Meeting 20 September 2019

Current status of hyperon analysis with PHSD at MPD/NICA

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Data set

- **Generator:** PHSD (V4, 2018-03-06), Au+Au @ 11 GeV, min. bias, 8M events
- **Detectors:** start version of MPD with up-to-date TPC & TOF
- **Cluster / hit reconstruction:** precluster finder *(group of adjacent pixels in time bin – pad space*) ; hit finder *("peak-and-valley" algorithm either in time bin – pad space (for simple topologies) or in time-transverse coordinate pixel space after Bayesian unfolding (for more complicated topologies))*→ COG around local maxima
- **Track reconstruction:** two-pass Kalman filter with track seeding using outer hits (*1st pass*) or leftover inner hits (*2nd pass*)
- **Track acceptance criterion:** $|\eta| < 1.3$, $N_{hits} \geq 10$
- **Particle Identification:** *dE/dx* in TPC & β in TOF

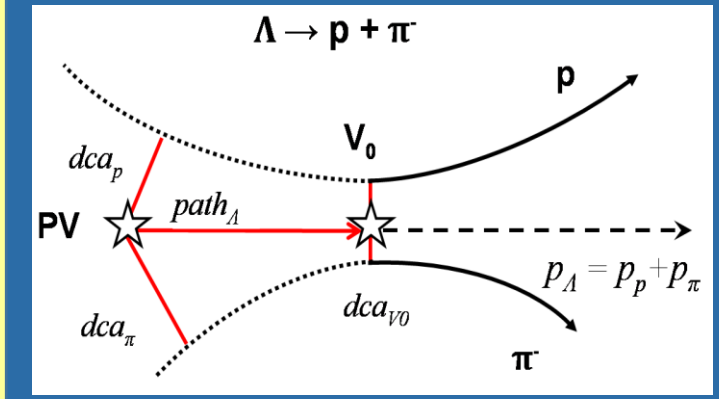
Analysis goals and Event topology

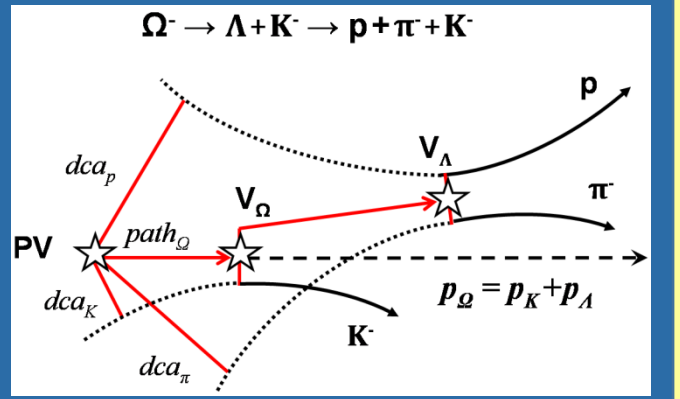
Goals:

- Secondary Vertex Reconstruction algorithm development for multistrangeness analysis
- Optimization of selection criteria in pT and centrality
- Preparation of analysis macros for invariant spectra reconstruction
- Estimates of MPD efficiency and expected event rates
- Publications with results of the study (supported by a RFBR Grant for 2019-21)

Analysis method:

Secondary Vertex Finding Technique

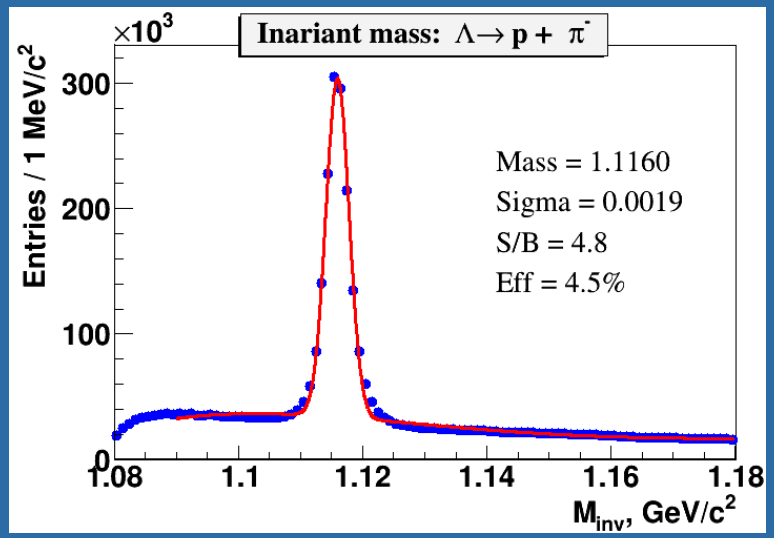


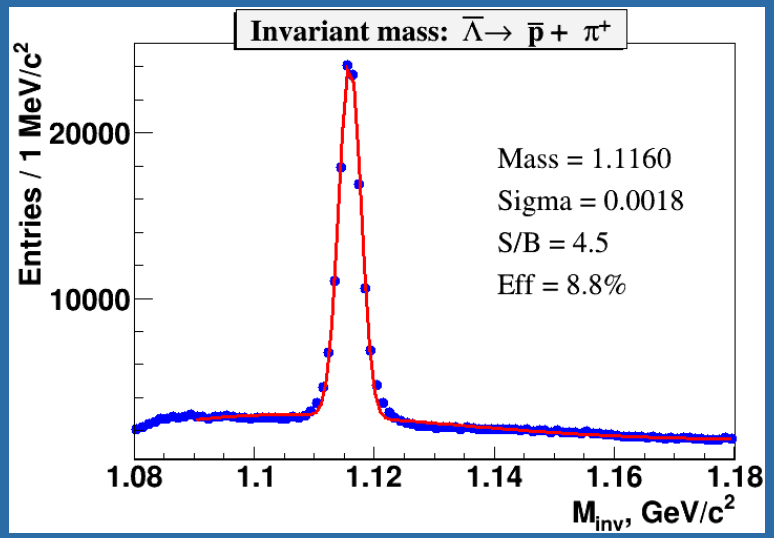


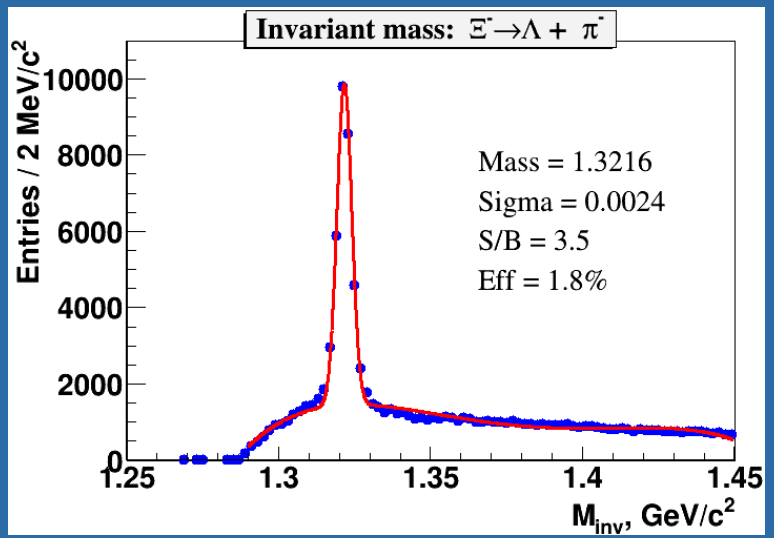
Event topology:

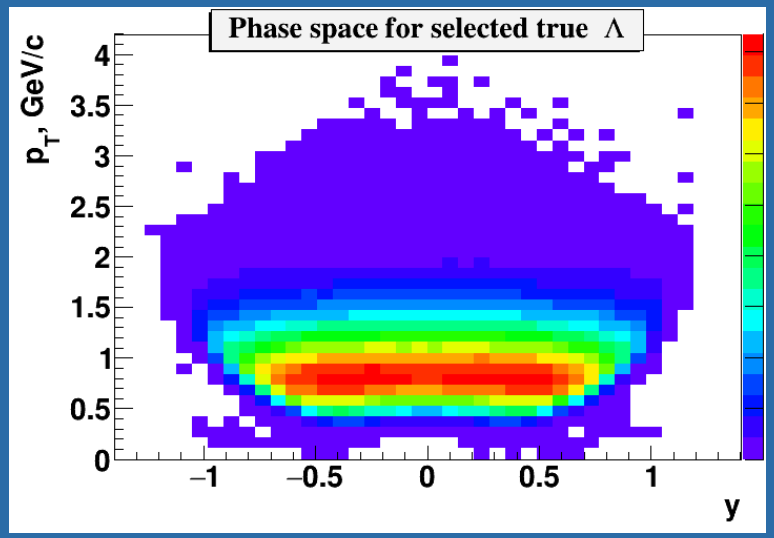
- PV – primary vertex
- V_0 – vertex of hyperon decay
- dca – distance of the closest approach
- path – decay length

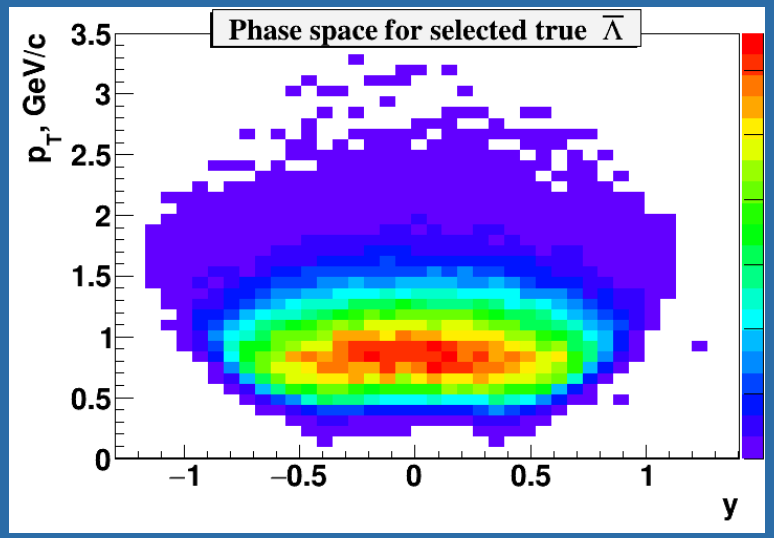
Λ, Λ_{bar}, Ξ^- reconstruction and Phase space

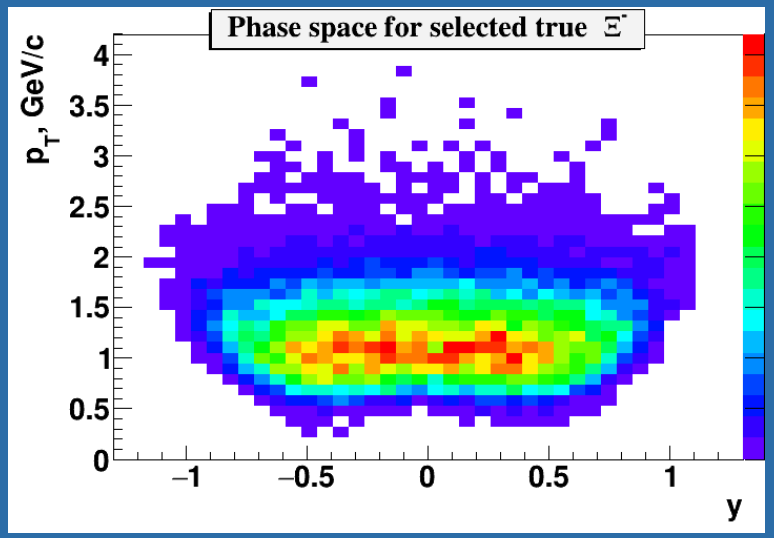




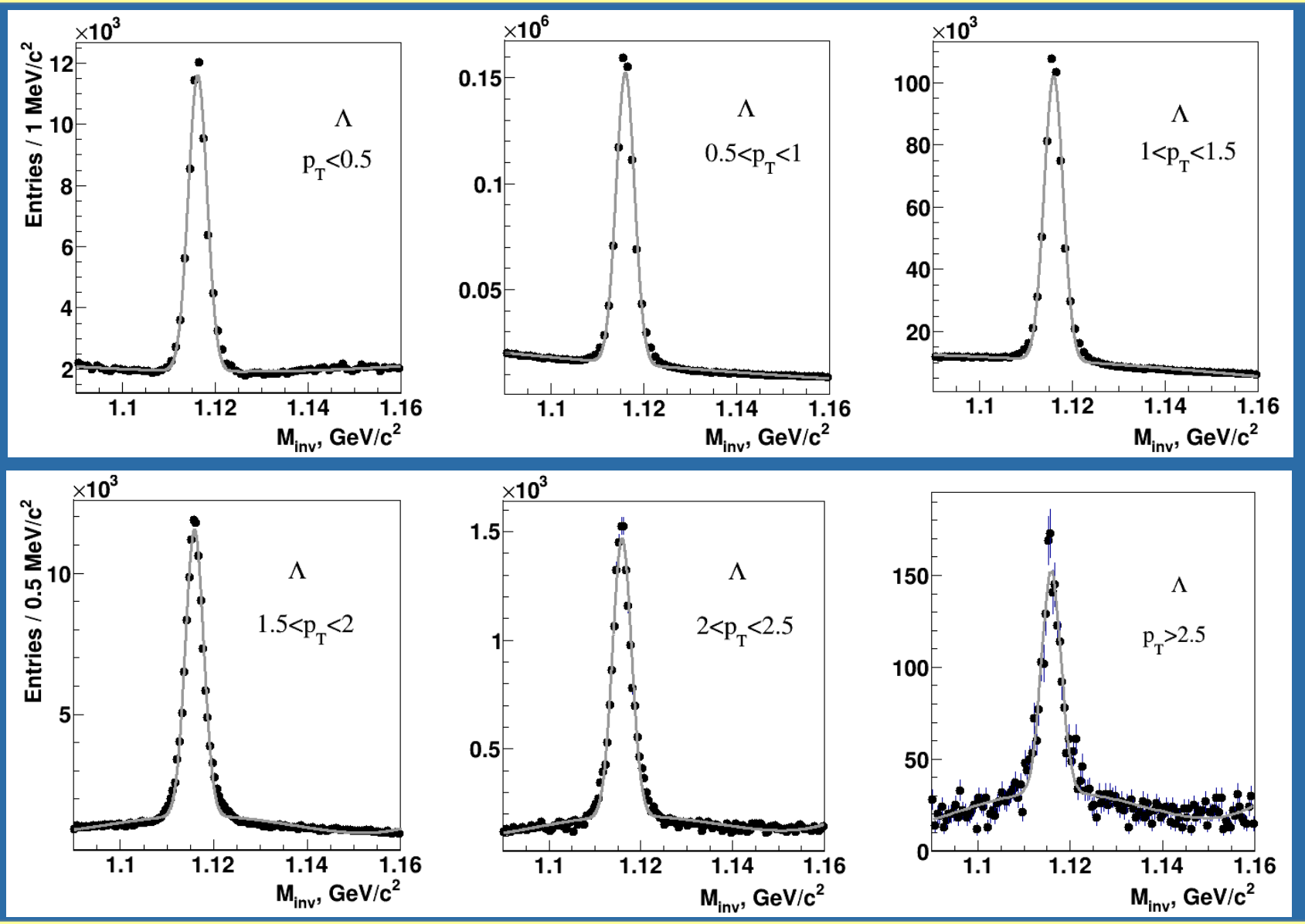




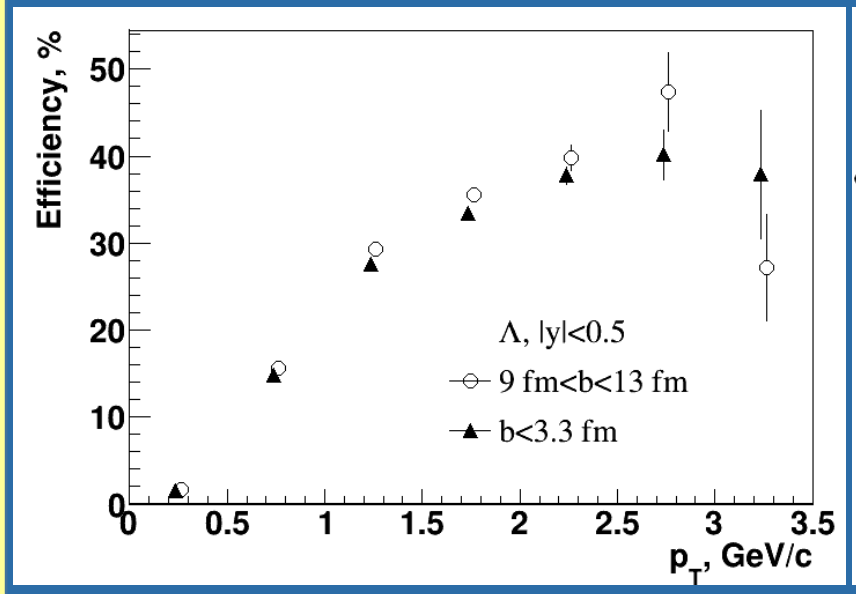


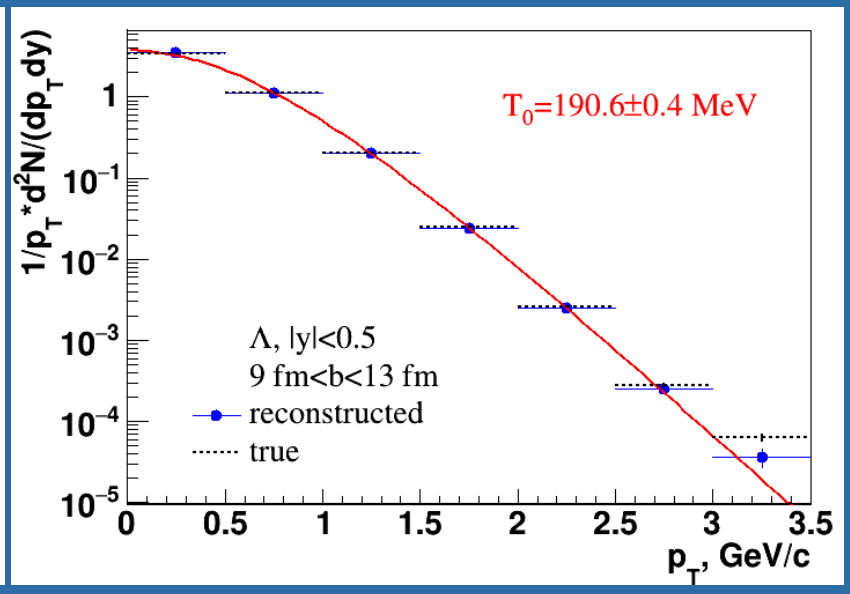


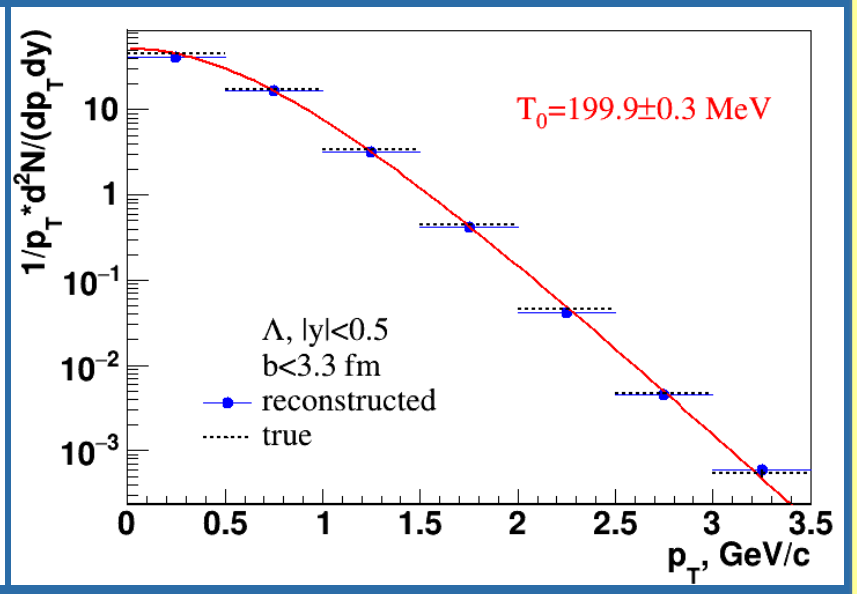
p_T dependence of Λ for all centralities



Λ reconstruction: efficiency and pT spectrum



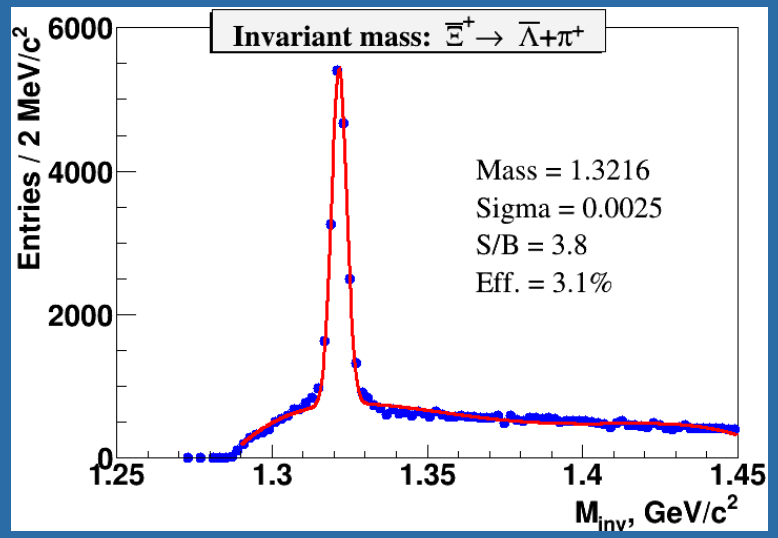


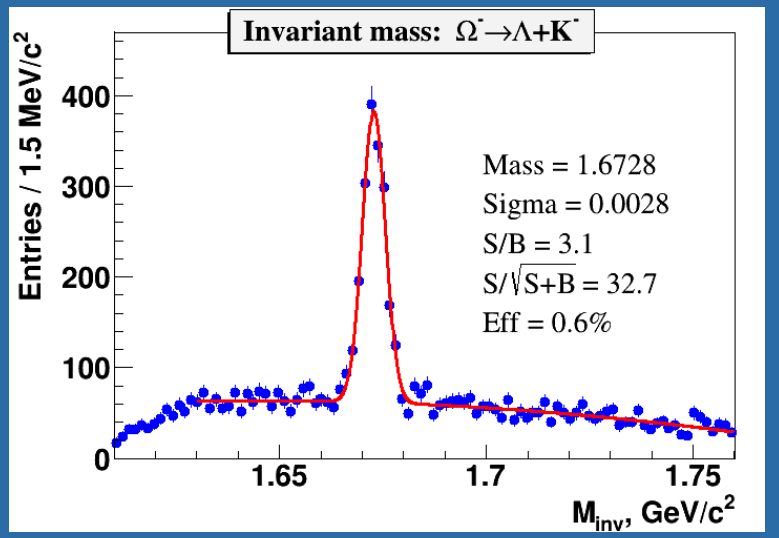


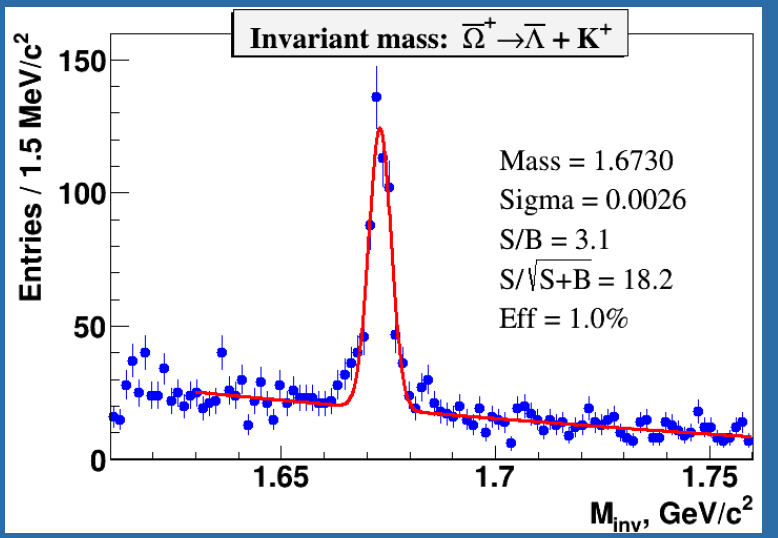
Efficiency of true Λ in p_T and b bins for |y|<0.5: (reco & select Λ) / (all gen Λ)

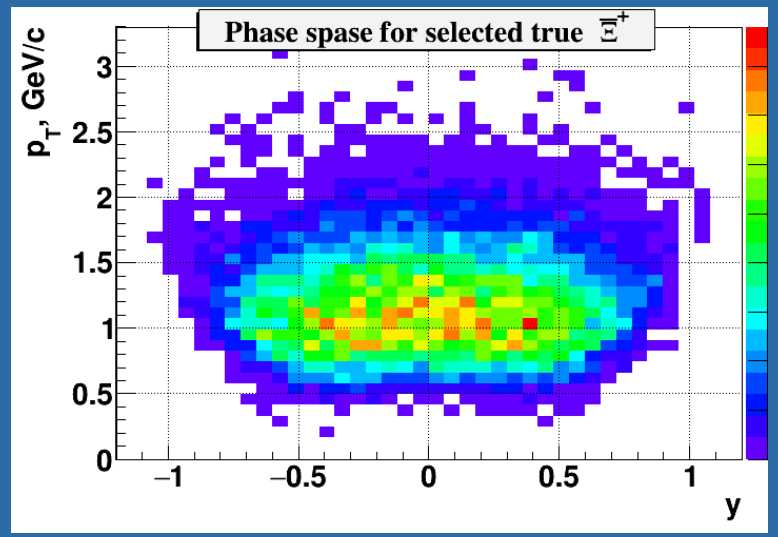
Reconstructed spectrum: fit of selected Λ in each bin (Gauss ± 3σ) / Eff.

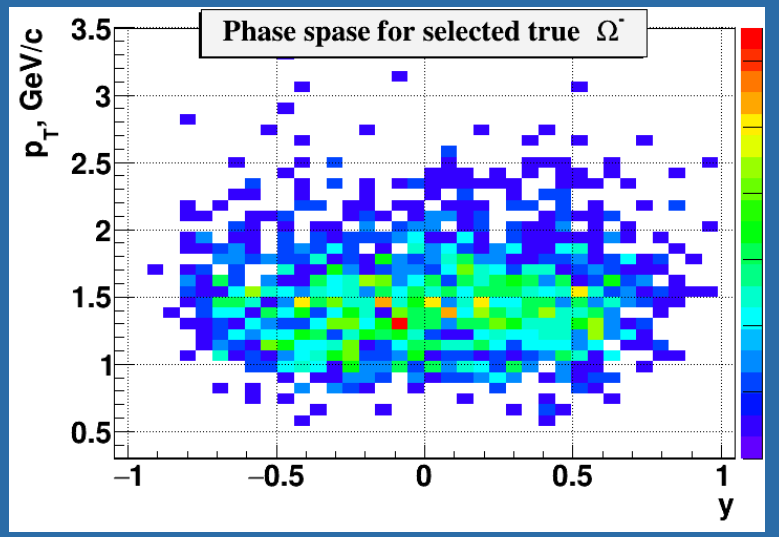
Ξ^+, Ω^-, Ω^+ reconstruction and Phase space

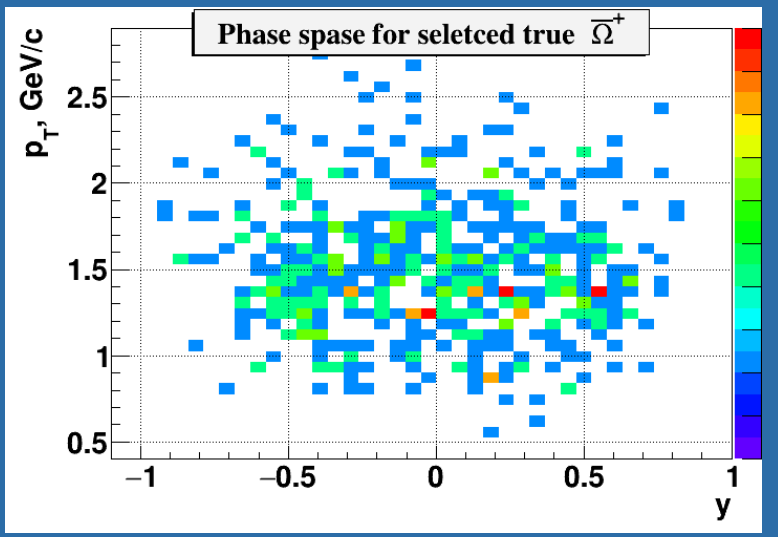










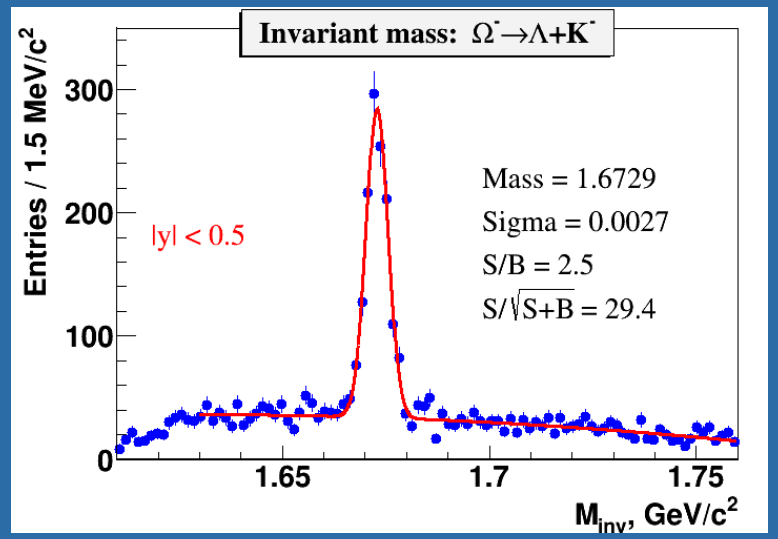


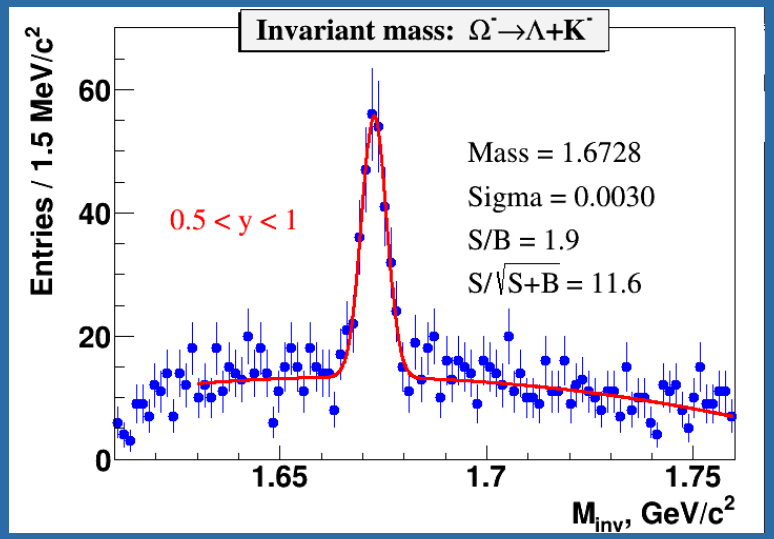
Statistics **15089**

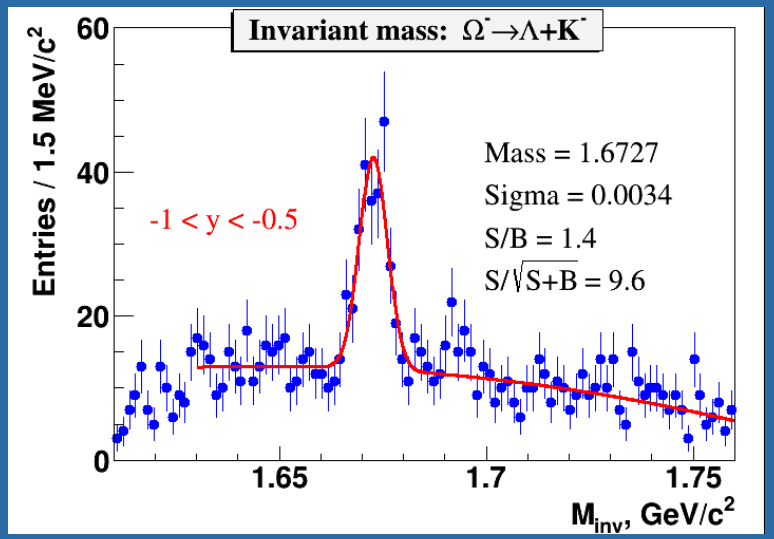
Statistics **1531**

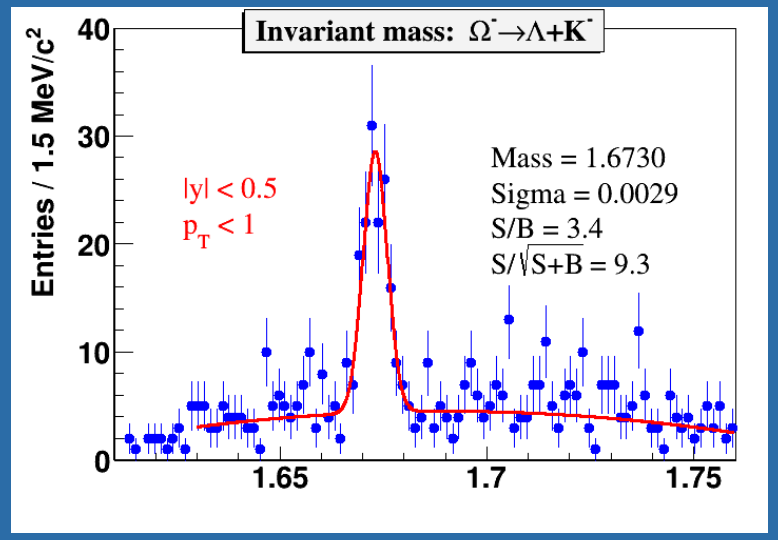
Statistics **502**

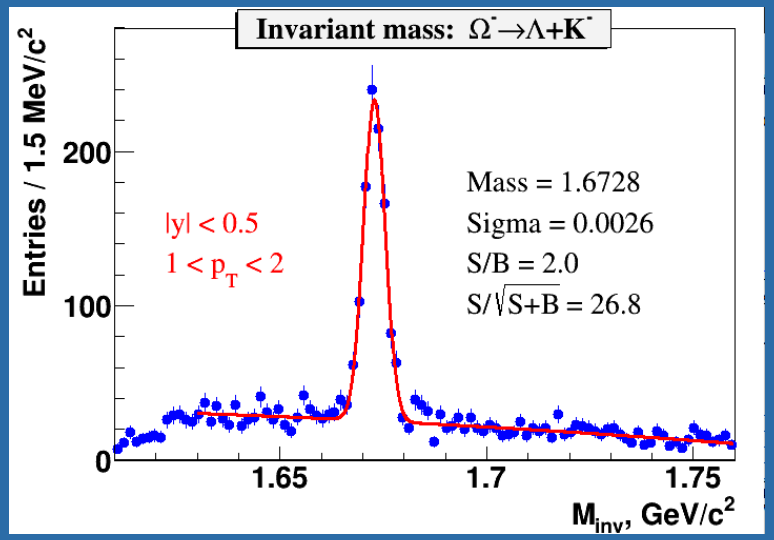
Ω^- hyperon: y & p_T dependence

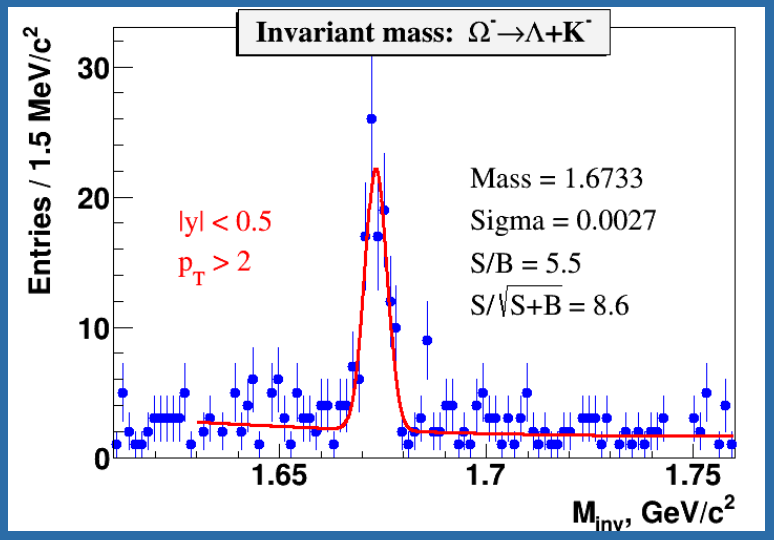










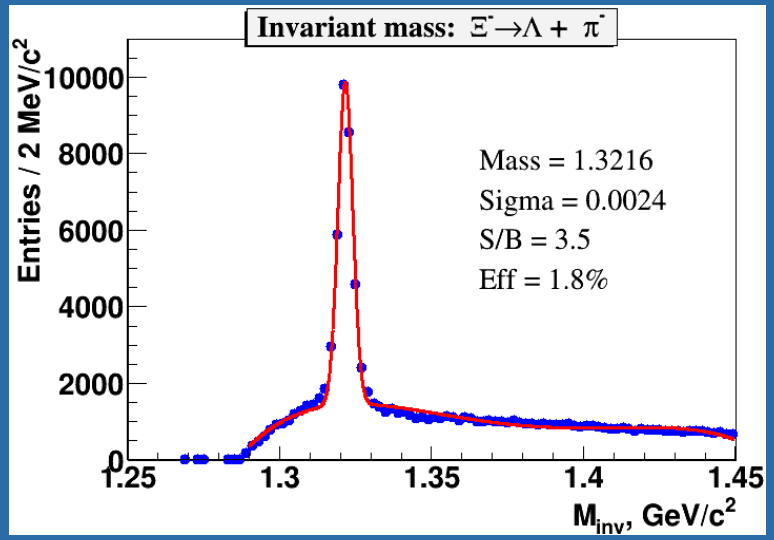


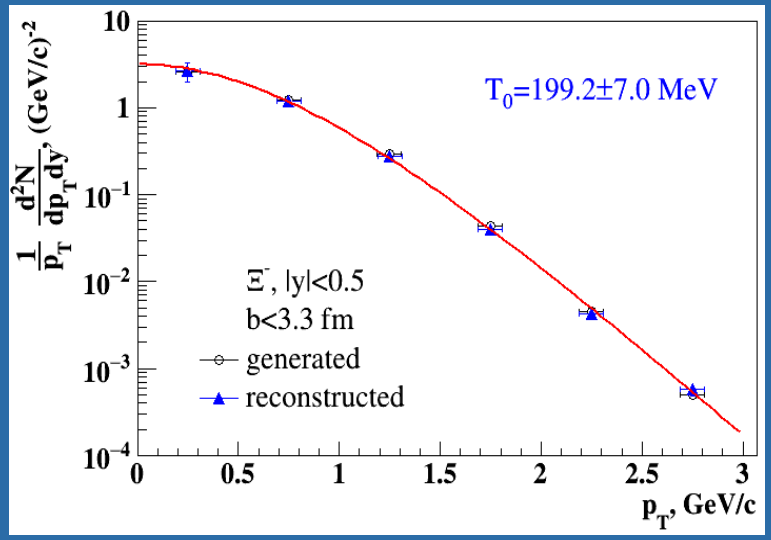
Expected hyperon yields

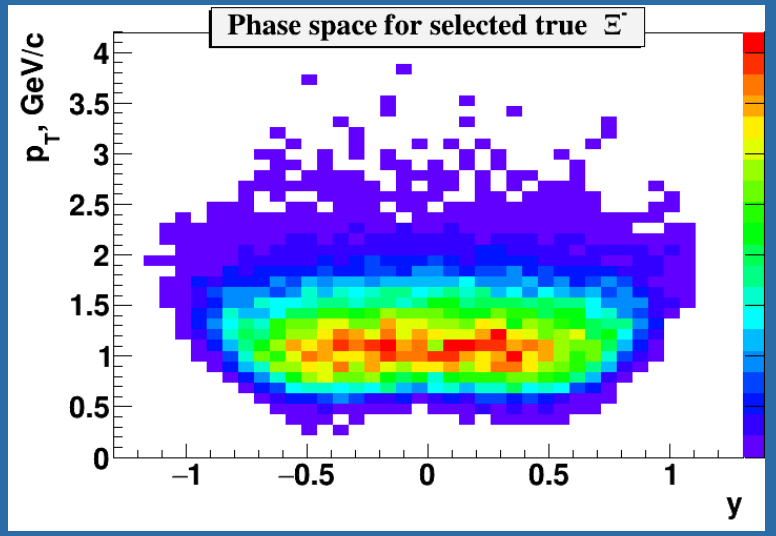
Expected multistrange hyperon yields in minimum bias Au+Au collisions for 2 weeks of running time at starting luminosity.

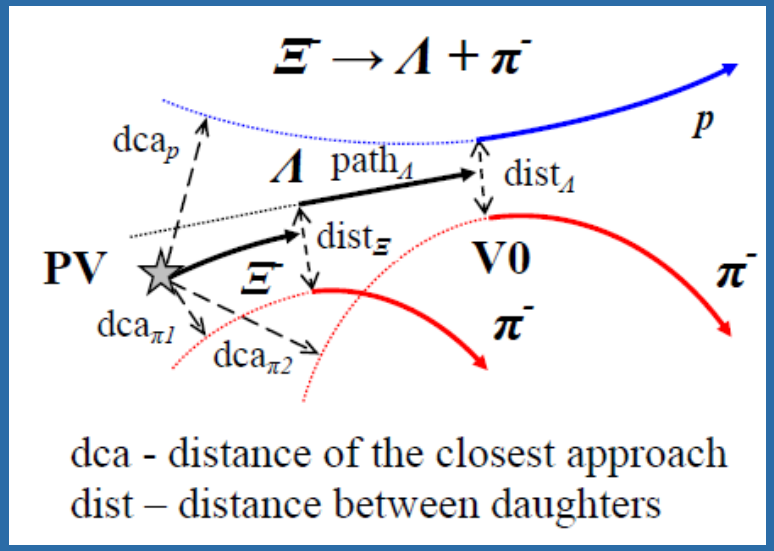
Particle	$\Xi^{+}_{bar} \rightarrow \Lambda_{bar} + \pi^{+}$	$\Omega^{-} \rightarrow \Lambda + K^{-}$	$\Omega^{+} \rightarrow \Lambda_{bar} + K^{+}$
Expected yield	7.2×10^{5}	7.4×10^{4}	2.3×10^{4}

Ξ^- reconstruction for QM-2019









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Summary

- Multistrange hyperons are reconstructed in min. bias Au+Au at 11 GeV
- MPD efficiency is estimated in p_T bins for several centrality intervals
- Invariant yields of (anti)Λ are obtained for central and peripheral collisions
- Analysis for Ξ and Ω is ongoing, the latter requires a larger data volume