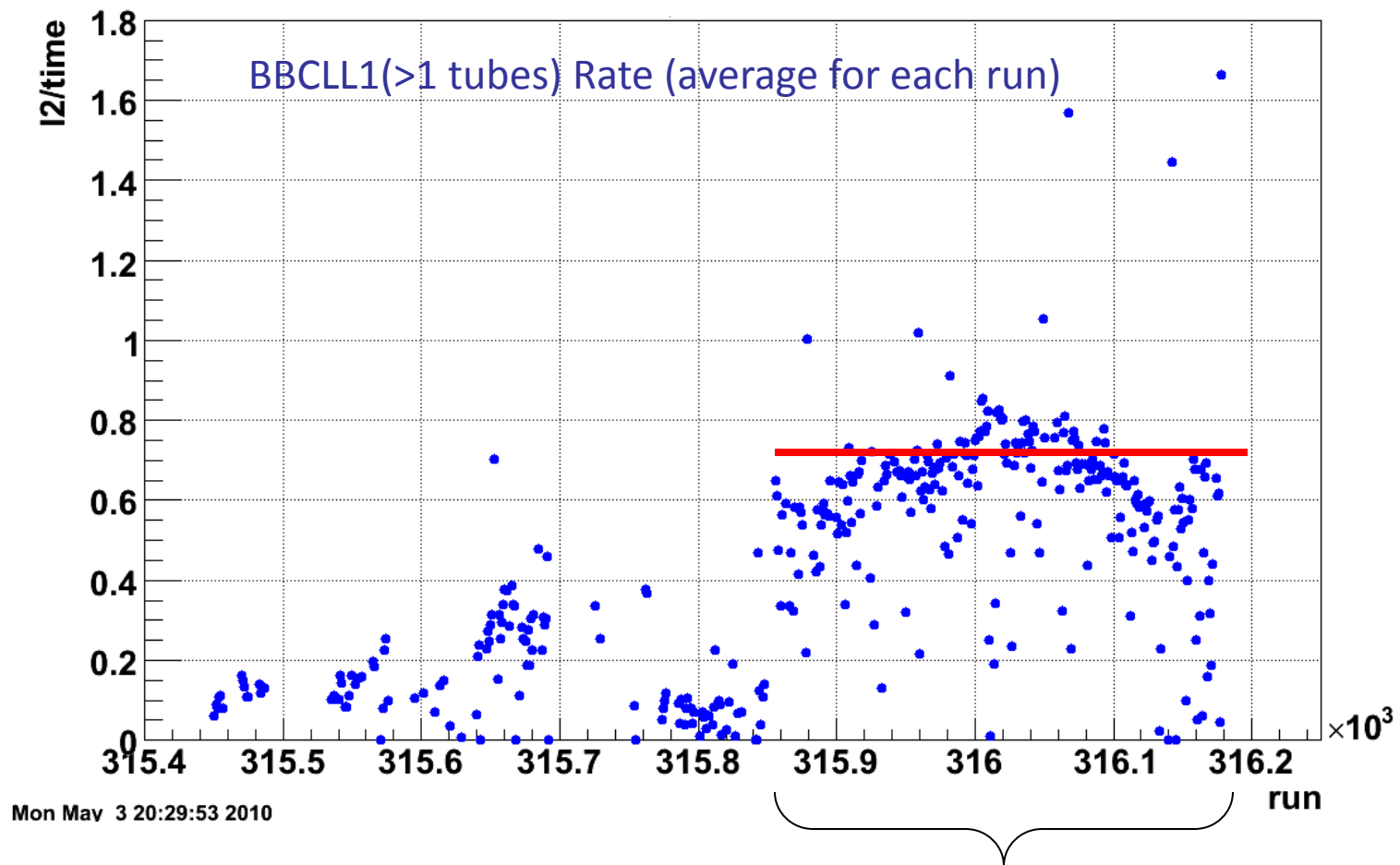


PHENIX Event Rate and Checks

Stefan Bathe for PHENIX

RHIC Machine-Experiment Meeting

05/04/2010



by Jamie Nagle

Over the last 4 days, the average physics trigger rate ~ 0.7 Hz taken over a given PHENIX run (which typically corresponds to one store).

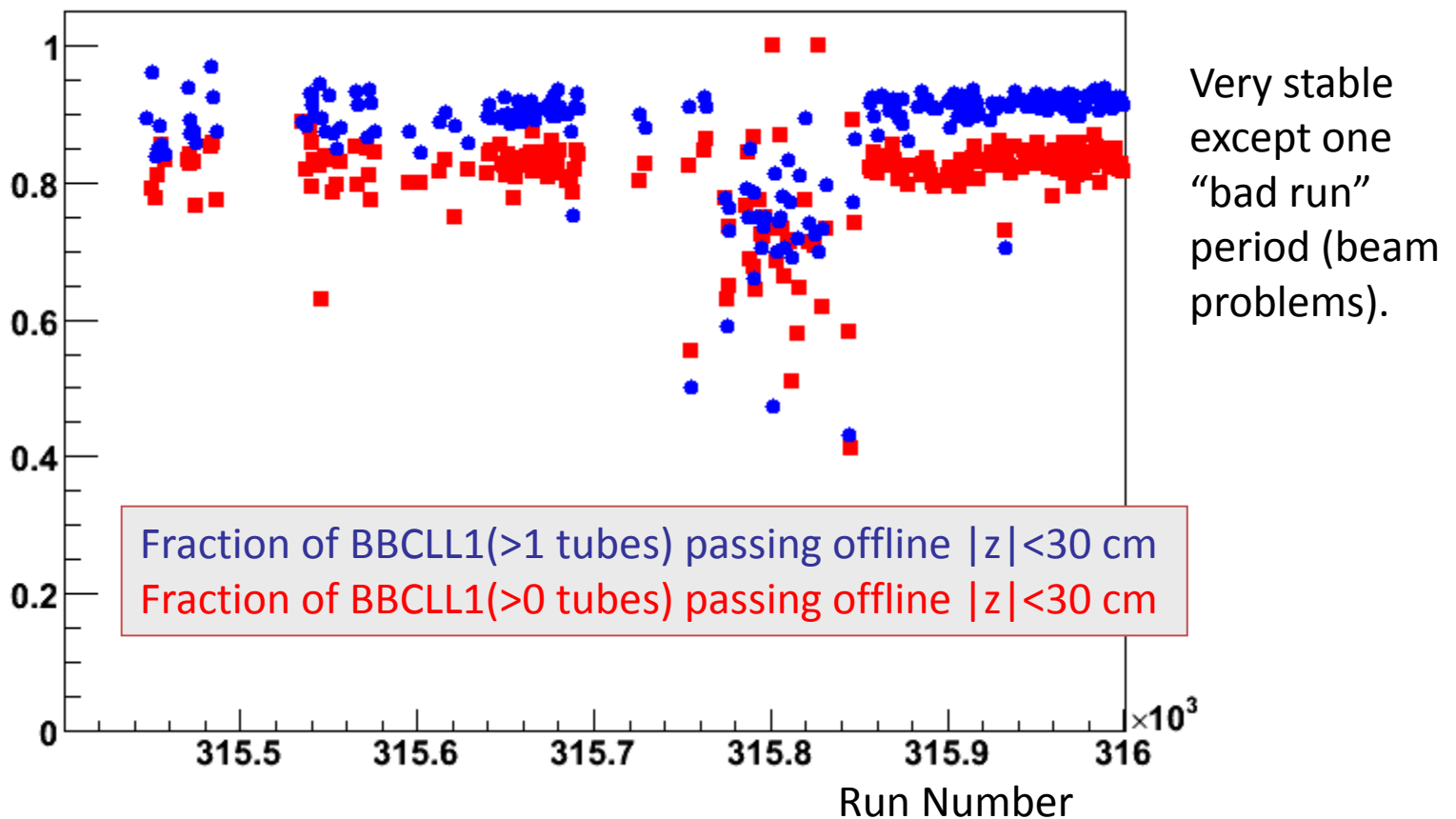
We expect to “see” $\sim 70\%$ of the AuAu inelastic cross section within $|z| < 30\text{cm}$.
Is there background in this trigger sample?

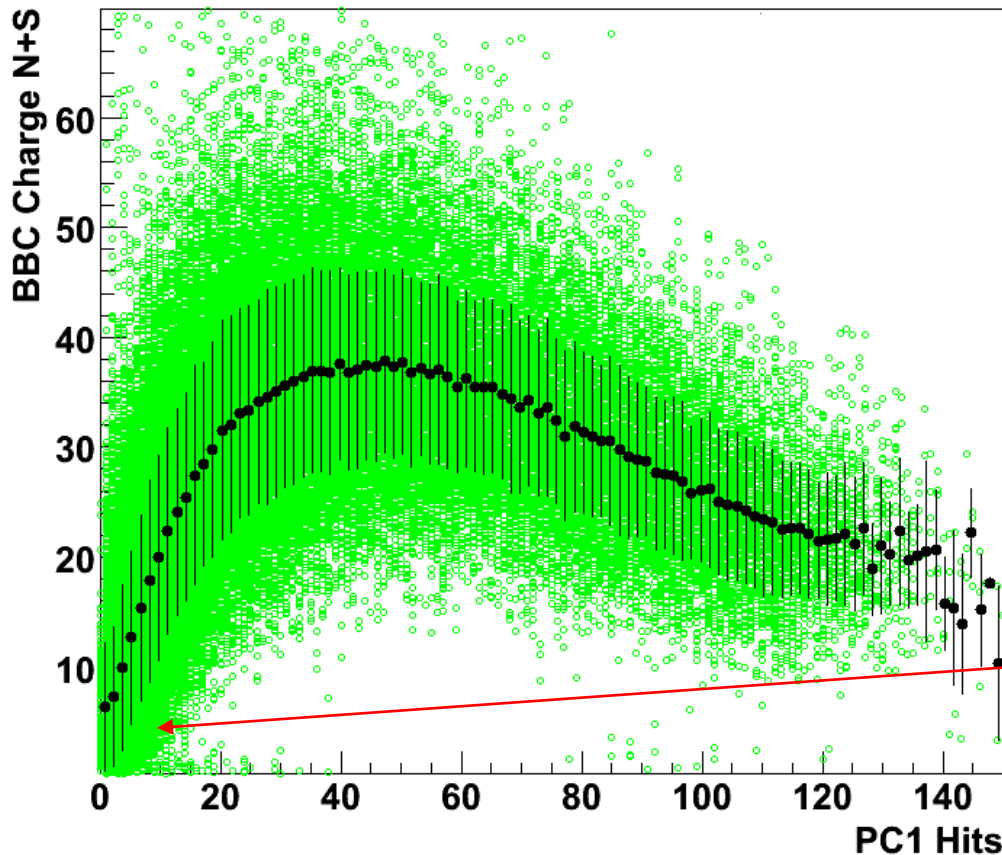
PHENIX-STAR Comparison

- STAR has reported similar rate of good events from offline (vertex) validation
- STAR's vertex cut is ± 75 cm (cf. ± 30 cm in PHENIX); this should give factor 2.4 larger rate
- How can this be reconciled?
- Our part: check PHENIX rate

This set of runs includes 100,702 live BBCLL1(>0 tubes) recorded
and as a subset of that 87,611 live BBCLL1(>1 tubes) recorded.

by Jamie Nagle





Run-10 AuAu @ 7.7 GeV

72,078 events total up to Run Number 315,999 passing BBCLL1(>1 tubes) and $|z| < 30$ cm.

by Jamie Nagle

Is there hidden background?

Very similar to what was seen at 9 GeV and expected from URQMD + fragmentation model. Direct comparison to URQMD + fragmentation model through PISA will be very interesting (Jeff Mitchell is running more URQMD jobs for this comparison).

https://www.phenix.bnl.gov/phenix/WWW/p/info/an/843/AnalysisNote_LowEnergyRun8v2.pdf

5/4/2010

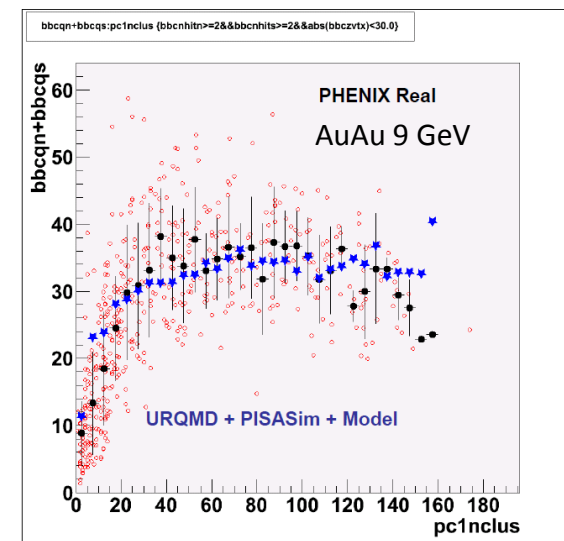


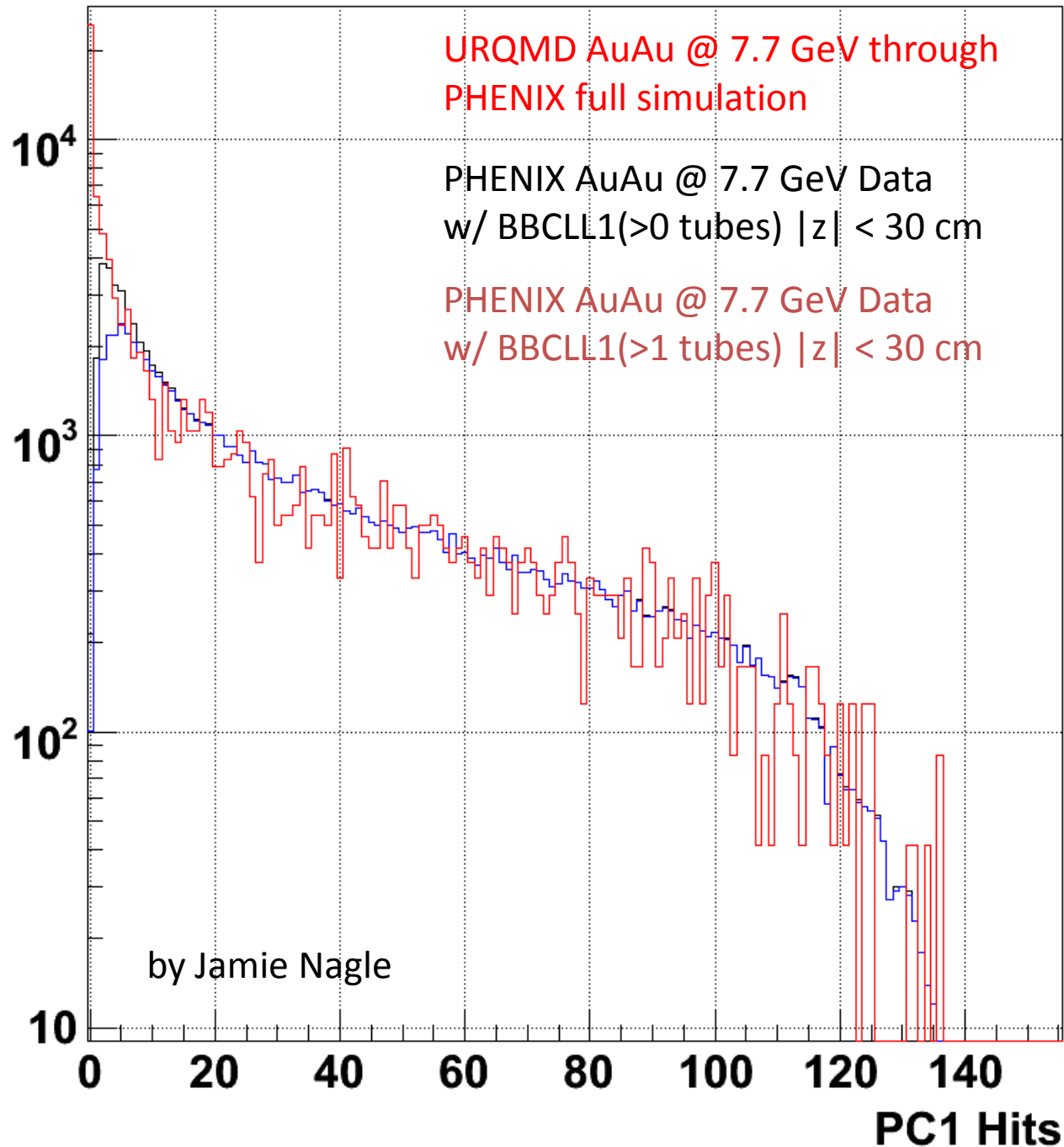
Figure 5: Shown are PHENIX Real Data (red points and solid black TProfile points) for BBC charge (North + South) as a function of the number of PC1 clusters. For comparison, we show the URQMD + PISA + Spectator Fragmentation Model results as a TProfile (blue stars).

URQMD is normalized to match the real data integral for PC1 hits > 40 .

URQMD is not matched to the z distribution in real data. **However, note that there is no rescaling of the x-axis.**

Then comparing the integrals implies (as a first look) that the BBCLL1(>0 tubes) fires on 77% of the cross section and the BBCLL1(> 1 tubes) fires on 70% of the cross section.

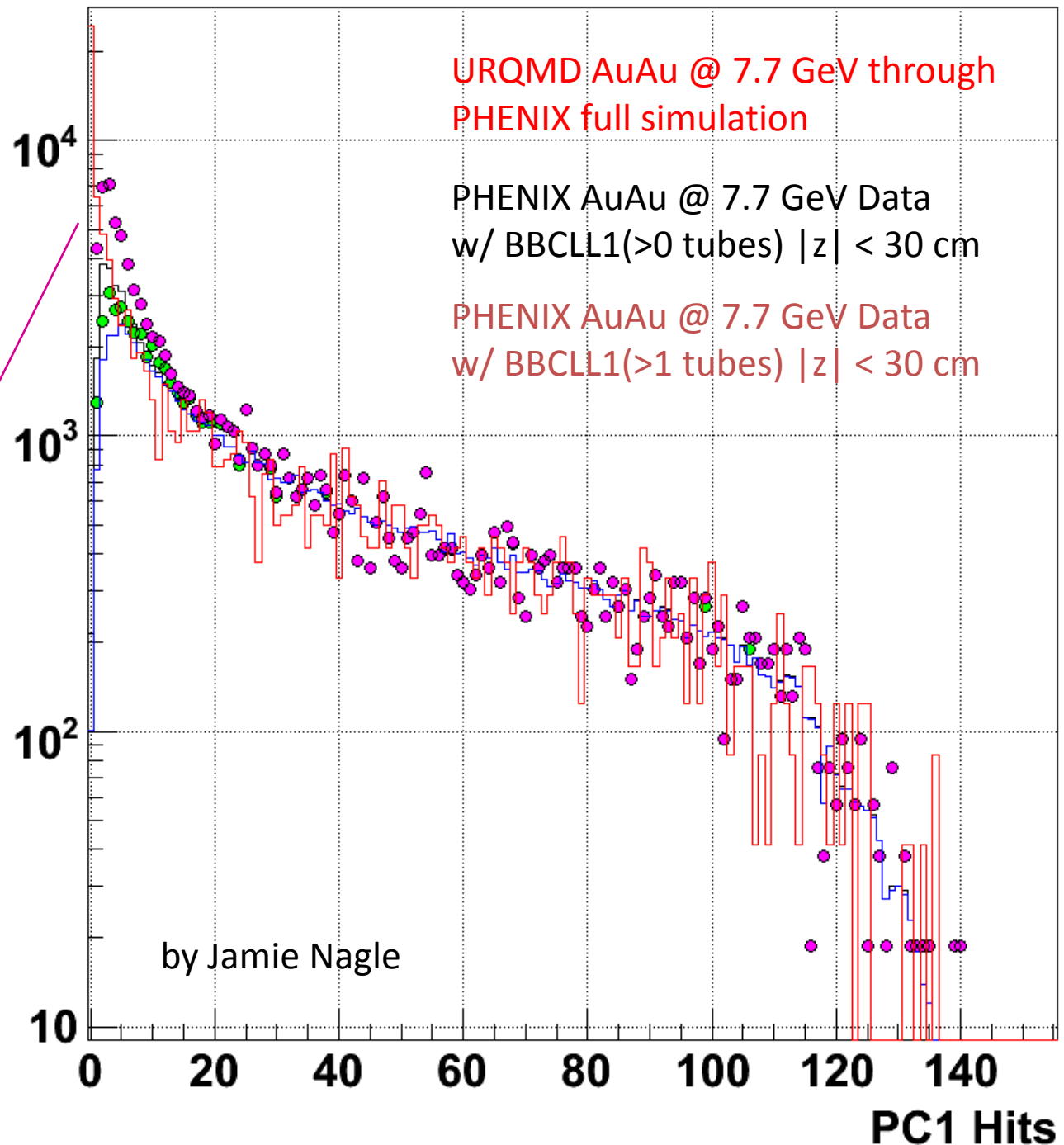
No indication of deviation at low PC1 hits from background (at least by this particular check).



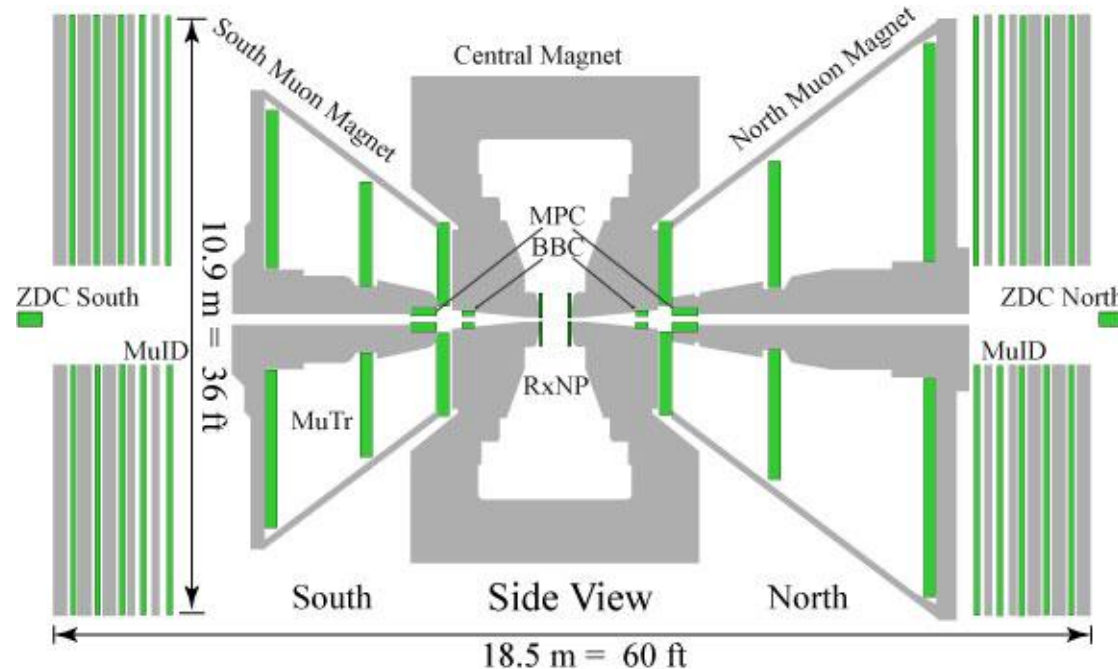
Just as a curiosity,
compare this PC1 hits
distribution for the “bad
running” period
315600-315850.

The BBCLL1(>1 tubes)
distribution looks very
similar to the other
running periods.

However, the BBCLL1(>
0 tubes) distribution has
a large excess of events
at low PC1 hits
(indication of
background). Compare
magenta points to the
black histogram.



Random Coincidence Rate



- Why is PHENIX BBC so clean compared to STAR VPD?
 - Closer to nominal interaction point: 150 cm
 - Shielded
 - 20 ns timing window

- BBC singles rate from Blue Logic: ~ 4 Hz
- Blue Logic uses only 4 out of 64 tubes on each side
- Scale up by factor 10 (16 max.): 40 Hz
- Random coincidence rate from singles:
 - $40 \text{ Hz} / 9.4 \text{ MHz} *$
 - $40 \text{ Hz} / 9.4 \text{ MHz} *$
 - $9.4 \text{ MHz} =$
 - $1.7 \times 10^{-4} \text{ Hz}$

Summary

- If PHENIX rate were due to random coincidences, singles rate would have to be high
→ excluded!
- If PHENIX rate were due to interactions of beam with non-beam (beam pipe, gas), expect events to pile up at low PC multiplicity
→ not observed
- If S/B is decreased by large factor, small contamination is observed
→ confirms that that contamination of good event sample is very small (of order couple percent)