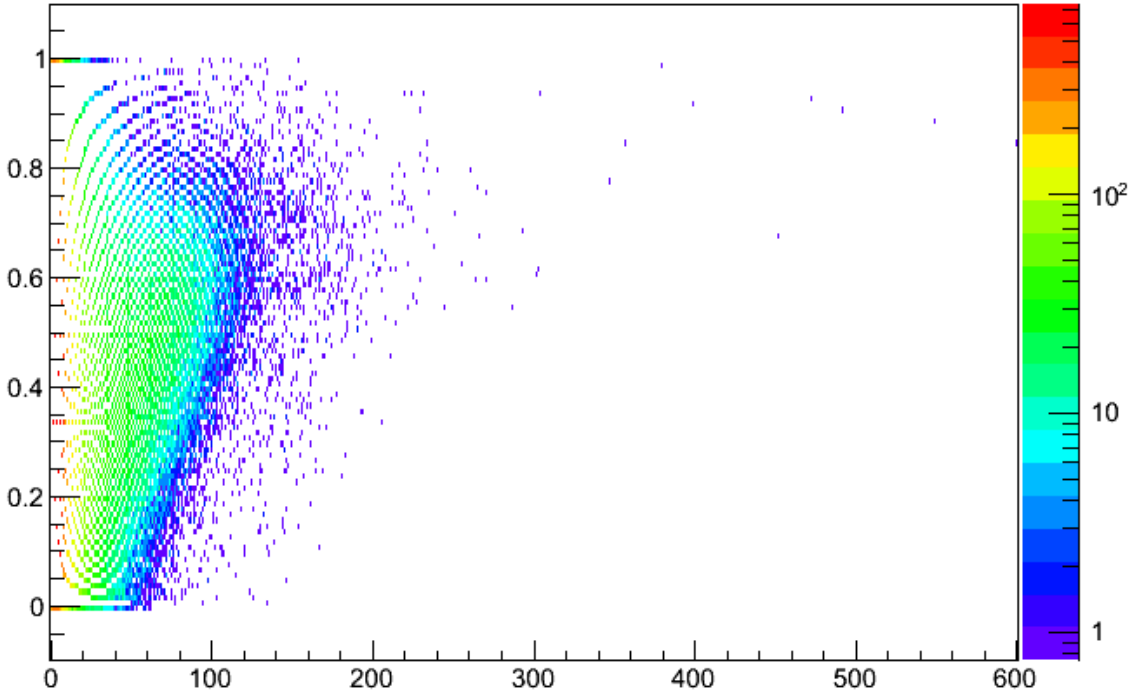
Total number of hits per event - CuAu MB : 2D

Same plot as on previous slide, but now also with the MinBias condition. Less noise seen.



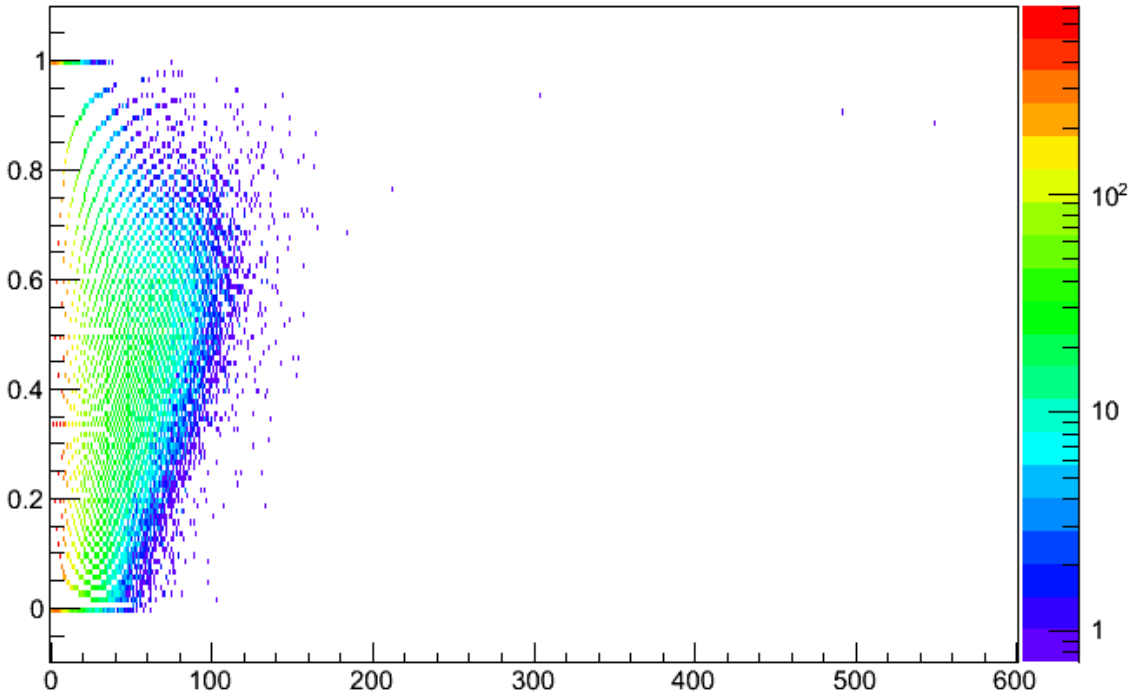
Total number of hits per event - CuAu All : Asymmetry ratio

For symmetric systems like pp and UU we used an asymmetry ratio cut to look for unphysical events. A way of quantifying the difference between the two arms is to plot the difference between them, divided by the sum, i.e. $(max - min)/(max + min)$. In the plot below, this ratio (y-axis) vs the max value(x-axis, arm with most hits) is shown. This sort of analysis is obviously less straightforward for asymmetric systems so we will not pursue this further here, for CuAu.



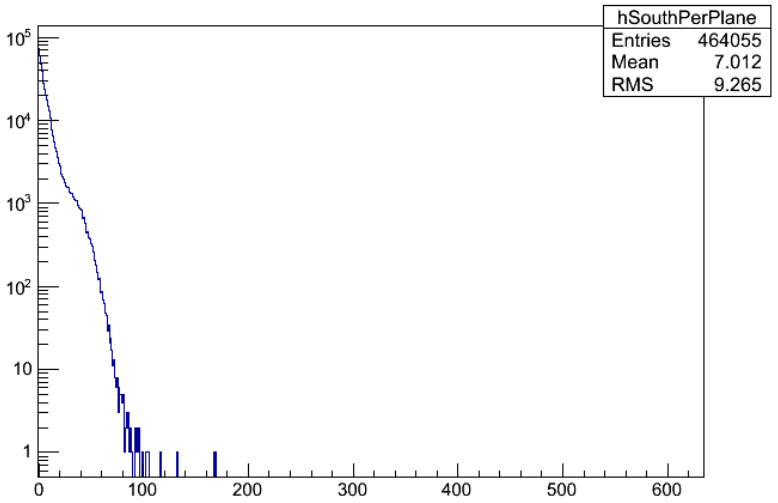
Total number of hits per event - CuAu All : Asymmetry ratio

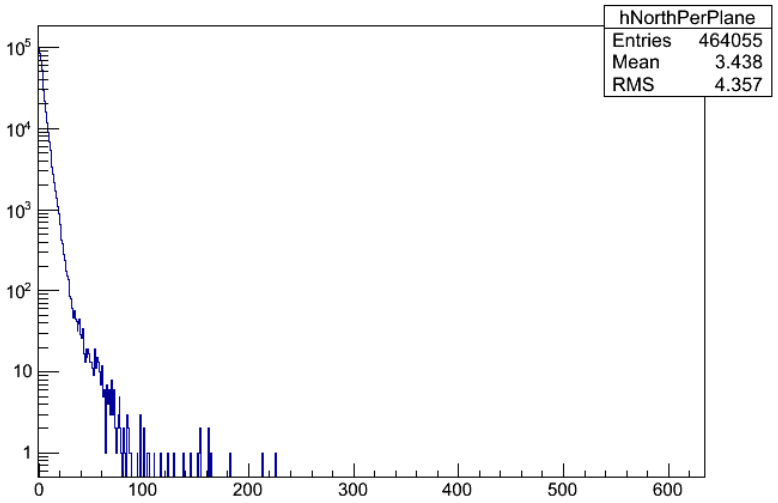
Same plot as on previous slide, but now also with the MinBias condition. Less noise seen. The remaining/later plots are with All events, i.e. not just MB, to check if we can see where the extra hits are from.



Total number of hits per event - CuAu All : per plane (gap)

Let us also look at the number of hits per plane. i.e. 5 times as many histogram fills as events (since we have 5 planes (gaps) per arm).
Note that approx. zero events (for the South arm) in the studied PRDF file would potentially be removed by the default offline $>$ 300 clusters or hits/event/plane cut.

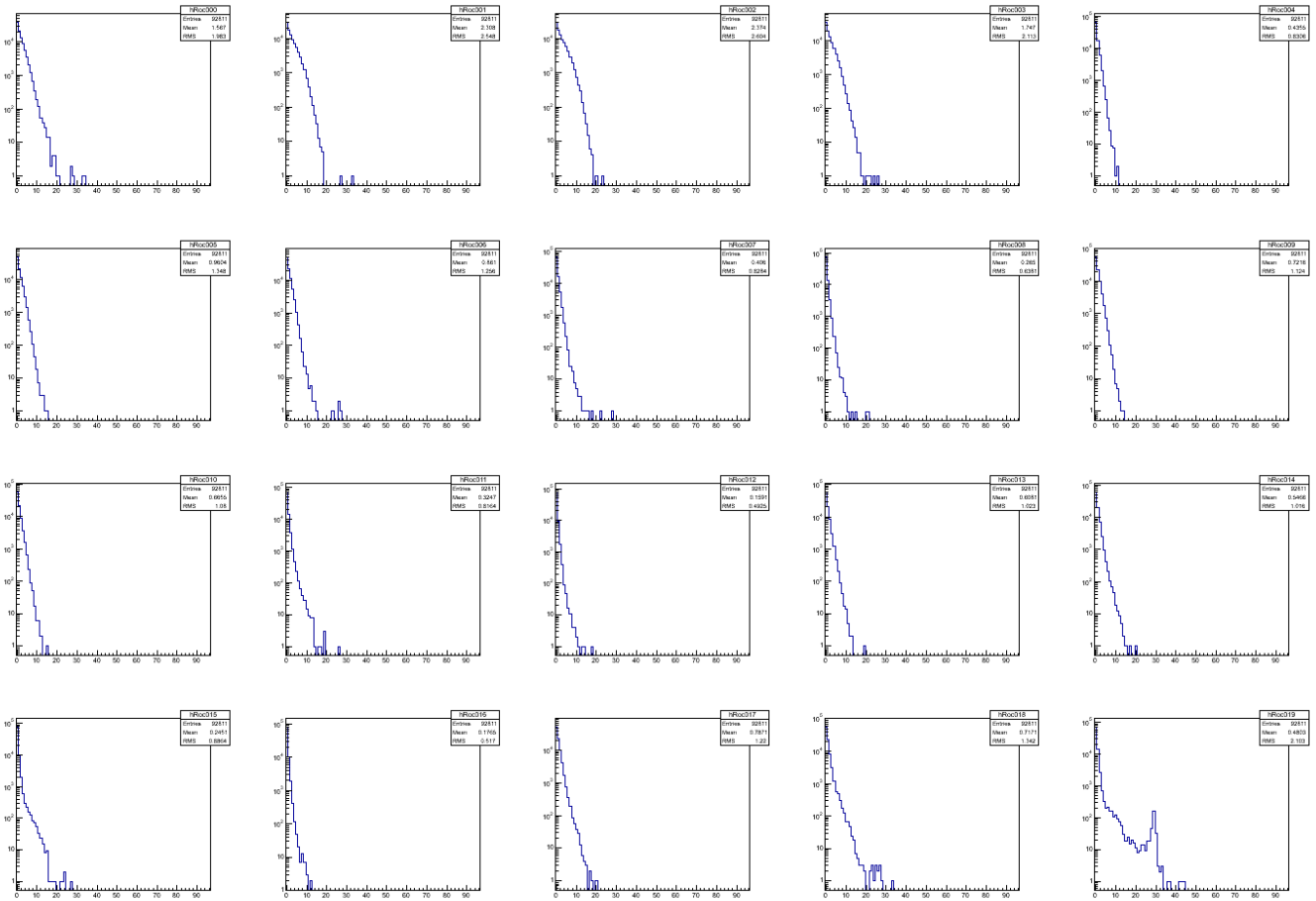




[South left, North right]

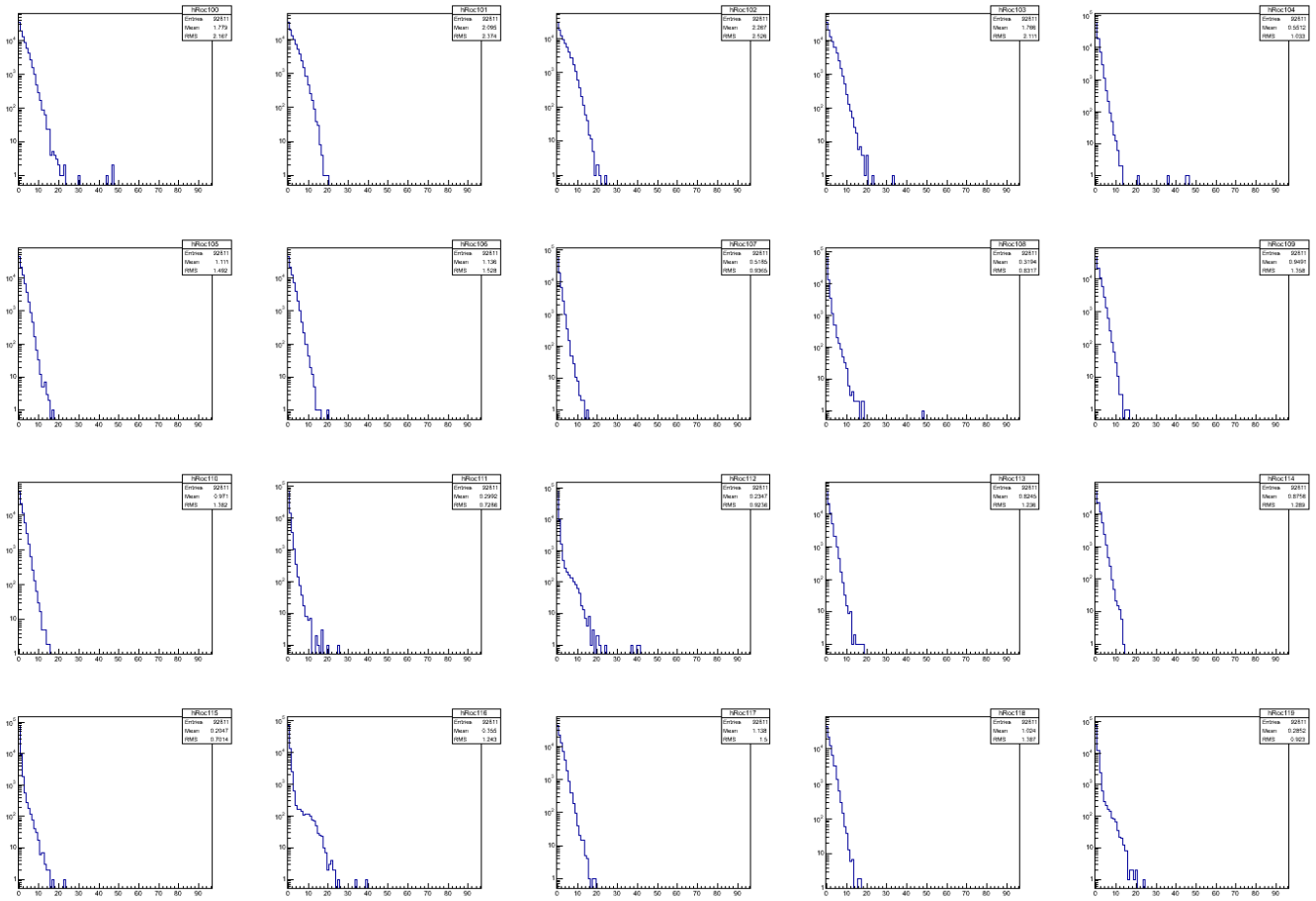
Nhits per event - CuAu All : per ROC, South Horiz 10

To further investigate where the extra MUID hits may be coming from, we can also see if the number of hits correlate with some particular ReadOut Cards; there are 20 of those in each orientation. The plot below is for South Horizontal FEM (1/4th of full MUID). One can see bumps in the distribtions for the later ROCs (corresponding to later gaps).



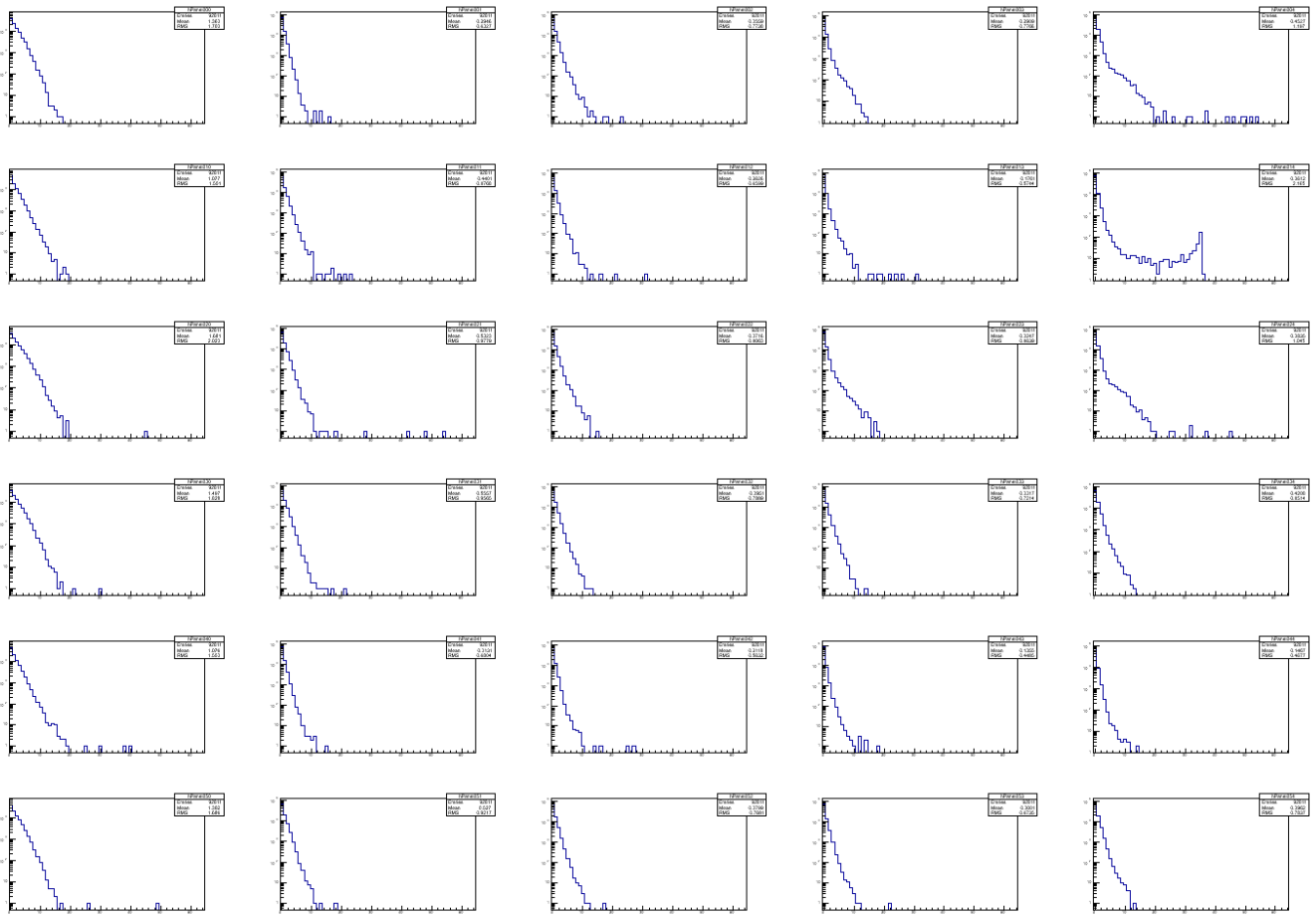
Nhits per event - CuAu All : per ROC, South Vert

The plot below is for South Vertical FEM (1/4th of full MUID). One can see bumps in the distribtions for the later ROCs (corresponding to later gaps) - maybe not so clearly.



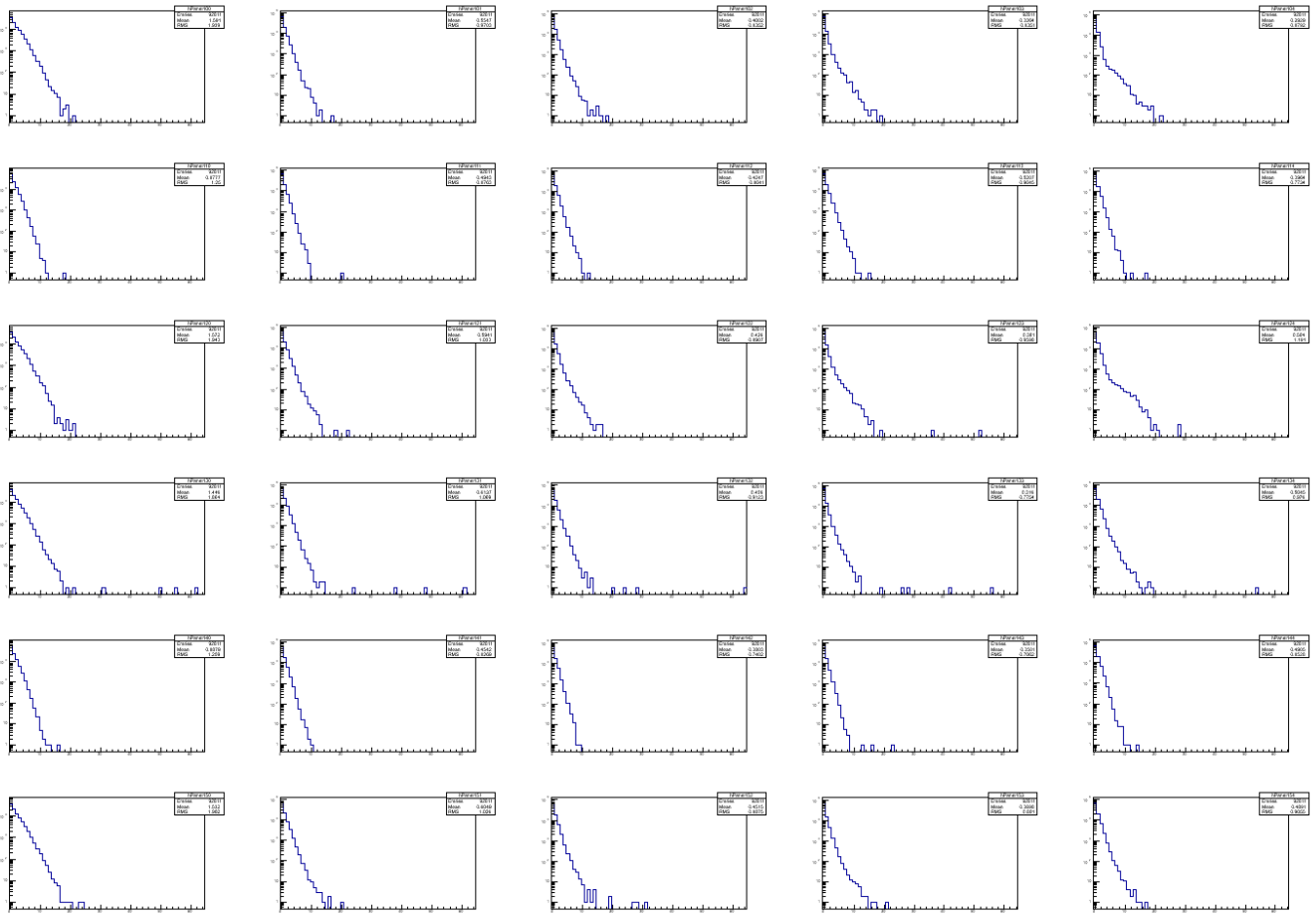
Nhits per event - CuAu All : per Panels, South Horiz 12

We can also see if the number of hits correlate with some particular detector panels; there are 20 of those in each orientation. The plot below is for South Horizontal FEM (1/4th of full MUID), with the 5 columns from left to right corresponding to the MUID gaps, and the 6 rows of plots corresponding to the panels (0 at the top). One can see a background bump in the last gaps, perhaps in particular for panels 0-2 (upper panels).



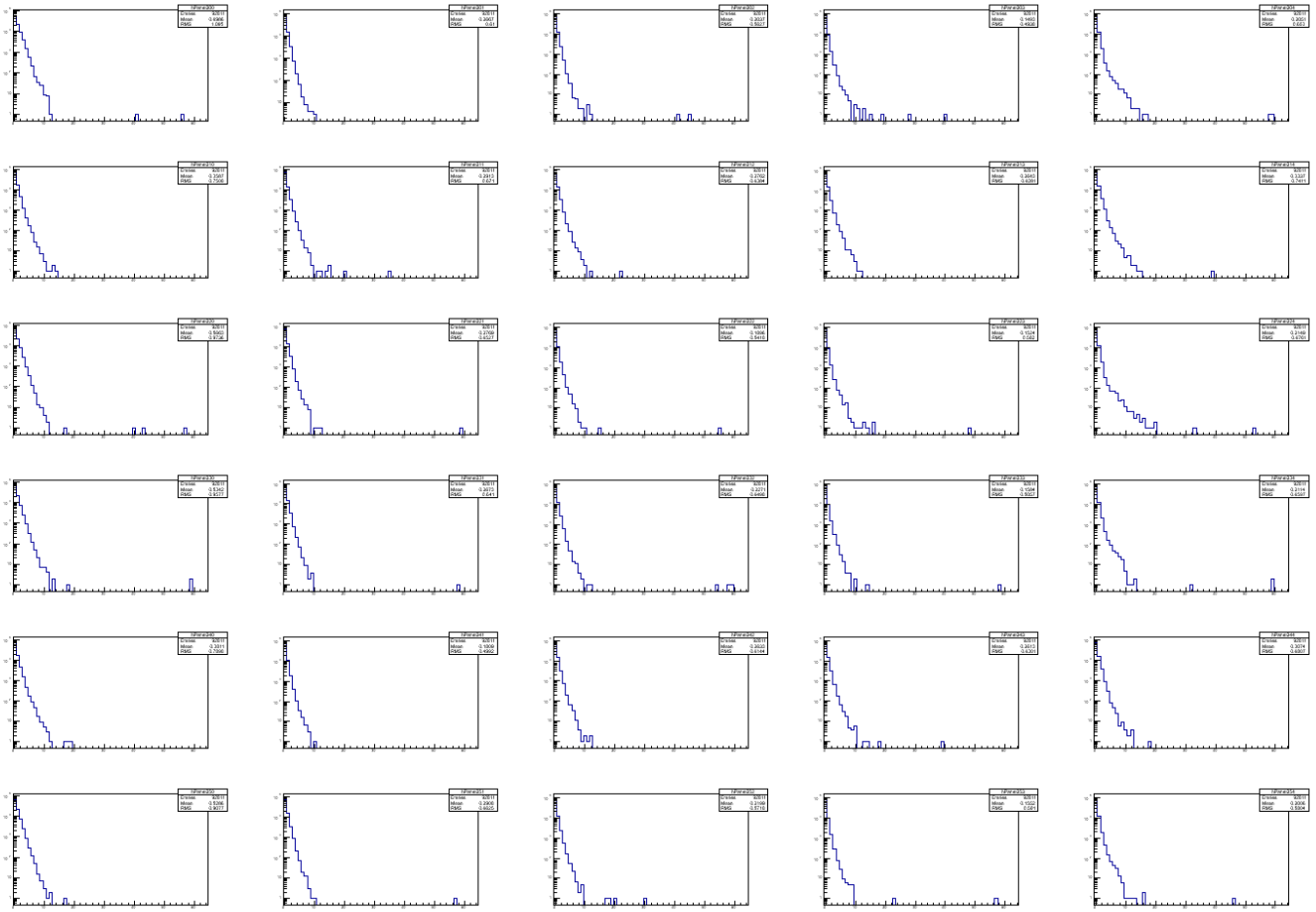
Nhits per event - CuAu All : per Panels, South Vert 13

The plot below is for South Vertical FEM (1/4th of full MUID), with the 5 columns from left to right corresponding to the MUID gaps, and the 6 rows of plots corresponding to the panels (0 at the top). One can see a background bump in the last gaps, perhaps in particular for panels 0-2 (upper panels).



Nhits per event - CuAu All : per Panels, North Horiz 14

Same plot as on previous slide, but now for North Horizontal FEM (1/4th of full MUID). The pattern seen for the South (background bump in the last gaps) is not really observed in the North arm.



Some noise or background seen, particular in the South arm, later gaps, upper panels (as also seen in pp and UU).

To avoid issues with large mult. events, one could use cuts Cesar developed, but with tighter values than the default, rather than the asymmetry cuts developed for Au+Au and U+U systems.