STAR Ready to move on to 7.7 GeV

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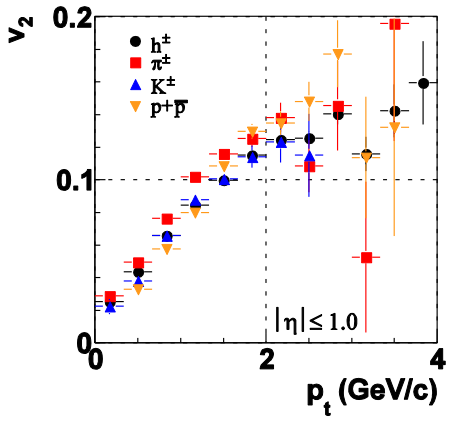
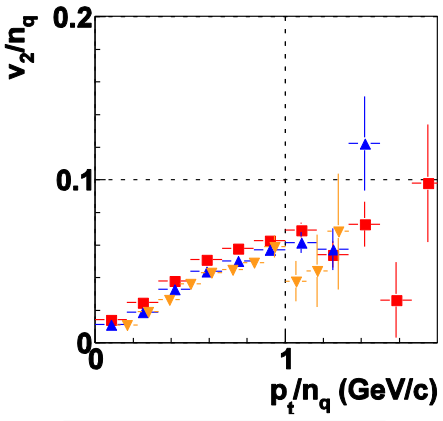
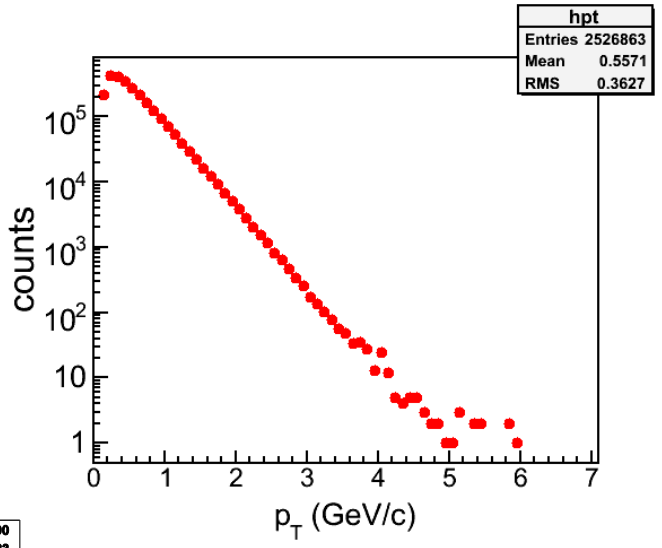
For

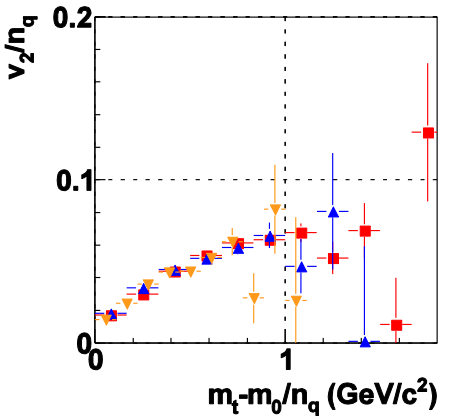
The STAR Collaboration

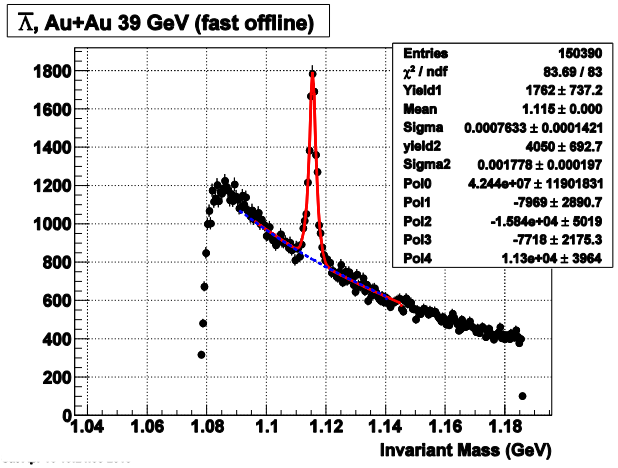
April 13, 2010.











Please N.B. All data plots shown in this presentation are online QA plots, and are not for distribution.

STAR BUR10

Run 10: 30 cryo-weeks, 25 weeks for physics production with a single species

a) **Search for the existence and location of the QCD Critical point. First energy scan from $\sqrt{s_{NN}}$ = 7.7 to 39 GeV Au+Au collisions, combined with C-AD test to increase luminosity for $\sqrt{s_{NN}}$ = 5 GeV Au+Au collisions**

b) 200 GeV Au+Au low material run with full Time-of-Flight and DAQ1000, in order to study in more detail the properties of matter produced at top RHIC energy

Run10 Physics Programs

Beam Energy (GeV)	29 cryo-week	STAR BUR In days	Physics
200	11 1/2 - 3/18	56	
62.4	4 3/20 - 4/17	0	
39	1.5 4/8 – 4/??	5 (24M)	BES programs QCD phase boundary
27		15 (33M)	
18		16 (15M)	
11.5	2 **6/7 - 21**	19 (5M)	
7.7	4 4/?? - 31	56 (5M)	
5.5	0.5 6/2 - 5	5 (0.1M)	

Weekly planning info: *http://www.c-ad.bnl.gov/esfd/RMEM_10/rhic_planning.htm*

Primary Physics Goals for the Beam Energy Scan

= we've already taken a factor of 3 more evts than needed for the most challenging of our goals at 39 GeV!

	Collision Energies (GeV)	5	7.7	11.5	17.3	27	39	
Section	Observables	Millions of Events Needed						
A1	v_2 (up to ~1.5 GeV/c)	0.3	0.2	0.1	0.1	0.1	0.1	✓
A1	v_1	0.5	0.5	0.5	0.5	0.5	0.5	✓
A2	Azimuthally sensitive HBT	4	4	3.5	3.5	3	3	✓
A3	PID fluctuations (K/π)	1	1	1	1	1	1	✓
A3	net-proton kurtosis	5	5	5	5	5	5	✓
A3	differential corr & fluct vs. centrality	4	5	5	5	5	5	✓
A3	integrated p_T fluct (T fluct)							
B1	n_q scaling π/K/p/Λ $(m_T-m_0)/n<2$GeV		6	5	5	4.5	4.5	✓
B1	φ/Ω up to $p_T/n_q=2$ GeV/c		56	25	18	13	12	✓
B2	R_{CP} up to p_T ~4.5 GeV/c (at 17.3) 5.5 (at 27) & 6 GeV/c (at 39)				15	33	24	✓
B3	untriggered ridge correlations		27	13	8	6	6	✓
B4	parity violation		5	5	5	5	5	✓

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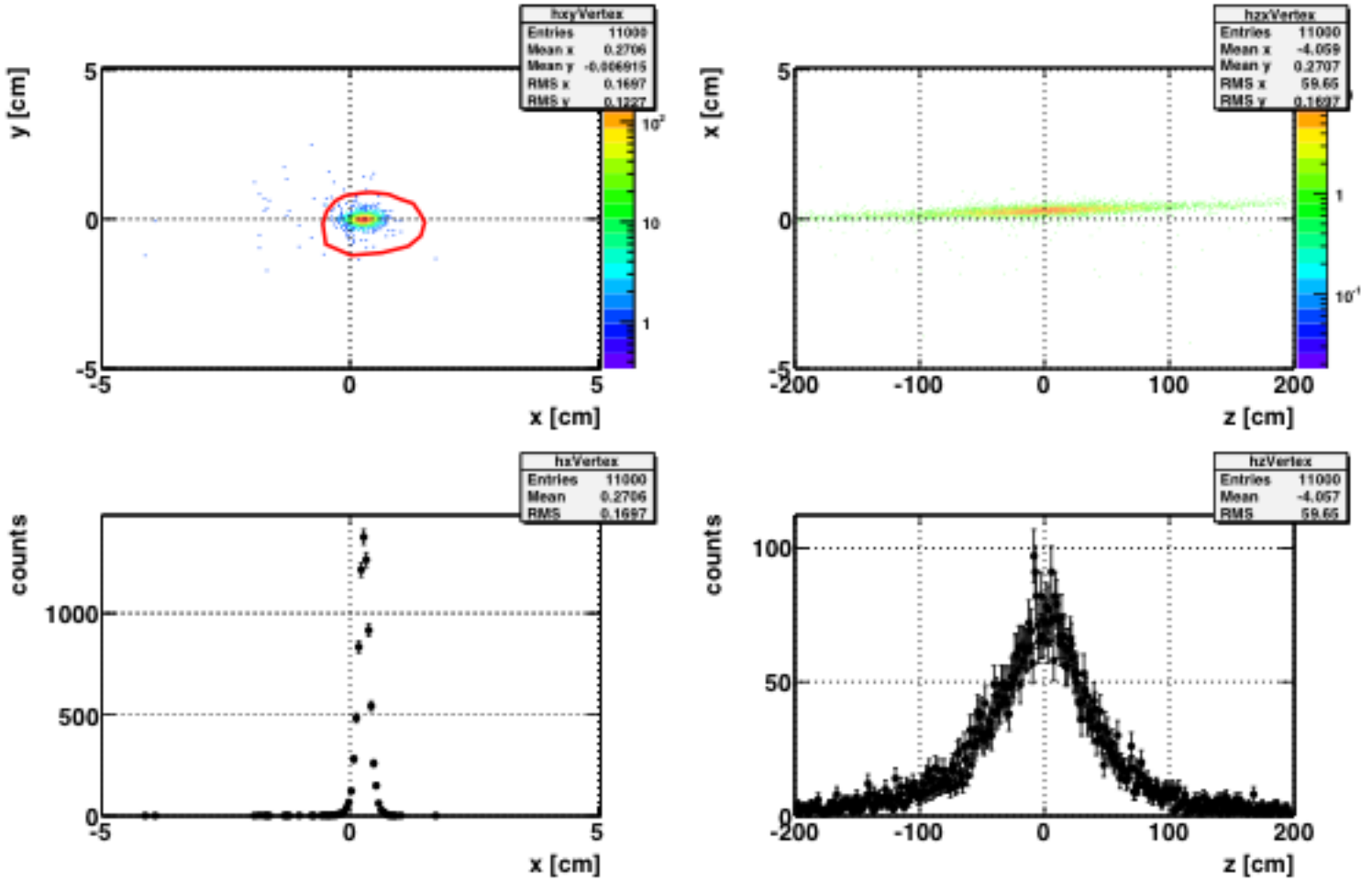
STAR Is Ready for BES (i)

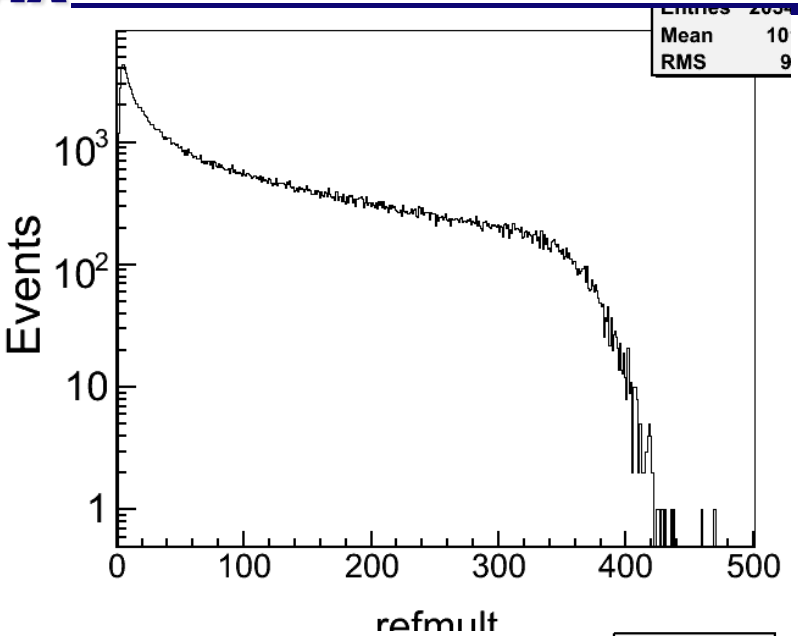
April 9th, st_physics_11099038_raw_2020001

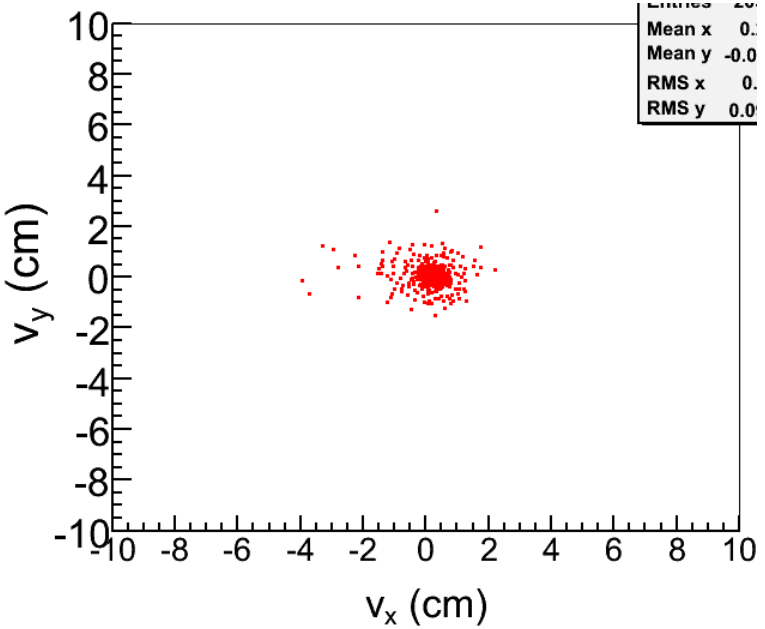
Au+Au at $\sqrt{s_{NN}}$ = *39* GeV:

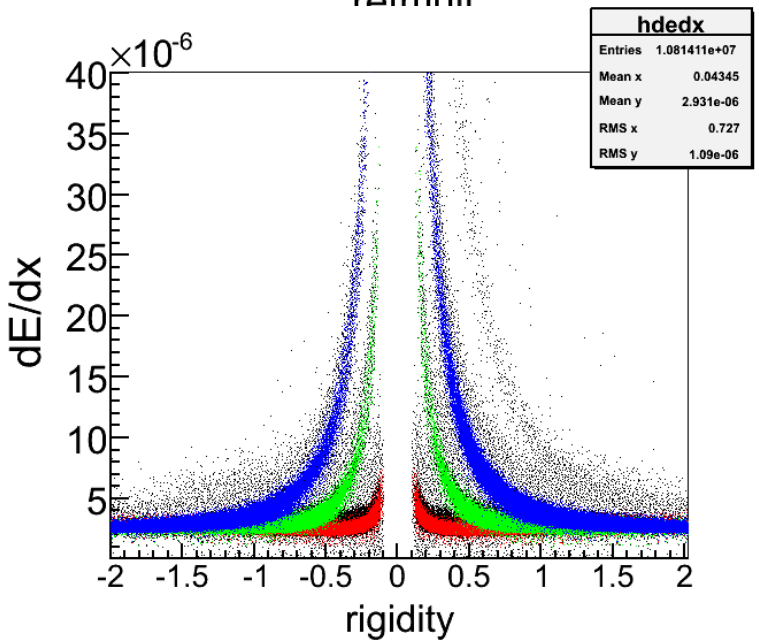
On-line monitoring beam positions!

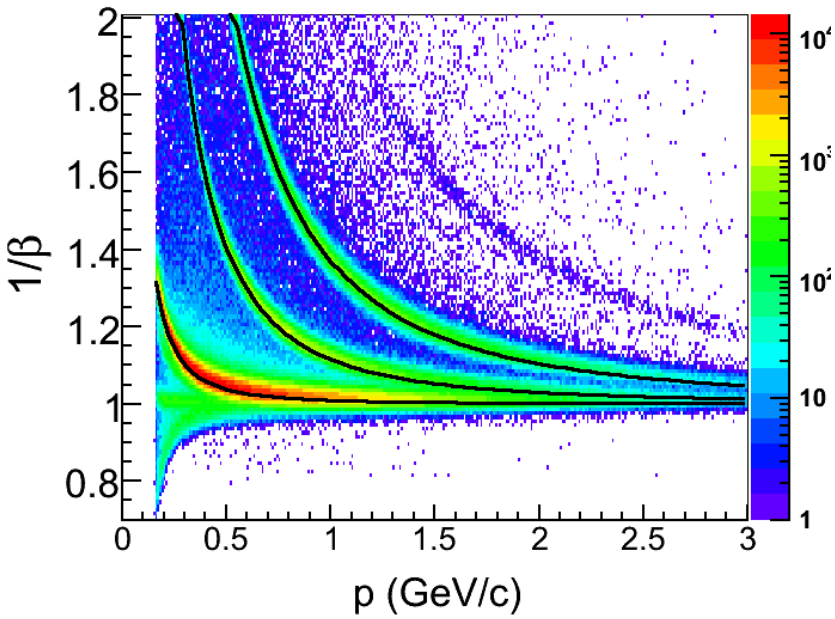


STAR is Ready for BES, Examples of online QA plots





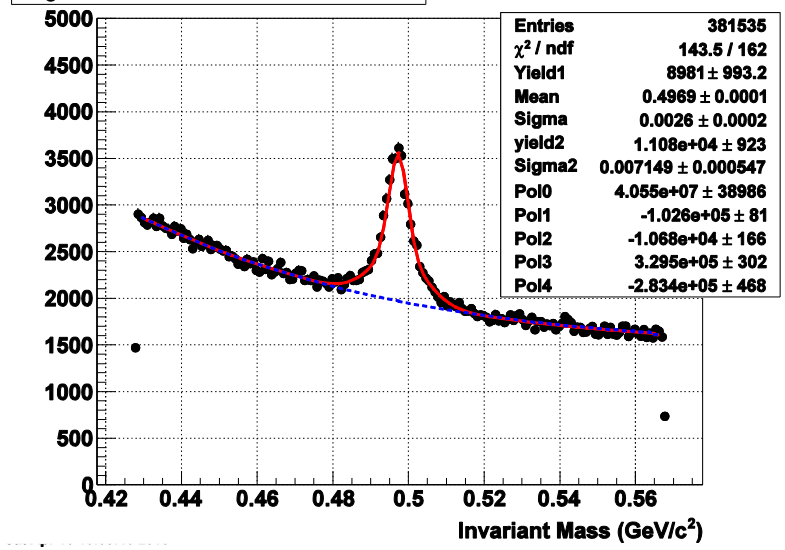




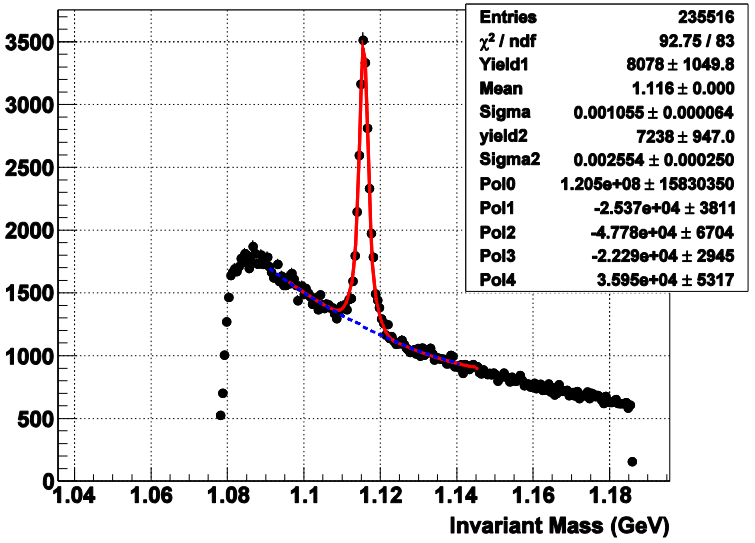
A few examples of online data QA plots for 39 GeV

Zhanglei Zhu, Tsinghua

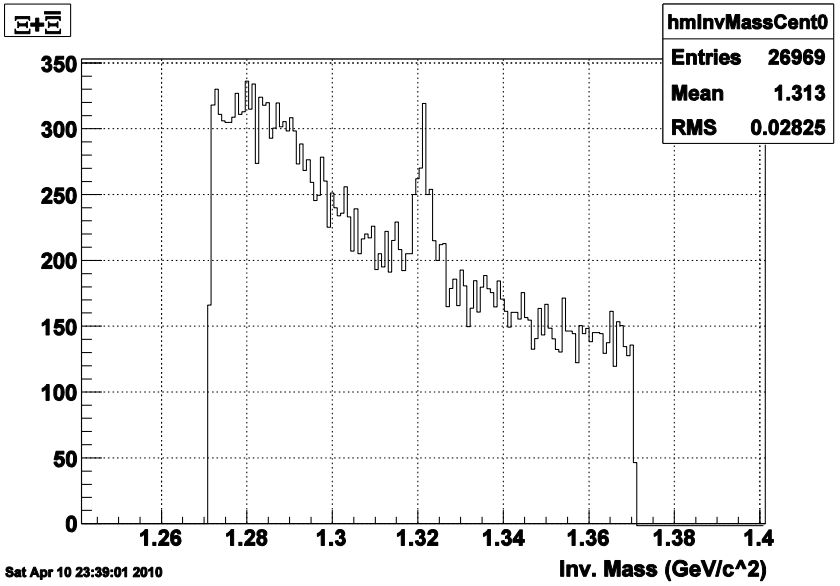
K^0_S, Au+Au 39 GeV (fast offline)



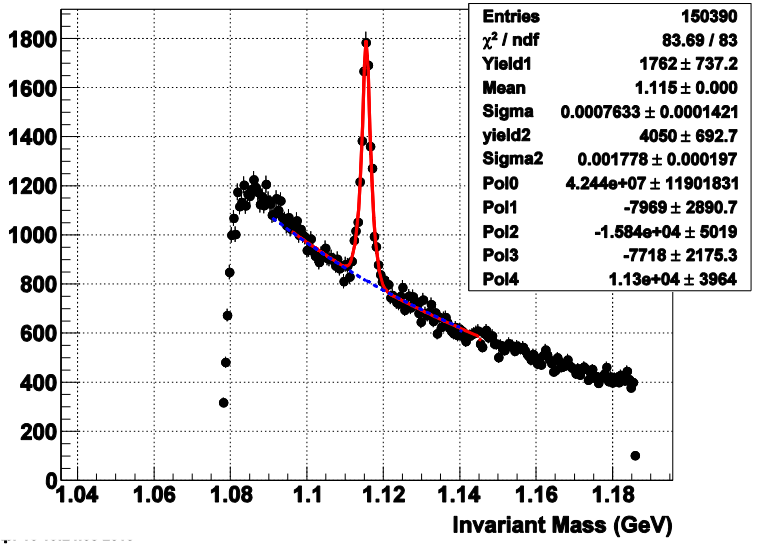
Λ, Au+Au 39 GeV (fast offline)



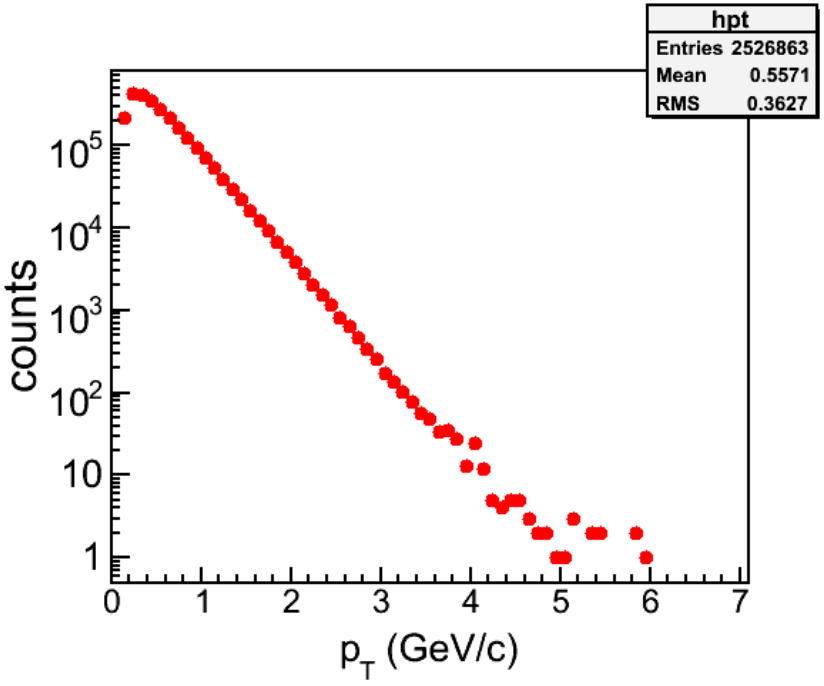
Ξ+Ξ̄

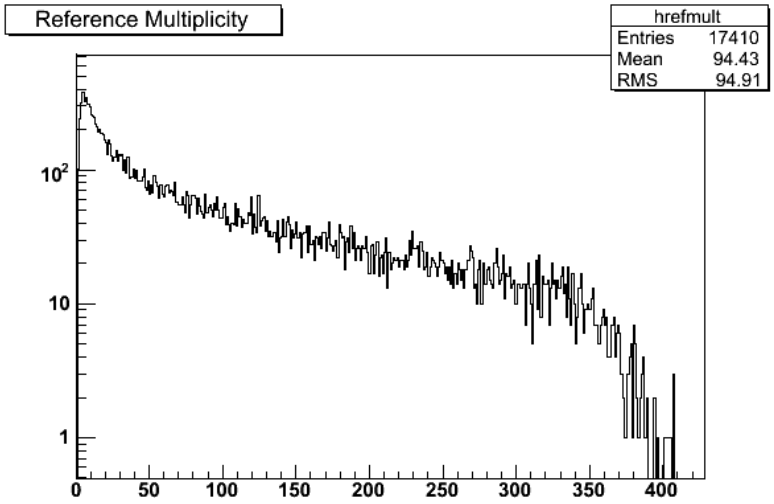


Λ̄, Au+Au 39 GeV (fast offline)



Running longer at 39 GeV will not extend the Pt range significantly!





Calculation of number of mb evts needed to get 10 counts in bin

Pt bin	<Pt>	# of mb evts
(GeV/c)	(GeV/c)	(Mevts)
1.25	0.1195	0.000185
1.75	1.683	0.00111
2.25	2.185	0.00585
2.75	2.69	0.0283
3.25	3.195	0.12
3.75	3.699	0.452
4.25	4.203	1.52
4.75	4.705	4.72
5.25	5.208	13.6
5.75	5.71	37.3
6.25	6.211	97.6
6.75	6.713	247
7.25	7.213	608
7.75	7.714	1470

~70 Mevts

Running longer won't significantly extend Pt reach

Summary for 39 GeV Run

Many thanks to CA-D, at 39 GeV, we have collected **72** M events. The data allow us to perform all of our planned physics analyses. We already have some fast offline results on these analyses!

More data will not provide significant improvement of the physics conclusions at this energy.

STAR is ready to move on to 7.7 GeV

1) we will be able to do R_CP up to pt ~ 6 GeV/c ==> check the turn off of the **jet-quenching**

2) PID v2 number of constituent quark scaling for pions, K, p, Lambda up to pt ~ 5 GeV/c ==> check the **coalescence process** and **partonic vs. hadronic scenarios**.

STAR Request:

1) Move to 7.7 GeV as soon as the 39 GeV goals are reached!

   (STAR currently has ~70+ Mevts, Goal was 25 Mevts)

2) At 7.7 GeV, ***5M*** events are needed:

   - number of quark scaling in v_2 => phase boundary

   - disappearance of LPV => phase boundary

   - net-proton Kurtosis => critical point

   - …

3) Test collision at 5 GeV

4) Move to 11.5 GeV