Update on multiplicity cumulants

w.j. llope, 4/23/2014
updated: 4/25/2014

Au+Au 14.5 GeV: test production QA and preliminary results


Net-K in 2010&2011 data

Run-14 14.5 GeV

14.5 GeV

now looking at full “test production” triggers used: (BBC_mb || bbc_mon_tof)

AuAu 14.6GeV run 2014 preview production is completed. Runnumbers without PXL, IST & SST detectors in have been processed. Total statistics is 405M events which includes next stream data:

- st_physics - 332M events;
- st_mtd - 9.5M events;
- st_hltgood - 63.5M events;

Lidia.
Bulkcorr PWG meeting, 4/23/2014

Updated versions on next page
1D QA by run index, updated...

I reject runid < 14052074 and 15056113 ≤ runid ≤ 15058052
Run-14 14.5 GeV

2D QA, updated

much better now
Run-14 14.5 GeV

Totals

Rvtx < 1 cm w.r.t. (0.0, -0.9), |Zvtx| < 30 cm, and non-test-ID BBC_mb..... **15.4 M events**

Following preliminary Run and Event QA..........................**11.5 M events**
RefMult, $\text{min}=100, n_{pp}=1.080, k=2.50, x=0.14$

$\text{consteff}=0; \text{eff}=0.14 \rightarrow Npt=265, \chi^2/Npt=41.73$

Entries $1.26187e+07$
RefMult2, min=100, n_{pp}=0.985, k=2.50, x=0.14
consteff=0, eff=0.14 \rightarrow N_{pt}=235, \chi^2/N_{pt}=45.32
Software environment

- **MuDst**
  - **anpp**: select minbias trigger, apply $|Z_{vtx}|$ cut, calculate refmultX
  - save event info and all primary tracks to TTrees

- **pDST@rice**
  - **fluct**: fill 4 “base” TH2Ds for specific track cut sets
    - (net,tot,pos,neg) vs. centrality variable

- **qa_**
  - **fluct_**: (root,PDF)
  - **fluctplot**: collect results from all sources and make final plots
  - make connections to LQCD

- **mix**
  - **mix_{DS}_**: (root,PDF)
  - **fluctplot**: collect results from all sources and make final plots
  - make connections to LQCD

- **QA**

**Compiled C++ code**

- **{DS}** unique identifier for year and $\sqrt{s_{NN}}$
  - Data
  - Compiled C++ code

**fluctplot**: collect results from all sources and make final plots

**mix**: read TH2Ds from net-p paper, net-q paper, or fluct
- calculate Cx, Rxy vs. centrality variable
- efficiency corrections
- CBW averaging
- bootstrap errors
- Sampled singles/IRV cumulant arithmetic

**qa**: bad runs: 30 variables, check 6, require $\geq 4$ vars fail
bad events: 10 2D correlation plots, check 2, $\pm N\sigma$ cuts

**fluct**
- fill 4 “base” TH2Ds for specific track cut sets
  - (net,tot,pos,neg) vs. centrality variable
My first results with ~300k events...

Run-14 14.5 GeV

Net-p cumulants and cumulant ratios: 14.5 GeV

C1
C2
C3
C4

C1/C2
C3/C1
C3/C2
C4/C2
C4/C3

deeper dip?
Run-14 14.5 GeV

Net-p cumulants and cumulant ratios: 14.5 GeV
Net-p cumulants and cumulant ratios: 14.5 GeV

uses efficiencies from net-p 19.6
Run-14 14.5 GeV

Net-q cumulants and cumulant ratios: 14.5 GeV

- Uncorr $C_q$, $|\eta|<0.5$, RM2
- Uncorr $C_2$, $|\eta|<0.5$, RM2
- Uncorr $C_3$, $|\eta|<0.5$, RM2
- Uncorr $C_4$, $|\eta|<0.5$, RM2

$R_{12}$, $|\eta|<0.5$, RM2
$R_{32}$, $|\eta|<0.5$, RM2
$R_{42}$, $|\eta|<0.5$, RM2
$R_{43}$, $|\eta|<0.5$, RM2

Comparison of uncorr data, uncorr SampSing, and uncorr (N)BD.
Run-14 14.5 GeV

Net-K cumulants and cumulant ratios: 14.5 GeV

[Graphs showing net-K cumulants and cumulant ratios for Run-14 14.5 GeV]
Run-14 14.5 GeV

Net-K cumulants and cumulant ratios: 14.5 GeV
NET-K

showing only 2010&2011 data from here on...
QM2012 results are the official “STAR Preliminary” and are \( \text{avg}(\text{Gary, dmac}) \)
Gary and dmac results are very consistent, except 62.4 GeV 0-5% and 200 GeV
My net-K results compared to QM2012 results

My values agree rather well with QM2012 results, I use bootstrap errors
Run-14 14.5 GeV

Bulkcorr PWG meeting, 4/23/2014

net-K comparison 0-5%

net-K C_4/C_2 0-5%
uncorrected

- QM2012
- amal
- dmac
- WJL

\( \sqrt{s_{NN}} \) (GeV)
Run-14 14.5 GeV

Bulkcorr PWG meeting, 4/23/2014

net-K comparison 0-5%, band is avg(dmac,WJL)
Run-14 14.5 GeV

my uncorrected net-K with (N)BD and Sampled Singles, 19.6 GeV
Run-14 14.5 GeV

my uncorrected net-K with (N)BD and Sampled Singles

Bulkcorr PWG meeting, 4/23/2014
Run-14 14.5 GeV

my uncorrected net-K with (N)BD and Sampled Singles, 0-5%

Bulkcorr PWG meeting, 4/23/2014
Run-14 14.5 GeV results using almost all of the test production data.

~12M good BBC-mb events with good Rvtx and |Zvtx|<30cm
~11M good events with tighter restrictions on tofmult...

RefMult, RefMult2, & RefMult3 distributions generally look o.k.

uncorrected net-p $C_4/C_2 \sim 0.92$

the “dip” I saw in the initial 300kevt analysis mostly gone in present dataset

uncorrected net-K $C_4/C_2 \sim 0.98$

I do need to tighten up the 1DQA and 2DQA. Now done.

More events at 14.5 GeV would certainly be helpful.

2010&2011 data net-K comparison plots shown for uncorrected cumulants

STAR Preliminary, dmac, plus new WJL & amal