Status and Considerations for Mass Production and Hyperon Flow Feasibility Studies

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* Hyperon Flow Studies require massive statistics.
What is considered “mass production”?
(1 million is definitely not enough for
detailed flow studies, let alone hyperon flow studies)

* How is it done? What is the request procedure?
Who does it? On what versions, models, details?
What is a reasonable request (time, size, etc.)?

* Models (which? At least 2, UrQMD, LaQGSM)
Energies (at least 3, e.g. 4, 7, 9, 11 GeV)

Some considerations and details follow...

Considerations...

* GEANT4 for FHCal

* New TOF sigma (80 ps) for better PID?
(e.g. high pT Kaons)

* Most FHCal unneeded mctracks have been removed, so RECO files are much, much smaller.
Is the crash with TOF point and missing FHCal mctrack still there? My version still has it.

… considerations...

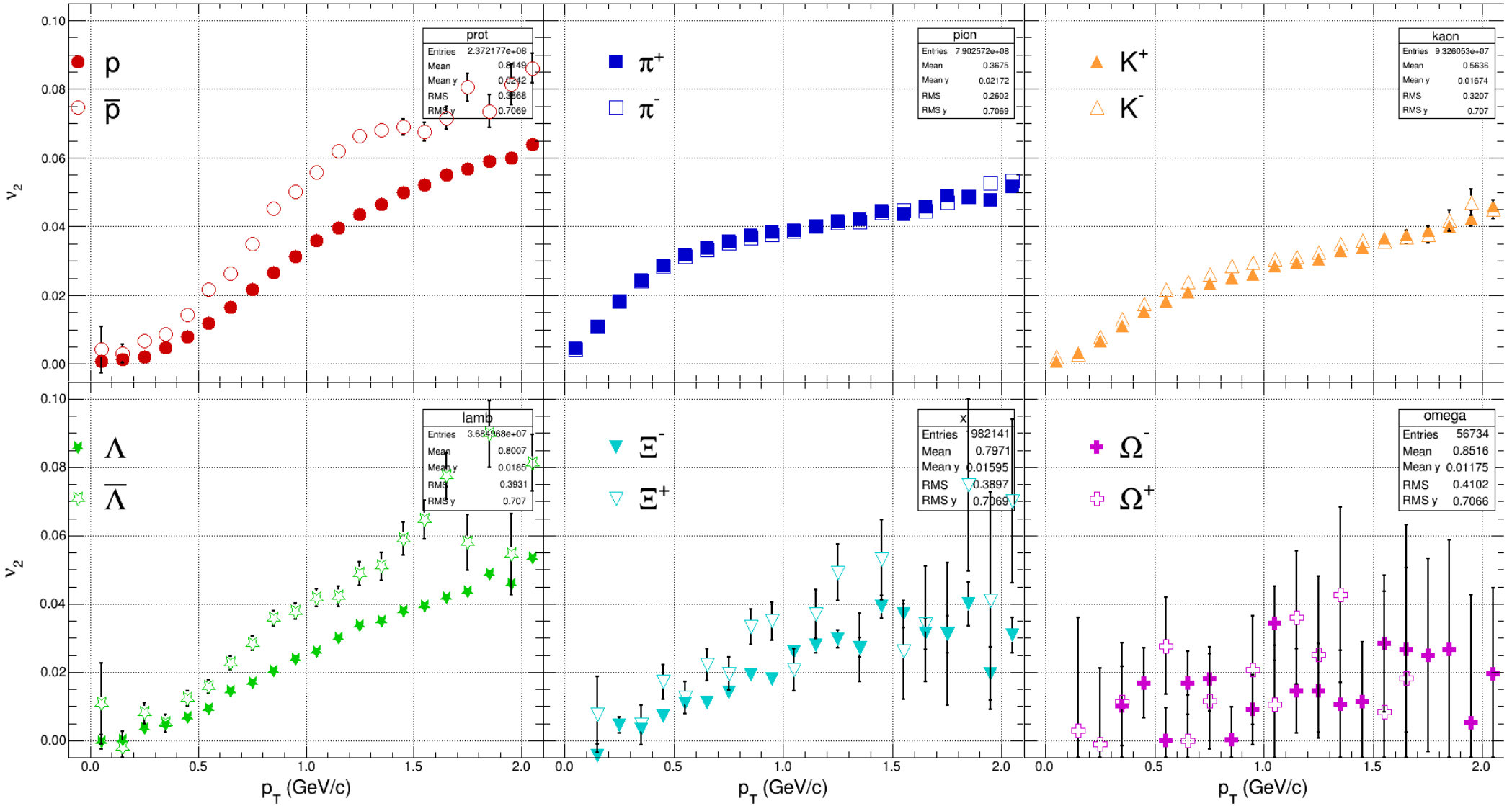
* Event selection based on presence of particles of interest in the model?
(downside is less BG from events without POI)

* Additional reduction of DST? Pico DST?
(Good idea but MpdParticle Reco requires full tracks) (AFAIK)

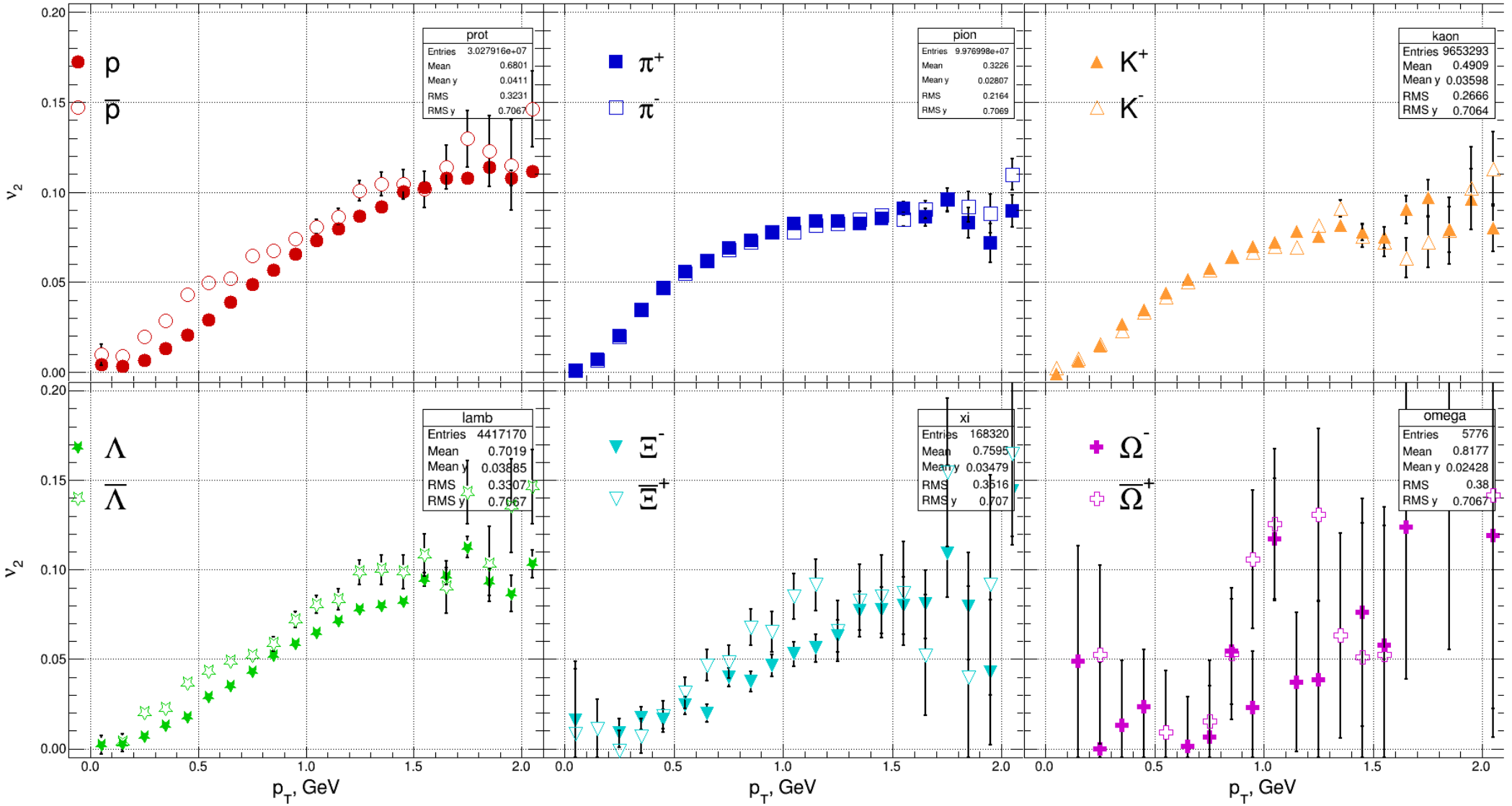
* Interactive NICA Cluster has been running worse recently (past week)
Limit of 50 qsub tasks on NICA Cluster.
Limit in storage space on NC.

* TPC Cluster Digitizer and MLEM Finder should be ported to GPU for (much) faster run time.
(Current Digi version porting to CUDA started, progress is slow)
(Previous Digi CUDA version has shown order of magnitude speed up)

Model in MPD acceptance:
UrQMD(non-hydro): AuAu, 10 mil events, 11 GeV, 0..16 fm



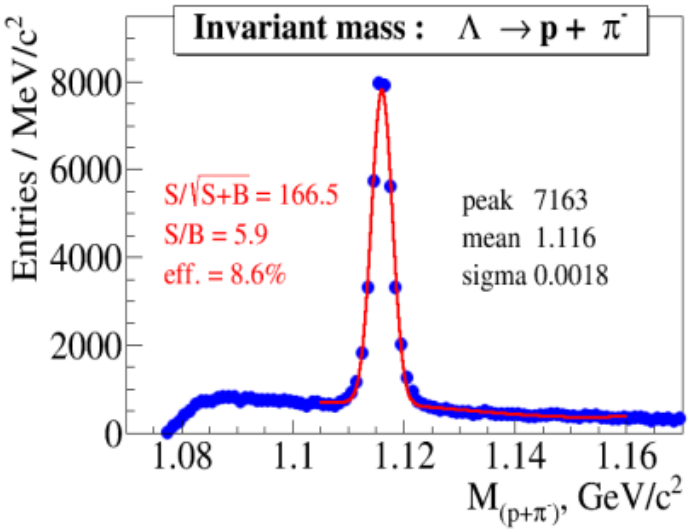
Model in MPD acceptance:
AMPT sm: 1 mil events, 11 GeV 0..16 fm

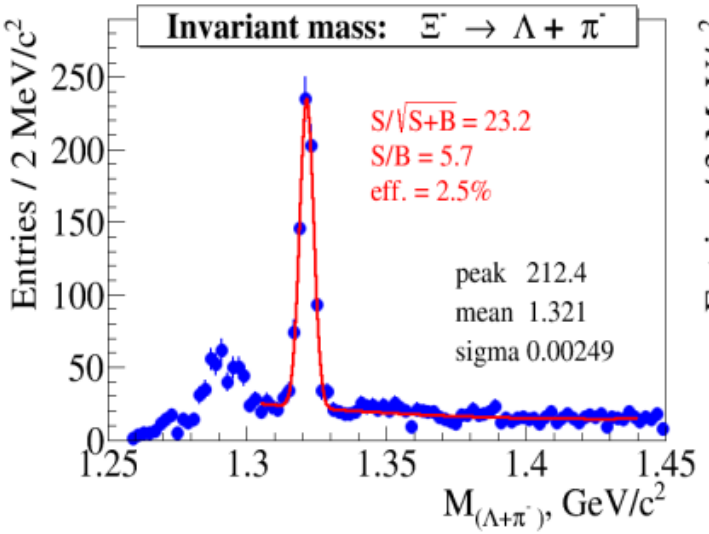


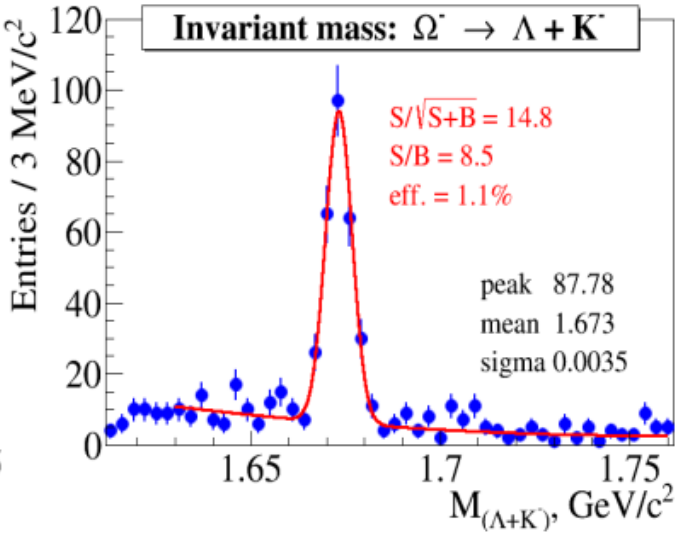
Hyperon Reconstruction

- Reconstruction efficiency is also important and not so good in previously shown results. (2013-2014)
- Results have improved for Lambda but are there newer Xi and Omega results?

  (with latest geometry and PID and MpdParticle algorithm)



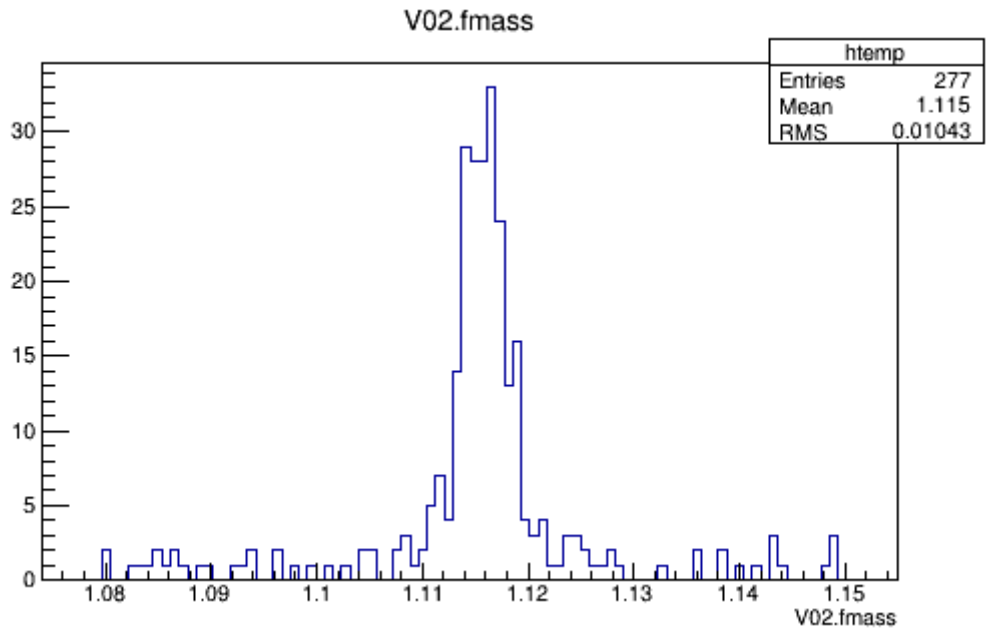


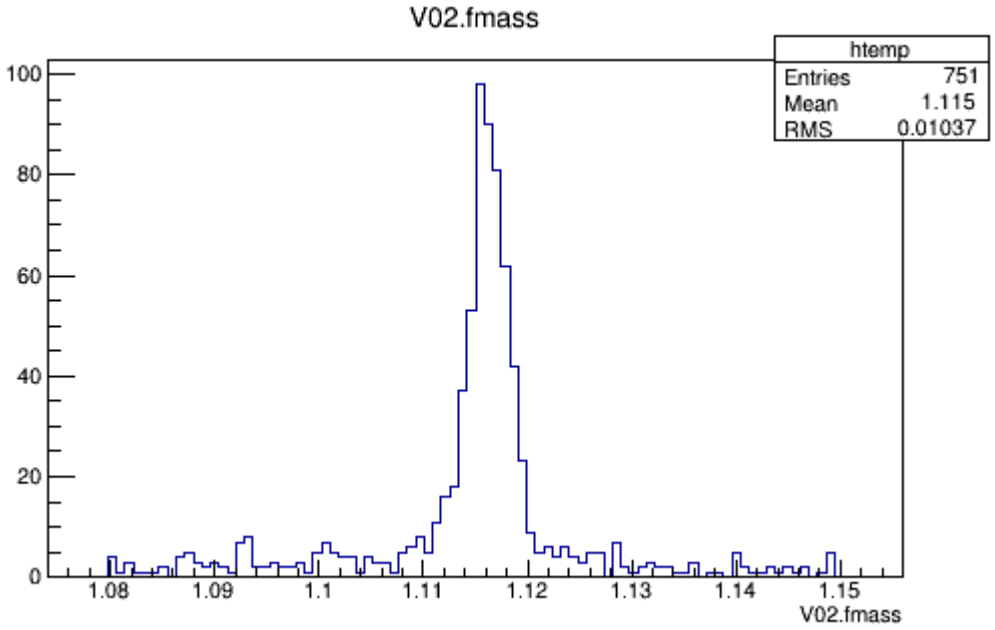


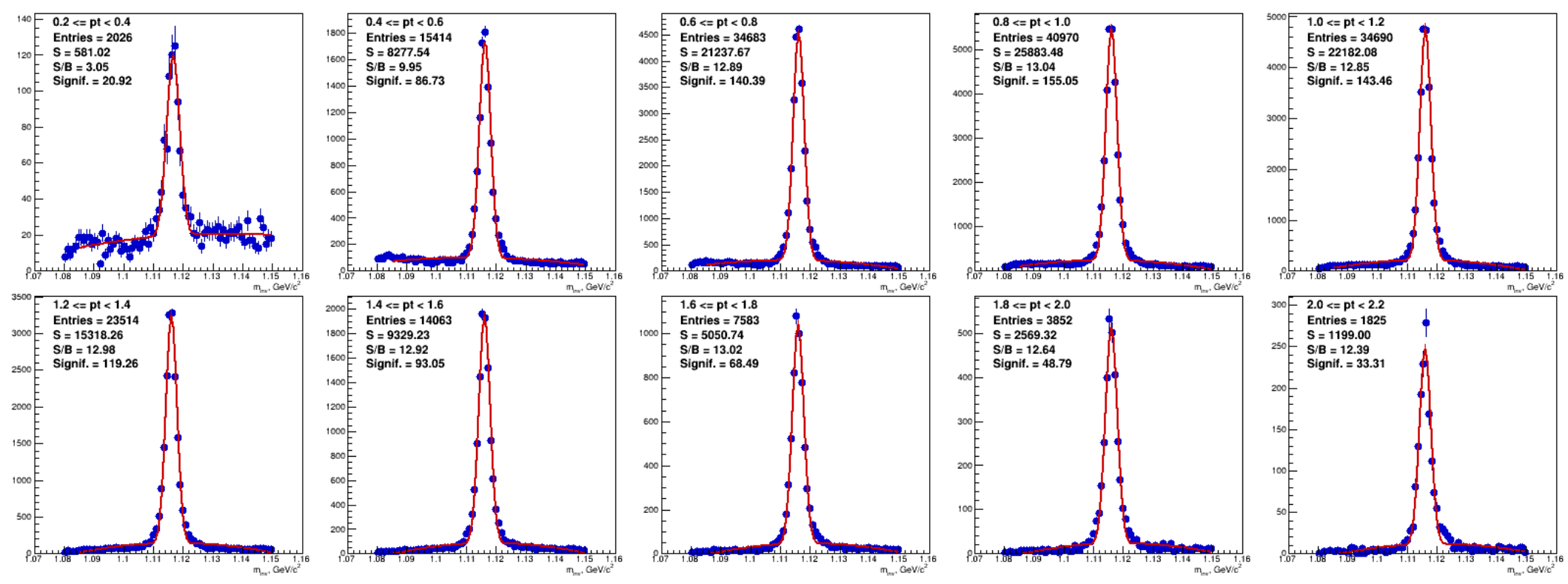
Yields for 10 weeks

Particle	Λ	$\bar{\Lambda}$	Ξ^-	$\bar{\Xi}^+$	Ω^-	$\bar{\Omega}^+$
Expected yield	$5.8 \cdot 10^9$	$7.3 \cdot 10^7$	$2.9 \cdot 10^7$	$1.6 \cdot 10^6$	$1.4 \cdot 10^6$	$2.9 \cdot 10^5$

* Doing a “worse” Lambda selection with more BG but better efficiency we can gain statistics.
* Different cuts are needed for various Energy, Centrality, Transverse Momentum for optimal performance.
* Same 1000 events 277 vs 751 ~ 2.8 times more Lambdas
* A proper criteria for better efficiency and/or acceptance may be an additional cut selection criteria in addition to those of good S/B or significance
* But what about bias?



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S = 581.02
S/B = 3.05
Signif. = 20.92
0.4 <= pt < 0.6
Entries = 15414
S = 8277.54
S/B = 9.95
Signif. = 86.73
0.6 <= pt < 0.8
Entries = 34683
S = 21237.67
S/B = 12.89
Signif. = 140.39
0.8 <= pt < 1.0
Entries = 40970
S = 25883.48
S/B = 13.04
Signif. = 155.05
1.0 <= pt < 1.2
Entries = 34690
S = 22182.08
S/B = 12.85
Signif. = 143.46
1.2 <= pt < 1.4
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S = 15318.26
S/B = 12.98
Signif. = 119.26
1.4 <= pt < 1.6
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S = 9329.23
S/B = 12.92
Signif. = 93.05
1.6 <= pt < 1.8
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S = 5050.74
S/B = 13.02
Signif. = 68.49
1.8 <= pt < 2.0
Entries = 3852
S = 2569.32
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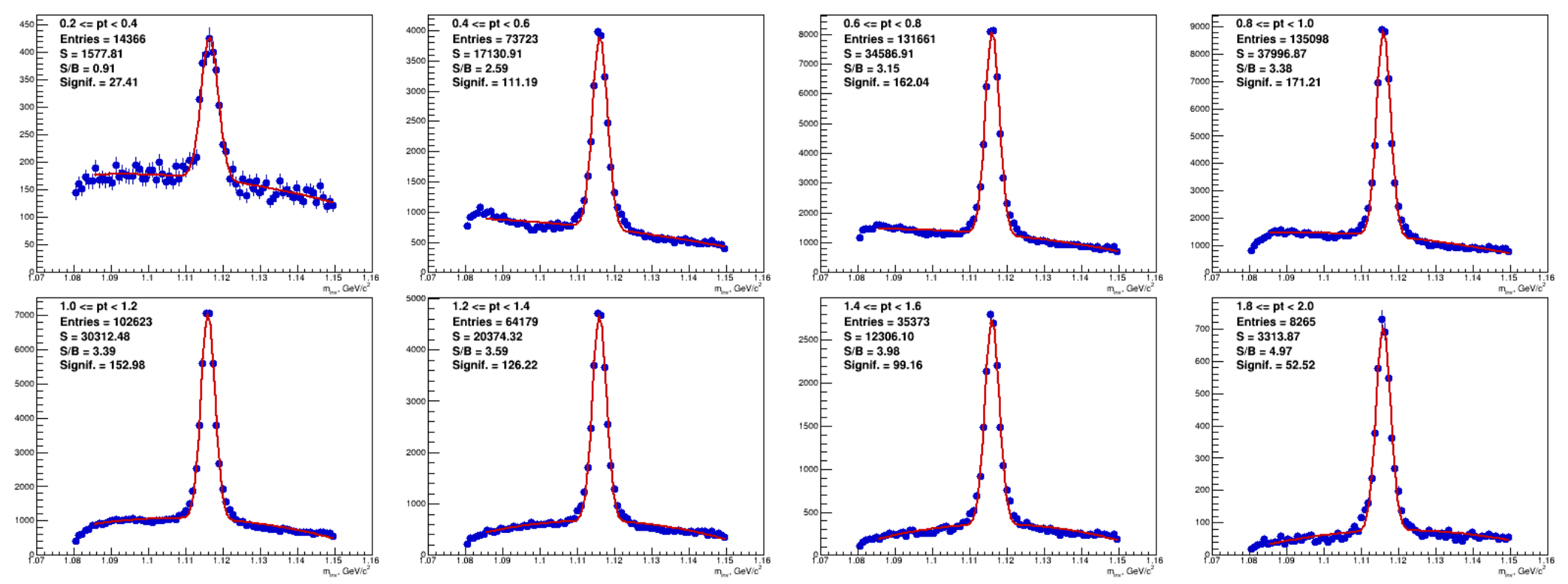
S = 1199.00
S/B = 12.39
Signif. = 33.31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Signif. = 27.41
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S = 17130.91
S/B = 2.59
Signif. = 111.19
0.6 <= pt < 0.8
Entries = 131661
S = 34586.91
S/B = 3.15
Signif. = 162.04
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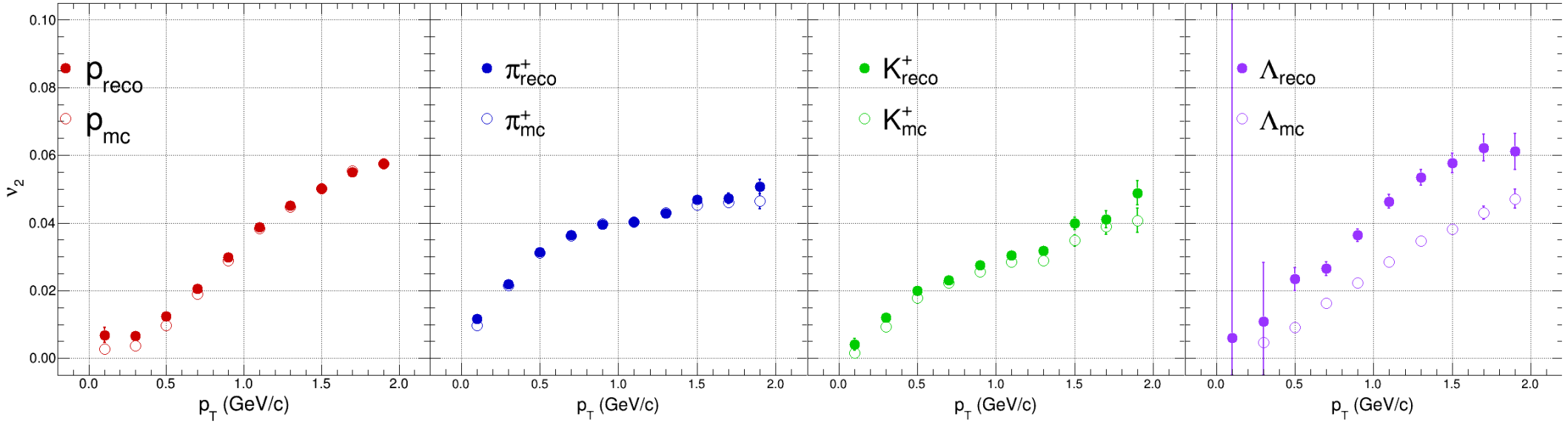
Entries = 135098
S = 37996.87
S/B = 3.38
Signif. = 171.21
1.0 <= pt < 1.2
Entries = 102623
S = 30312.48
S/B = 3.39
Signif. = 152.98
1.2 <= pt < 1.4
Entries = 64179
S = 20374.32
S/B = 3.59
Signif. = 126.22
1.4 <= pt < 1.6
Entries = 35373
S = 12306.10
S/B = 3.98
Signif. = 99.16
1.8 <= pt < 2.0
Entries = 8265
S = 3313.87
S/B = 4.97
Signif. = 52.52

* But what about bias?
UrQMD: AuAu, 2 mil, 11 GeV, 0..16 fm
Old Data (old tpc, tof, hp) with MEPhi Flow code,
Psi = 0, Res = 1 (true flow, no EP reco)



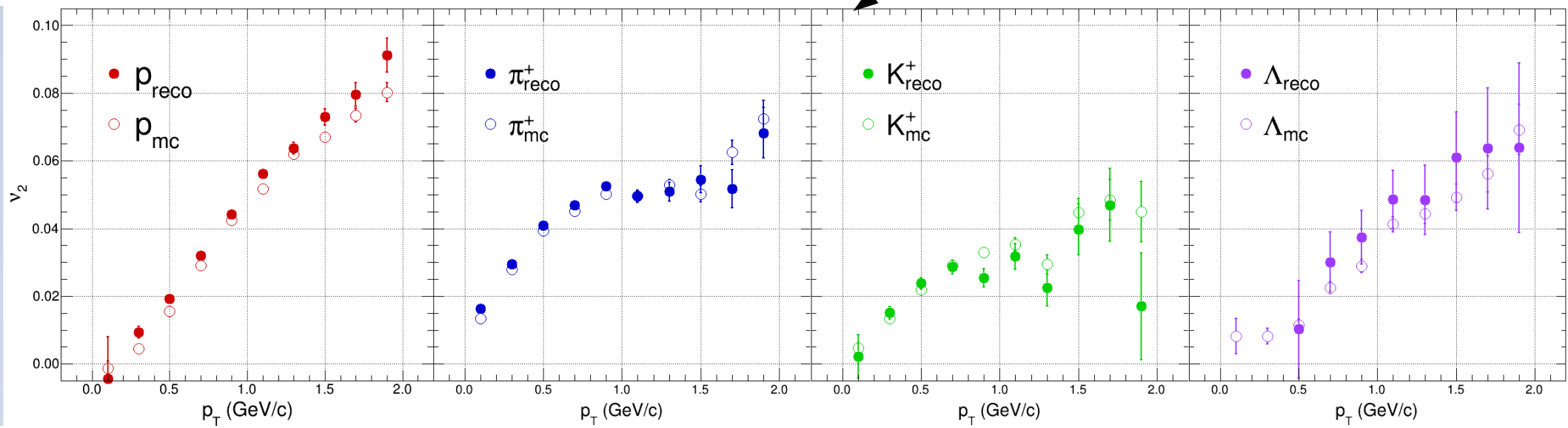
- Charged hadrons are near perfect (as expected)
- But there is some systematic problem with Lambda
- Possible reason

  - systematic bias in cuts for reconstructed Lambda

  - or it may be due to old reconstruction and not present in new data

Latest results

* UrQMD(non-hydro) 500k events AuAu, 11 GeV, 8..12 fm
* TPC Clusters, MLEM Finder, PID, Reco Lambda,
FHCal Event Plane, Flow Analysis

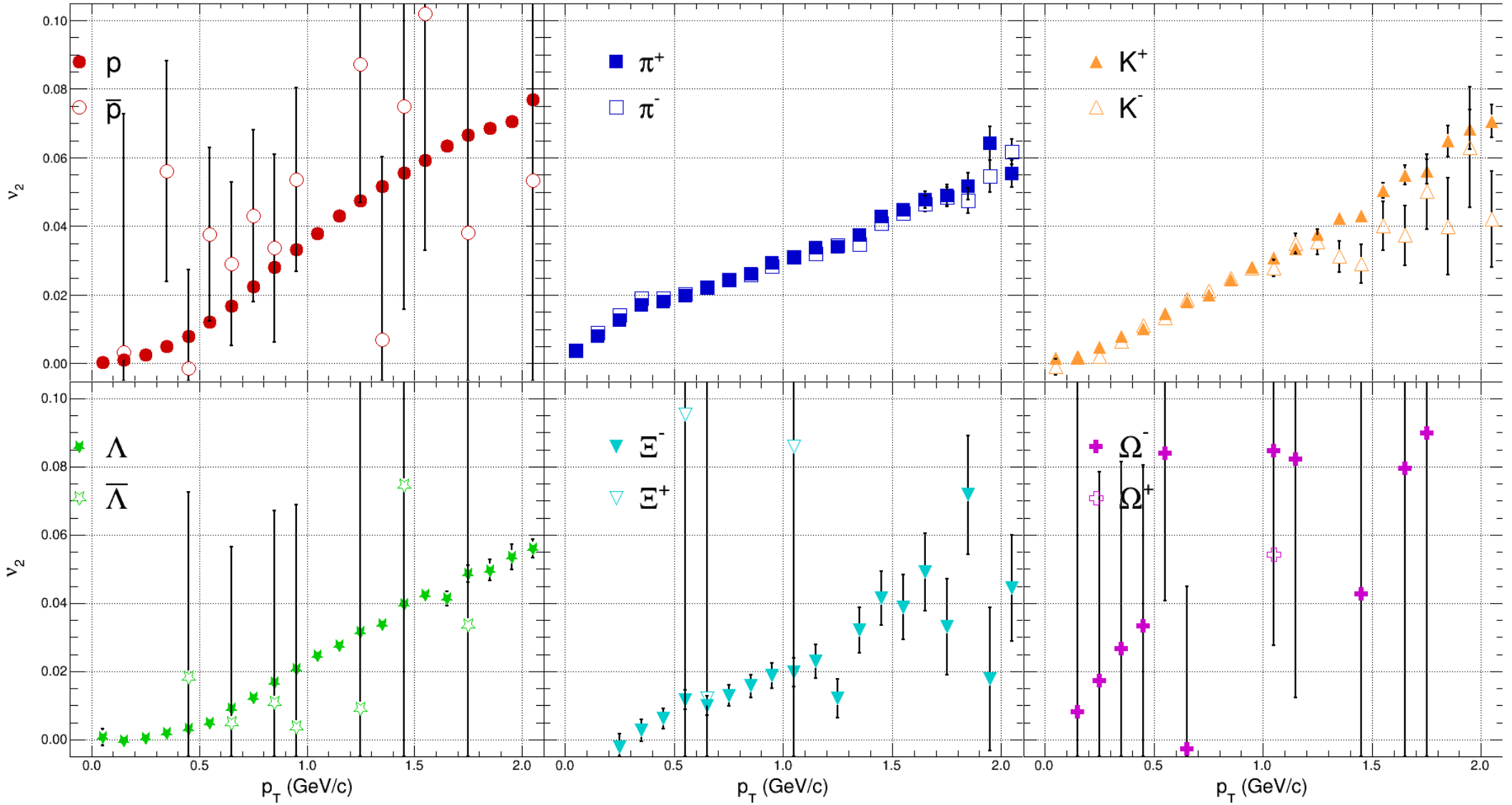


On 14.05 started simulation (model, sim, reco) and finished on 06.06
~3-4 weeks for 1 million events, 0..16 fm, on NICA Cluster (50 task limit).
1000 RECO files with 1000 events each.
Accessible at /nica/mpd15/geraks/sim
Soon to be analysed...

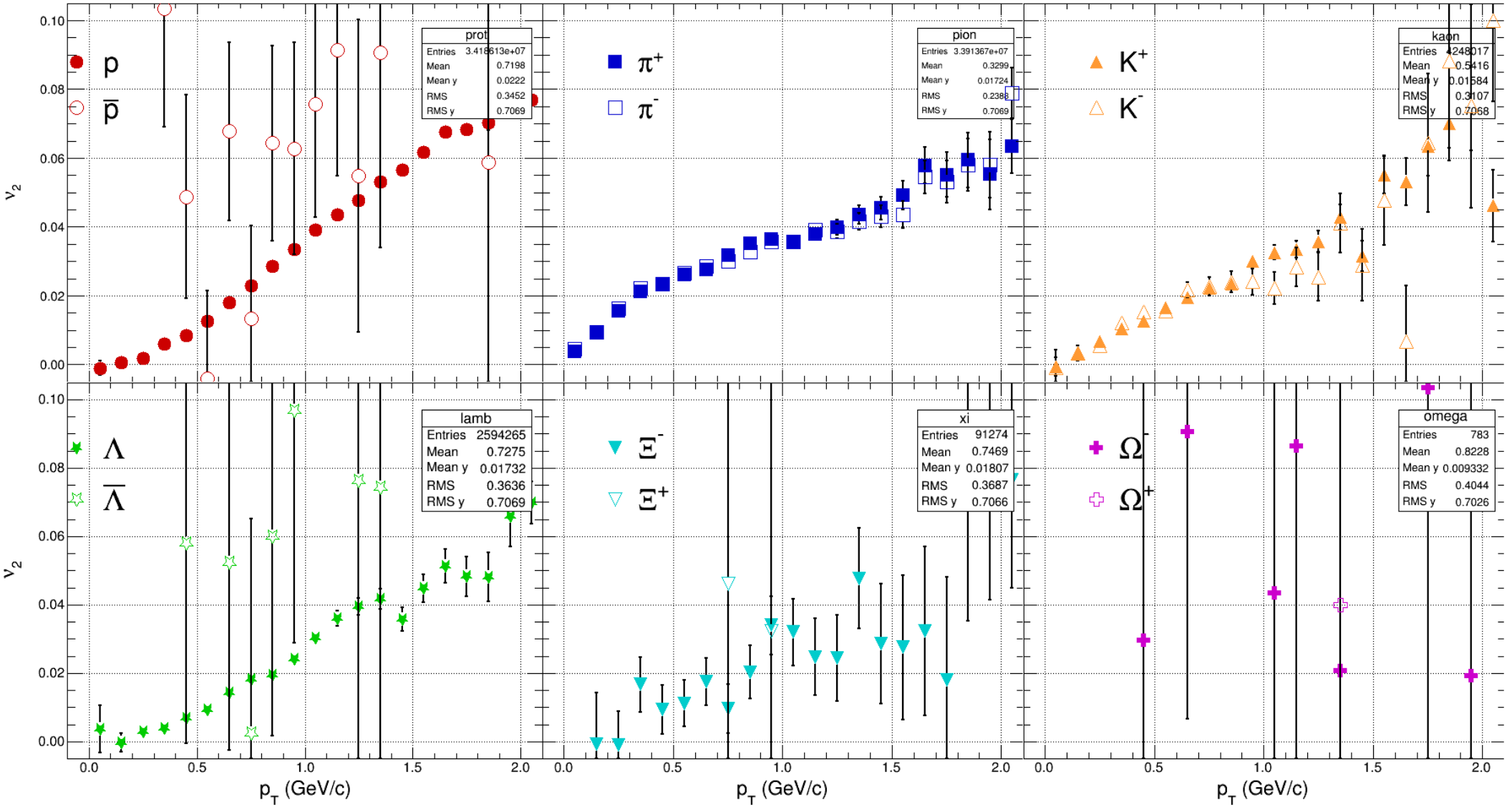
Thank you!

Additional slides

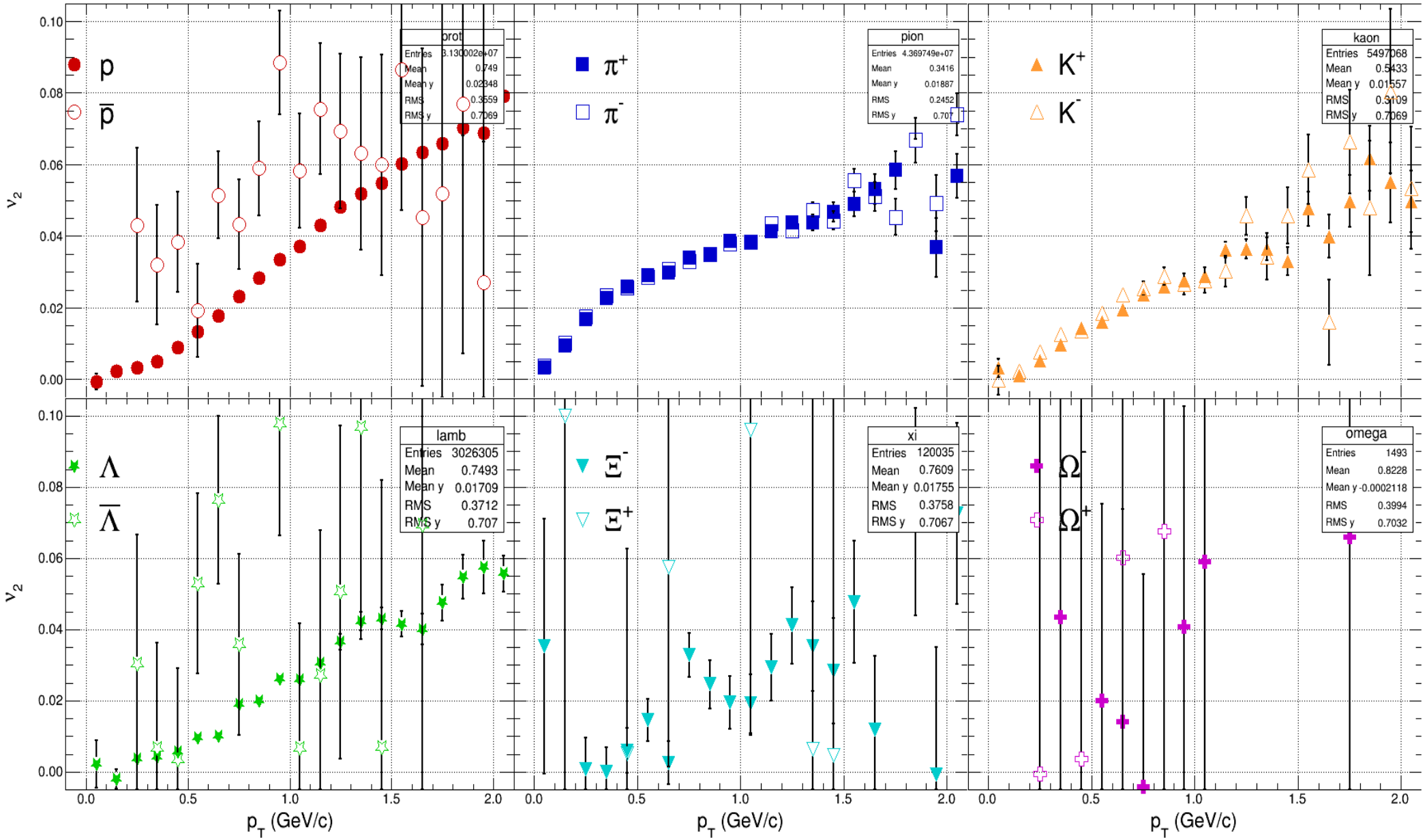
UrQMD, 4 GeV, 10 million



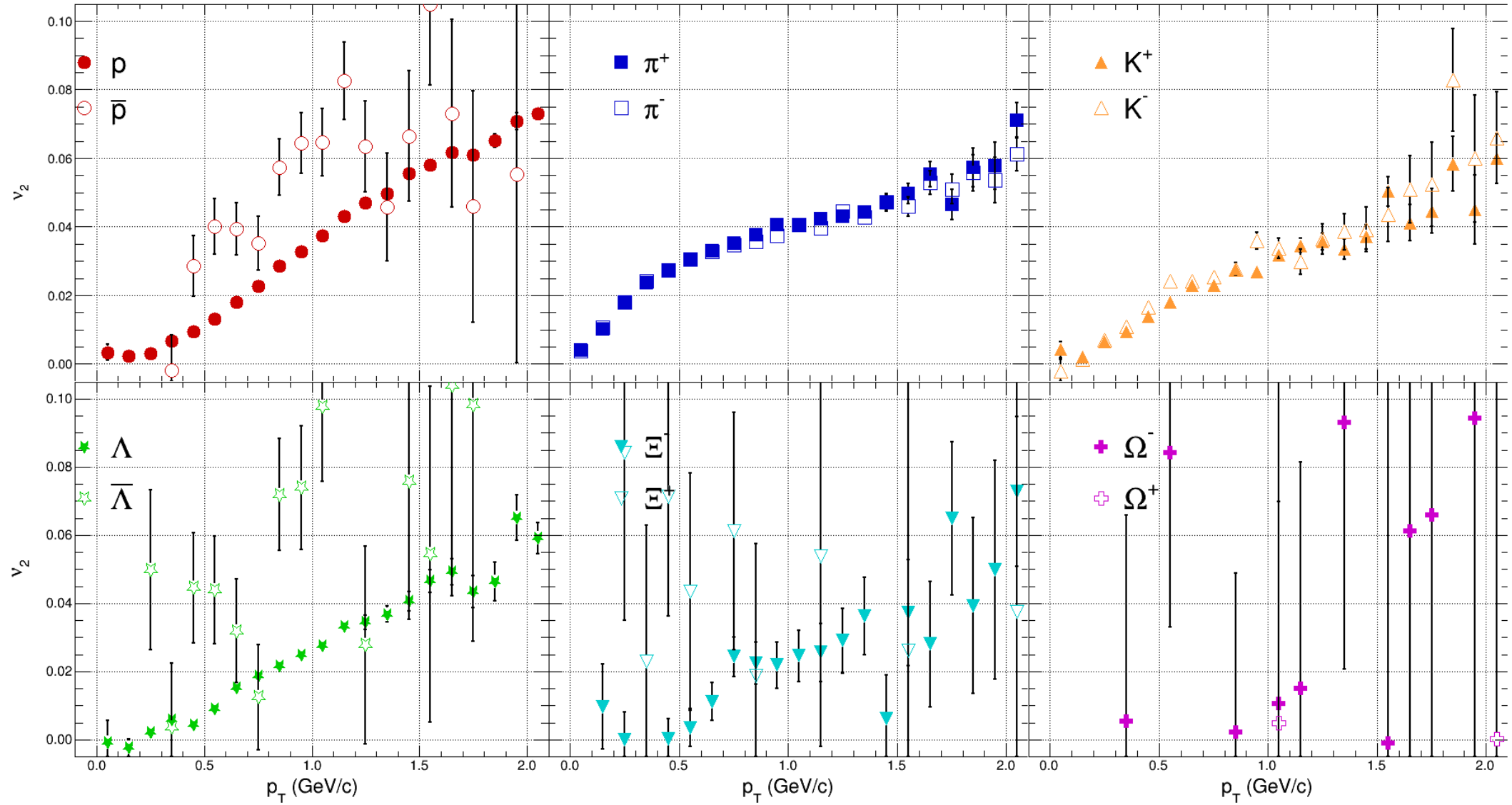
UrQMD, 5 GeV, 1 million



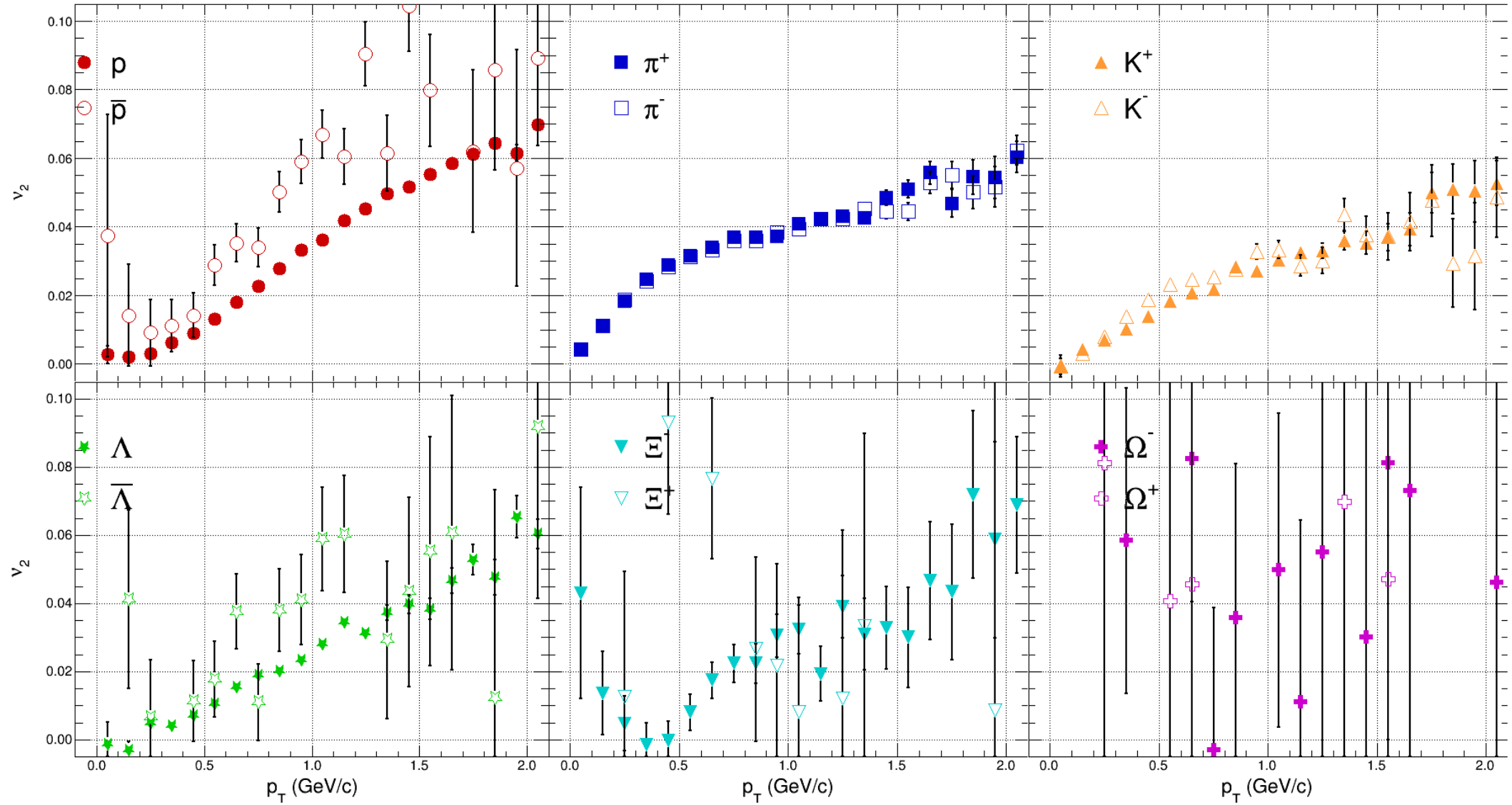
6 GeV


p
$\bar{p}$
prot
Entries 3.130002e+07
Mean 0.749
Mean y 0.02348
RMS 0.3559
RMS y 0.7069
π^+
π^-
pion
Entries 4.369749e+07
Mean 0.3416
Mean y 0.01887
RMS 0.2452
RMS y 0.707
K^+
K^-
kaon
Entries 5497068
Mean 0.5433
Mean y 0.01557
RMS 0.3109
RMS y 0.7069
Λ
$\bar{\Lambda}$
lamb
Entries 3026305
Mean 0.7493
Mean y 0.01709
RMS 0.3712
RMS y 0.707
$[\Xi]^-$
$[\Xi]^+$
xi
Entries 120035
Mean 0.7609
Mean y 0.01755
RMS 0.3758
RMS y 0.7067
Ω^-
Ω^+
omega
Entries 1493
Mean 0.8228
Mean y -0.0002118
RMS 0.3994
RMS y 0.7032
v_2
p_T (GeV/c)

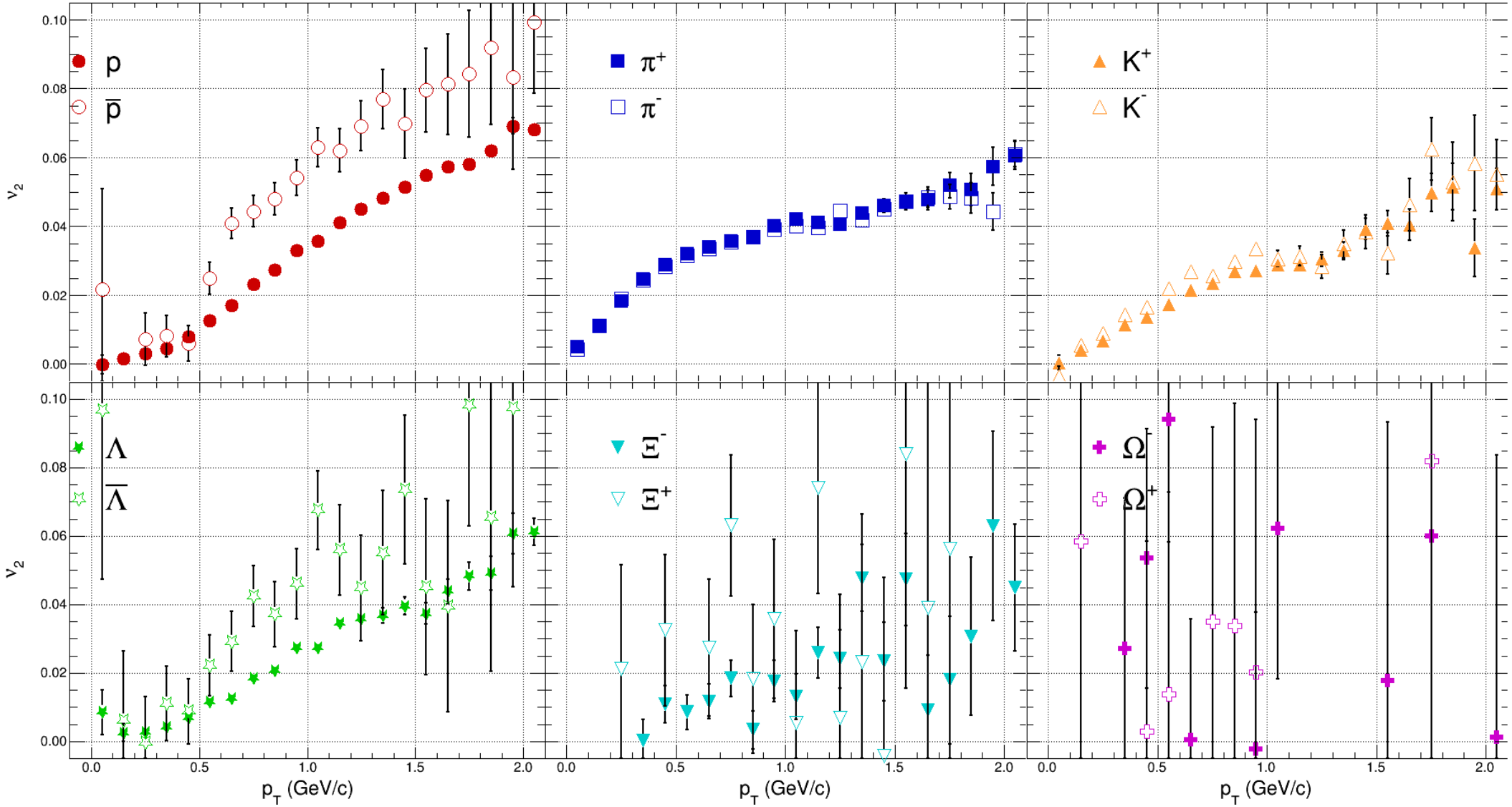
7 GeV


p
$\bar{p}$
π^+
π^-
K^+
K^-
Λ
$\bar{\Lambda}$
Ξ^-
$\bar{\Xi}^+$
Ω^-
Ω^+
v_2
p_T (GeV/c)

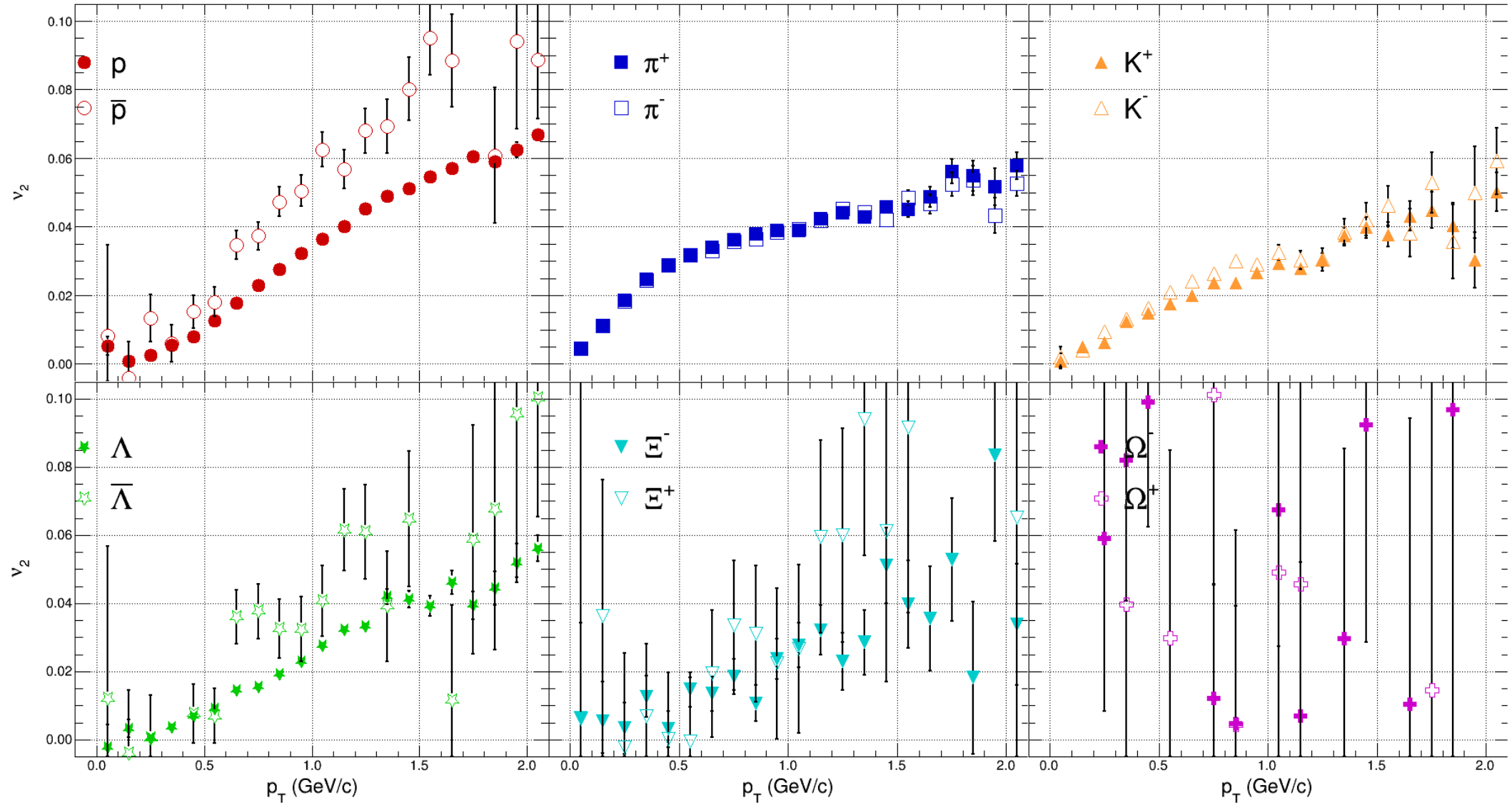
8 GeV



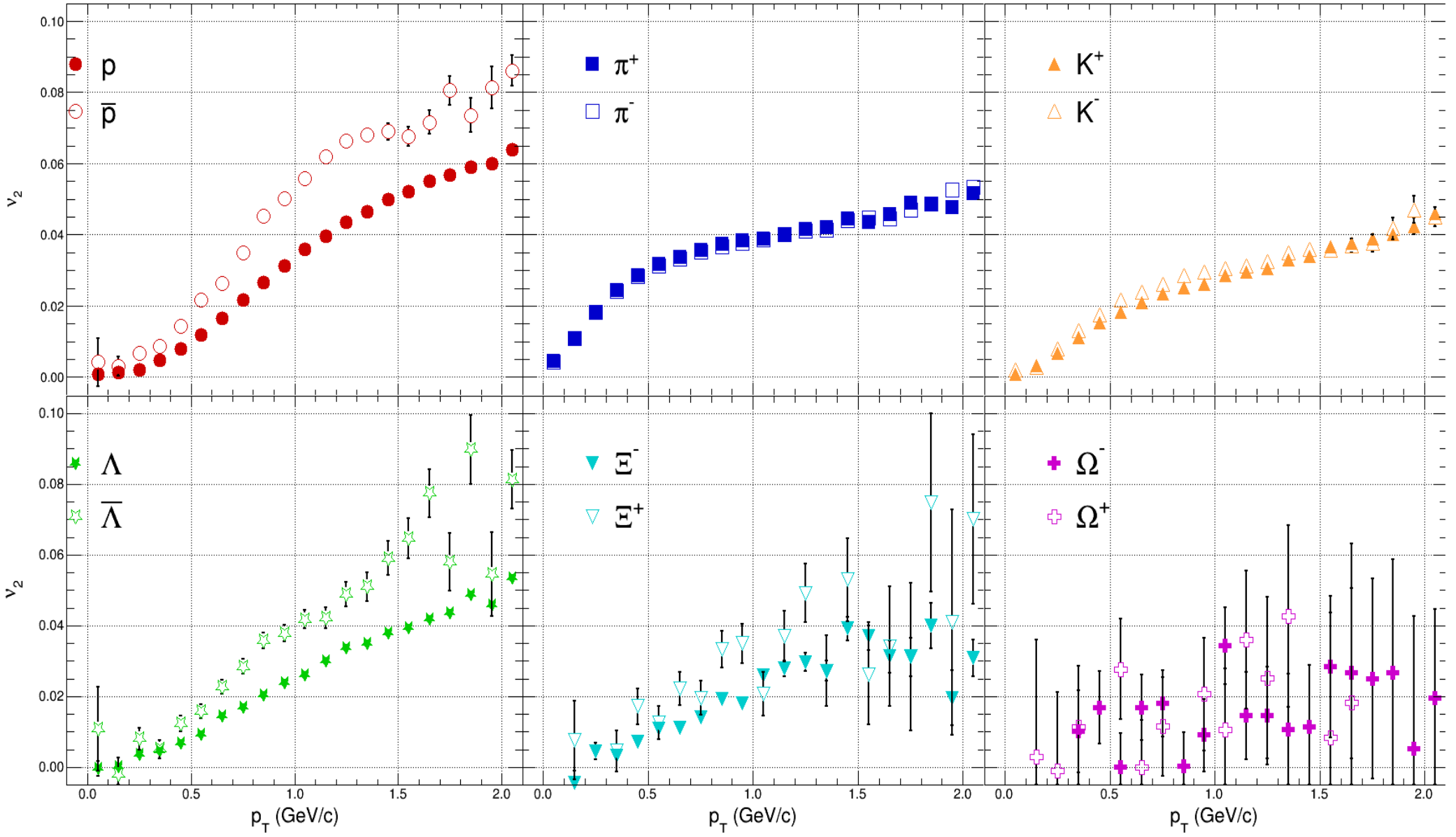
9 GeV


p
$\bar{p}$
π^+
π^-
K^+
K^-
Λ
$\bar{\Lambda}$
Ξ^-
$\bar{\Xi}^+$
Ω^-
$\bar{\Omega}^+$
v_2
p_T (GeV/c)
0.00
0.02
0.04
0.06
0.08
0.10
0.0
0.5
1.0
1.5
2.0

10 GeV


p
$\bar{p}$
π^+
π^-
K^+
K^-
Λ
$\bar{\Lambda}$
Ξ^-
$\bar{\Xi}^+$
Ω^-
$\bar{\Omega}^+$
v_2
p_T (GeV/c)

11 GeV


p
$\bar{p}$
π^+
π^-
K^+
K^-
Λ
$\bar{\Lambda}$
Ξ^-
Ξ^+
Ω^-
Ω^+
v_2
p_T (GeV/c)
0.00
0.02
0.04
0.06
0.08
0.10
0.0
0.5
1.0
1.5
2.0