Strangeness Production in few-GeV Heavy Ion Collisions

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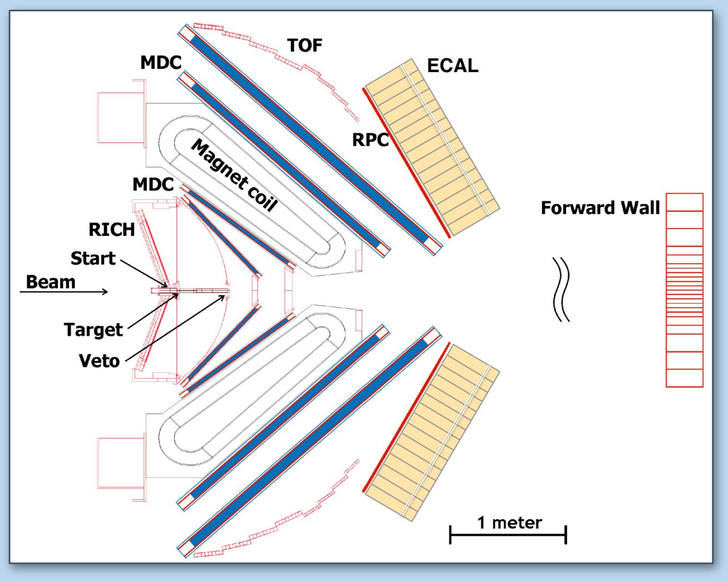
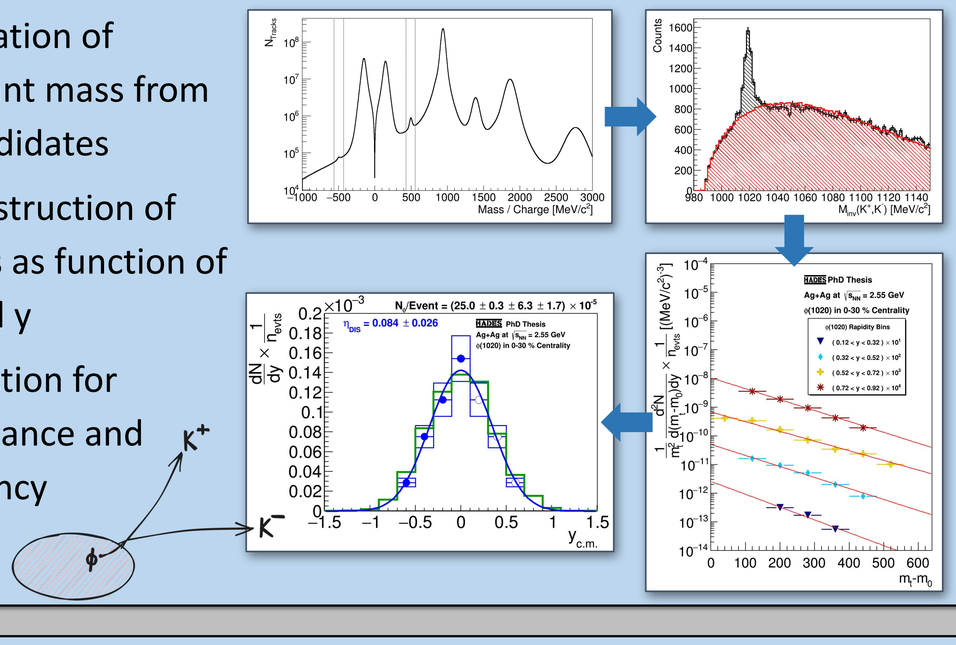
HADES

- Fixed target experiment at GSI, Darmstadt
- Polar angle coverage between 18° and 85°, nearly full azimuthal coverage
- Charged hadron ToF precision σ~100 ps
- Charged particle momentum reconstruction via fitting of bent track from hits in 24 MDC layers
- Energy loss in MDCs and TOF



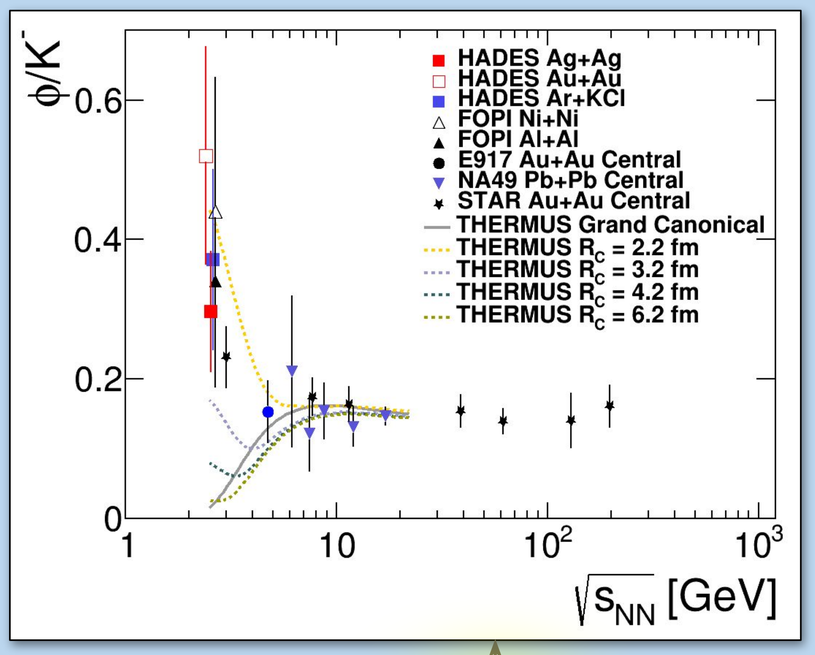
ϕ-Meson Reconstruction

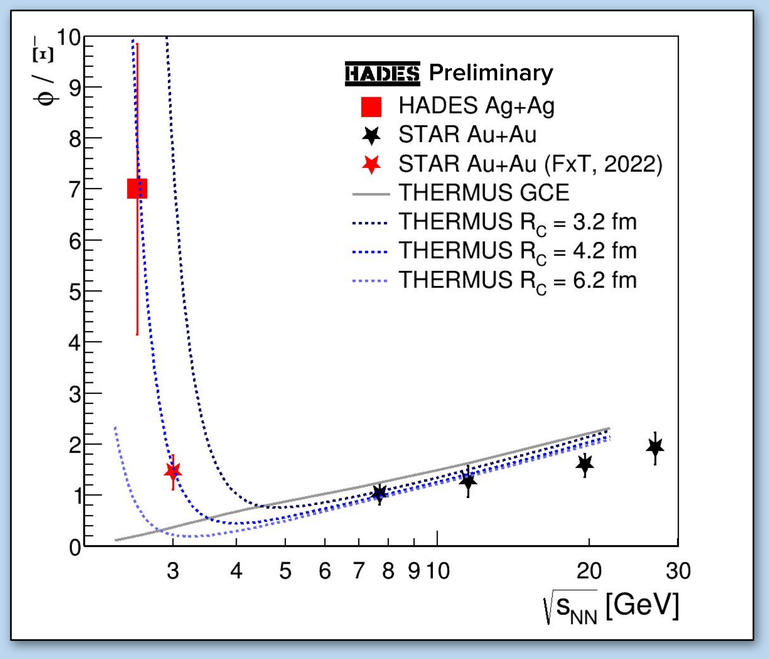
- Selection of $K^{\pm}$ mass region for daughter track candidates
- Application of track quality selection criteria and energy loss constraints on daughter particle candidates
- Calculation of invariant mass from $K^{\pm}$ candidates
- Reconstruction of signals as function of m_t and y
- Correction for acceptance and efficiency



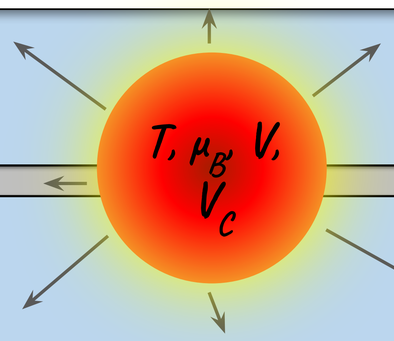
Ratios of Hadrons with Strangeness Content

- Ratio of ϕ/K^- and ϕ/Ξ^- present with steep rise towards few GeV collision energies when comparing results from HADES, STAR [2] and further experiments [1]
- Description of both ratios as function of collision energy not consistent for same strangeness suppression parameter R_C in the framework of the statistical model
- THERMUS curves [2] based on collision energy dependent $\{T,\mu_B\}$ parameterisation in [3]



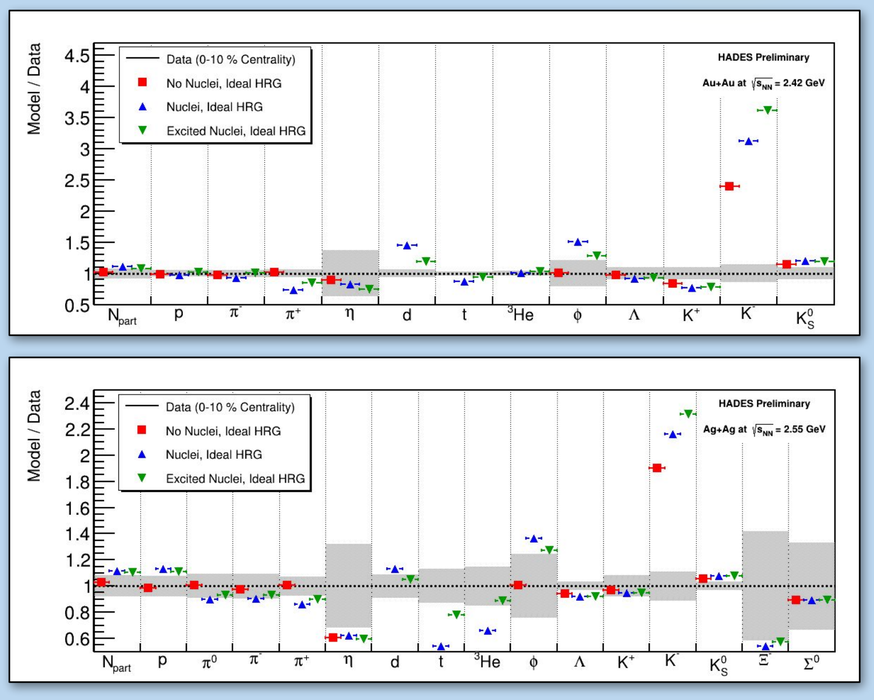


[1] G. Agakishiev et al. , DOI: 10.1103/PhysRevC.80.025209
[2] M.S. Abdallah et al., DOI: 10.1016/j.physletb.2022.137152
[3] A. Andronic et al., DOI: 10.1038/s41586-018-0491-6



Statistical Model Fit

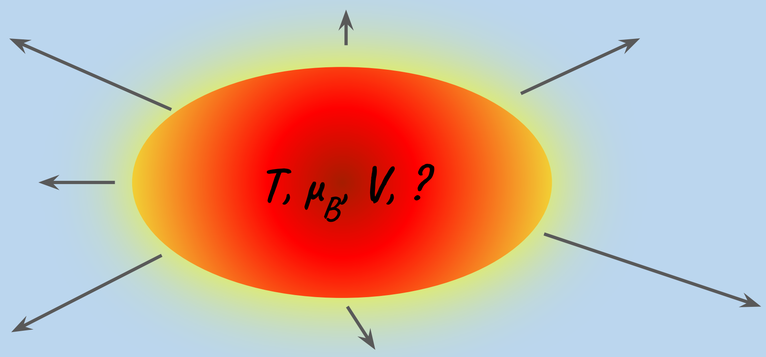
- Thermal-FIST [4] fit performed using single canonical suppression factor R_C
- Cases without light nuclei (■) and with excited light nuclei feed down (▼) show comparable and best global χ^2 values
- Case of light nuclei without excited light nuclei feed down (▲) offers poor description
- K^- not well described



[4] V. Vovchenko et al., DOI:10.1016/j.cpc.2019.06.024

Outlook

- Testing alternative approaches for strangeness suppression in momentum space [5]
- Inclusion of non-spherical source-symmetry [6] and Hubble-like expansion velocity distributions [7]
- Comparison of data to transverse and longitudinal spectra generated by statistical model



[5] P. Braun-Munzinger, K. Redlich, A. Rustamov, J. Stachel, e-Print: 2312.15534 [nucl-th]
[6] H. Dobler, J. Sollfrank, U. W. Heinz, DOI:10.1016/S0370-2693(99)00551-1
[7] S. Harabasz, W. Florkowski, T. Galatyuk, M. Gumberidze, R. Ryblewski, et al., DOI: 10.1103/PhysRevC.102.054903

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