Medium-induced modification of kaons spectra measured in SIDIS at HERMES

Gevorg Nazaryan

AANL (Yerevan Physics Institute), HERMES Yerevan Group

(on behalf of HERMES collaboration)

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Outline

Theoretical motivation

Data

Results

Conclusion

How K^- can form ?

$K^-(\bar{u}s)$ ⟶

1. Valence quark (u, d) shower evolution
2. Sea quarks ($\bar{u}s$)

How K^- spectra can enhance ?

Medium-induced flavor conversion (large x_{Bj} & z)!

Nuclear Modification Factor

$$R^h_{A/D}(x_{Bj}, z, p_t^2, \dots) = \frac{\left(\frac{N^h(x_{Bj}, z, p_t^2, \dots)}{N^e(x_{Bj}, z, p_t^2, \dots)}\right)_A}{\left(\frac{N^h(x_{Bj}, z, p_t^2, \dots)}{N^e(x_{Bj}, z, p_t^2, \dots)}\right)_D}$$

x_{Bj}: fraction of the nucleon's momentum carried by the struck quark (Bjorken variable)

z : hadron fractional energy

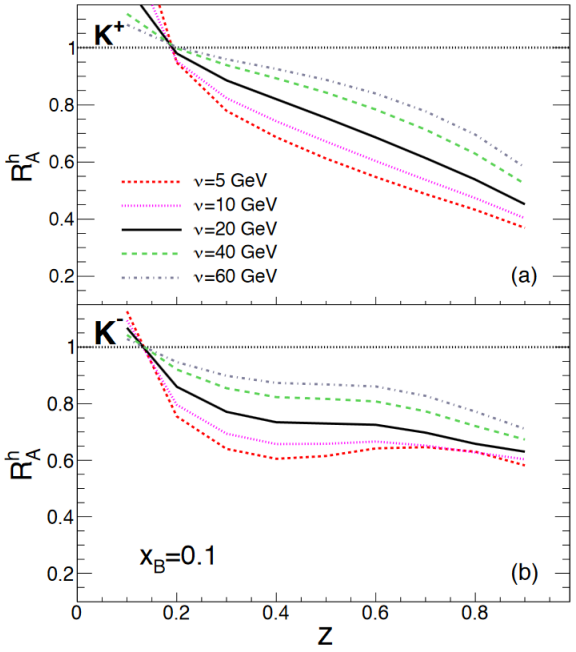
p_t : transfers momentum of produced hadrons

N^e: number of DIS electrons

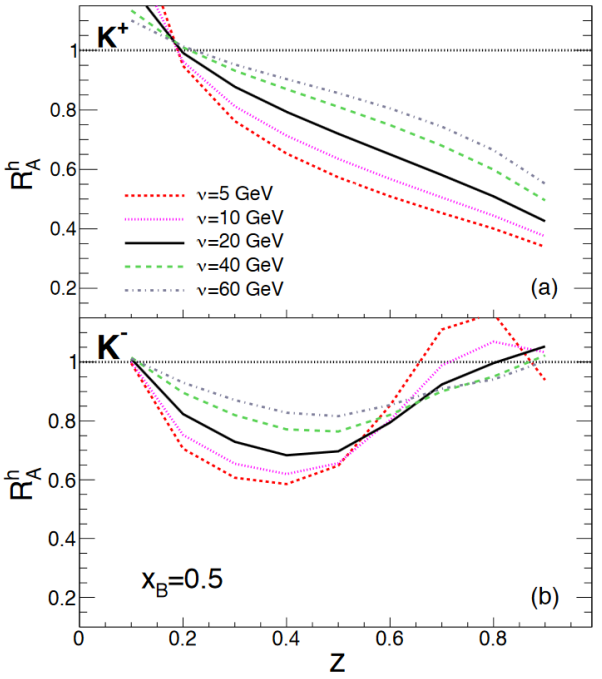
N^h: number of SIDIS (Semi Inclusive Deep Inelastic Scattering) hadrons

Theoretical prediction

Medium-induced flavor conversion and kaon spectra in electron-ion collisions
Ning-Bo Chang, Wei-Tian Deng and Xin-Nian Wang, e-Print: arXiv:1411.7007 [hep-ph], Nov. 25, 2014; Phys.Rev. **C92** (2015) no.5, 055207

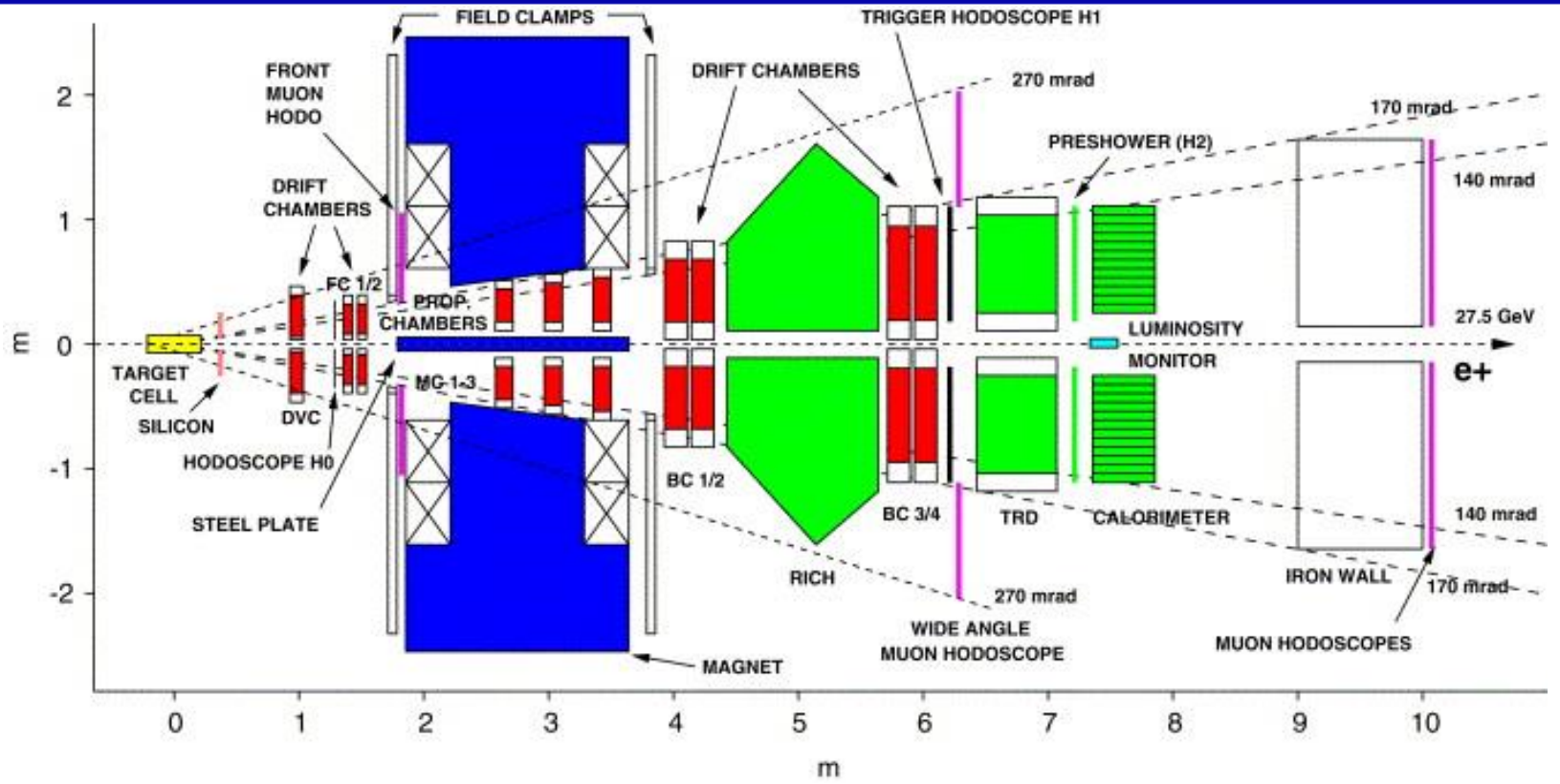


The nuclear modification factor for (a) K^+ and (b) K^- for different initial quark energy in SIDIS at x_{Bj}= 0.1



The nuclear modification factor for (a) K^+ and (b) K^- for different initial quark energy in SIDIS at x_{Bj}= 0.5

HERMES spectrometer



Energy of beam (e^+, e^-) 27.5$[GeV]$

Geometric acceptance: ± 170 mrad horizontally plane and 40-140 mrad vertically plane

Momentum resolution: $\Delta p/p \sim 0.7\text{-}1.7\%$

Angular resolution: $\Delta\theta/\theta \sim 0.5\%$

Targets (pure gaseous): H, D, Ne, Kr, Xe

Data from Hermes

Targets: D, Ne, Kr and Xe

Data selection

1. $Q^2 > 1[GeV^2]$; $W^2 > 10[GeV^2]$
2. $2 < p_h < 15\ [GeV]$
3. x_{Bj}: $0.023 < 0.1$; $0.1 - 0.15$; $0.15 - 0.25$; $0.25 - 0.35$; $0.35 - 0.41$
4. z : $0.2 - 0.3$; $0.3 - 0.4$; $0.4 - 0.55$; $0.55 - 1.2$

Data from Hermes

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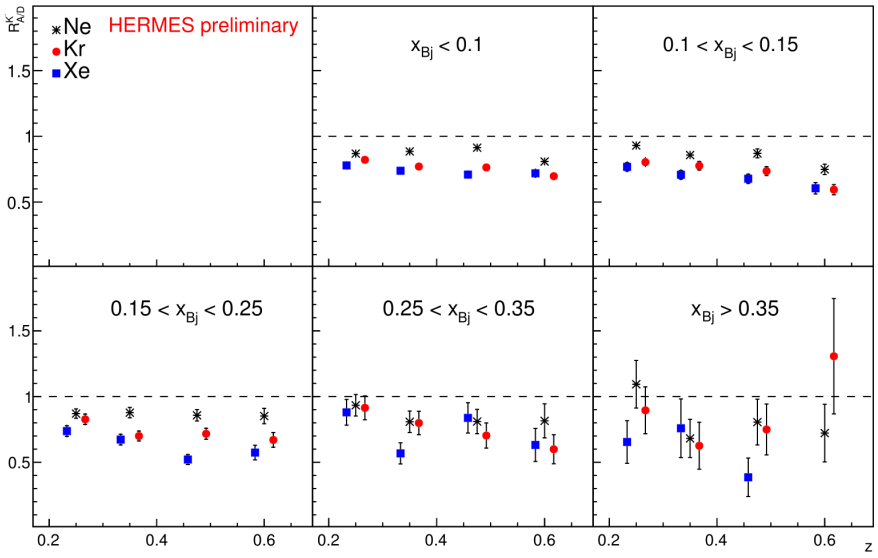
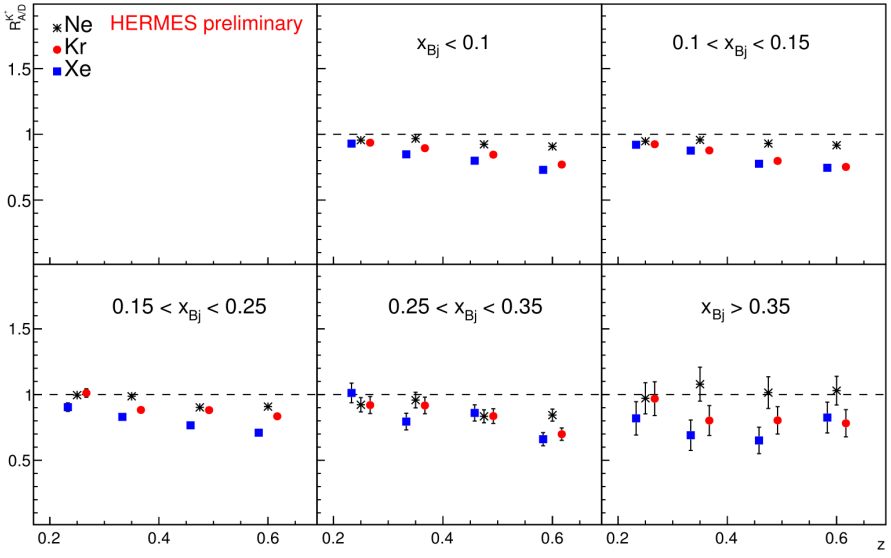
Results

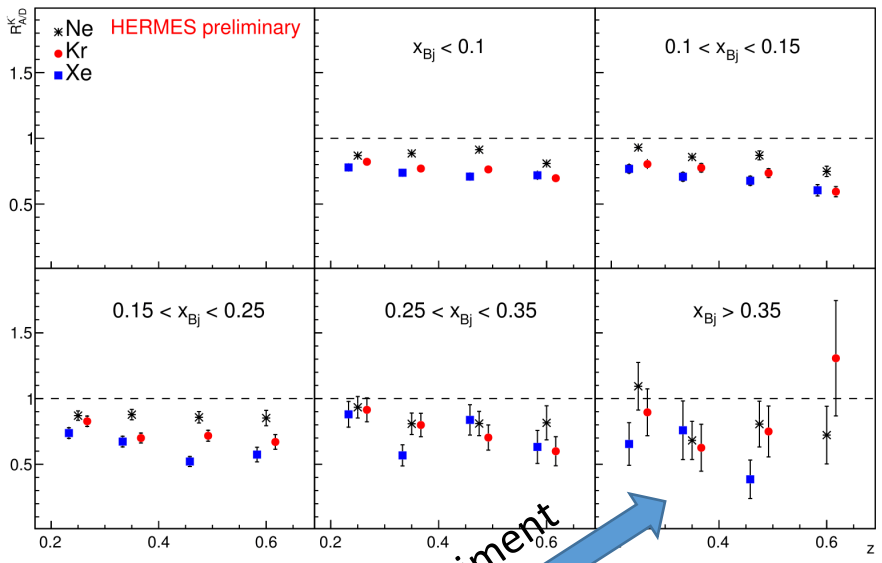


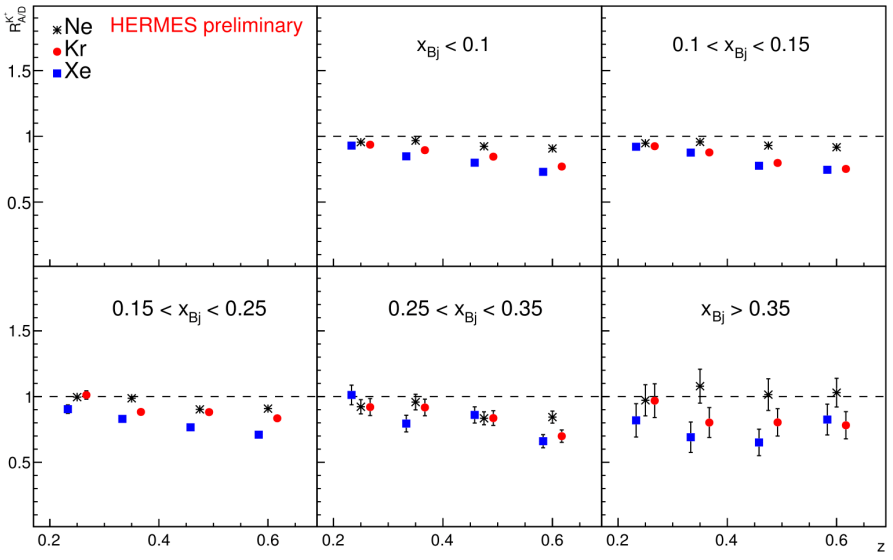
The $R^h_{A/D}(z)$ ratios at five x_{Bj} slices for negatively charged kaons



The $R^h_{A/D}(z)$ ratios at five x_{Bj} slices for positively charged kaons

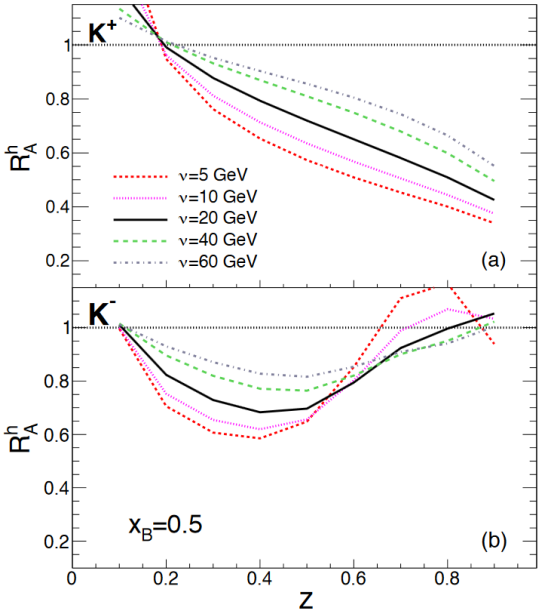
Results



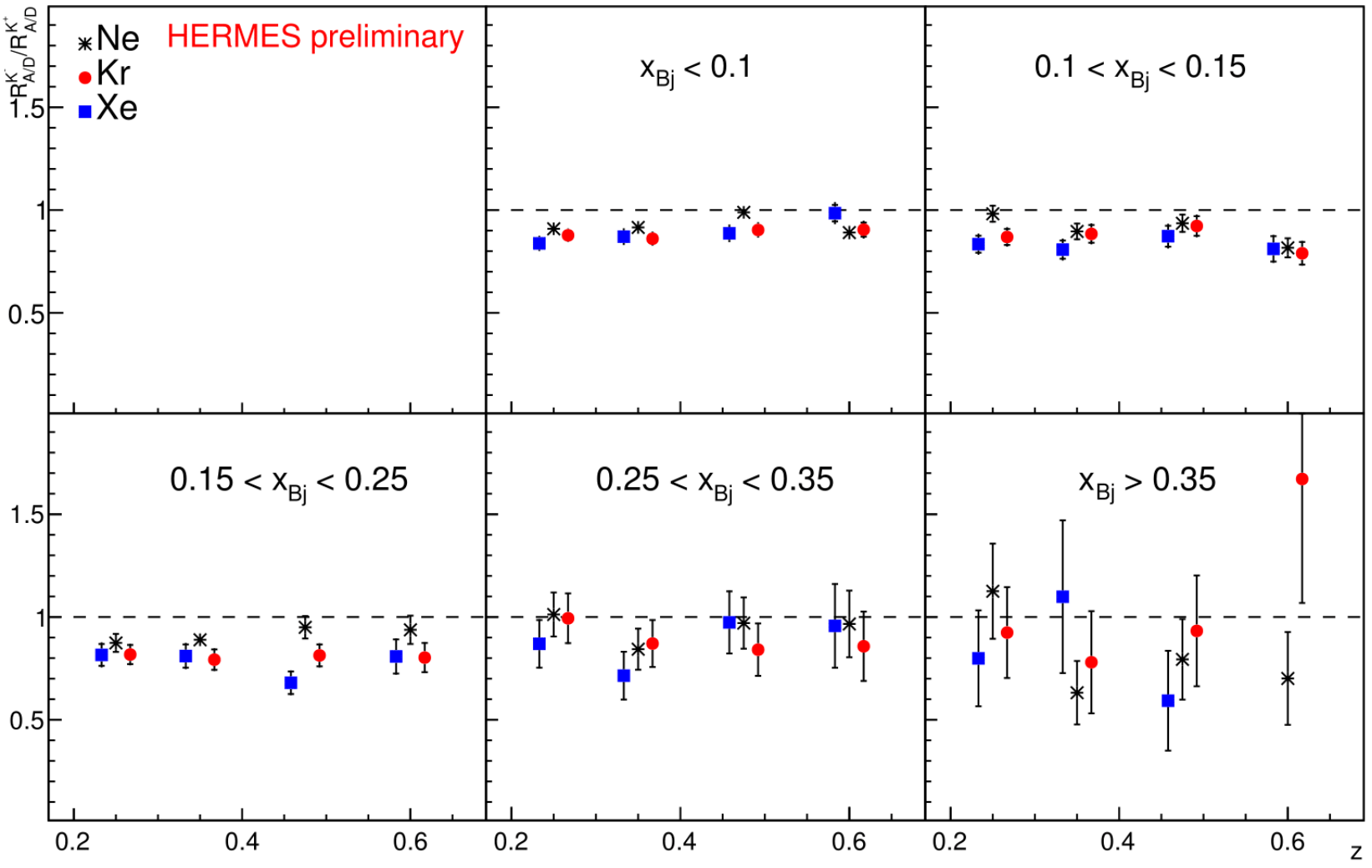


Experiment

Theory



Results



$R^{K^-}_{A/D}/R^{K^+}_{A/D}(z)$ ratio for chrged kaons

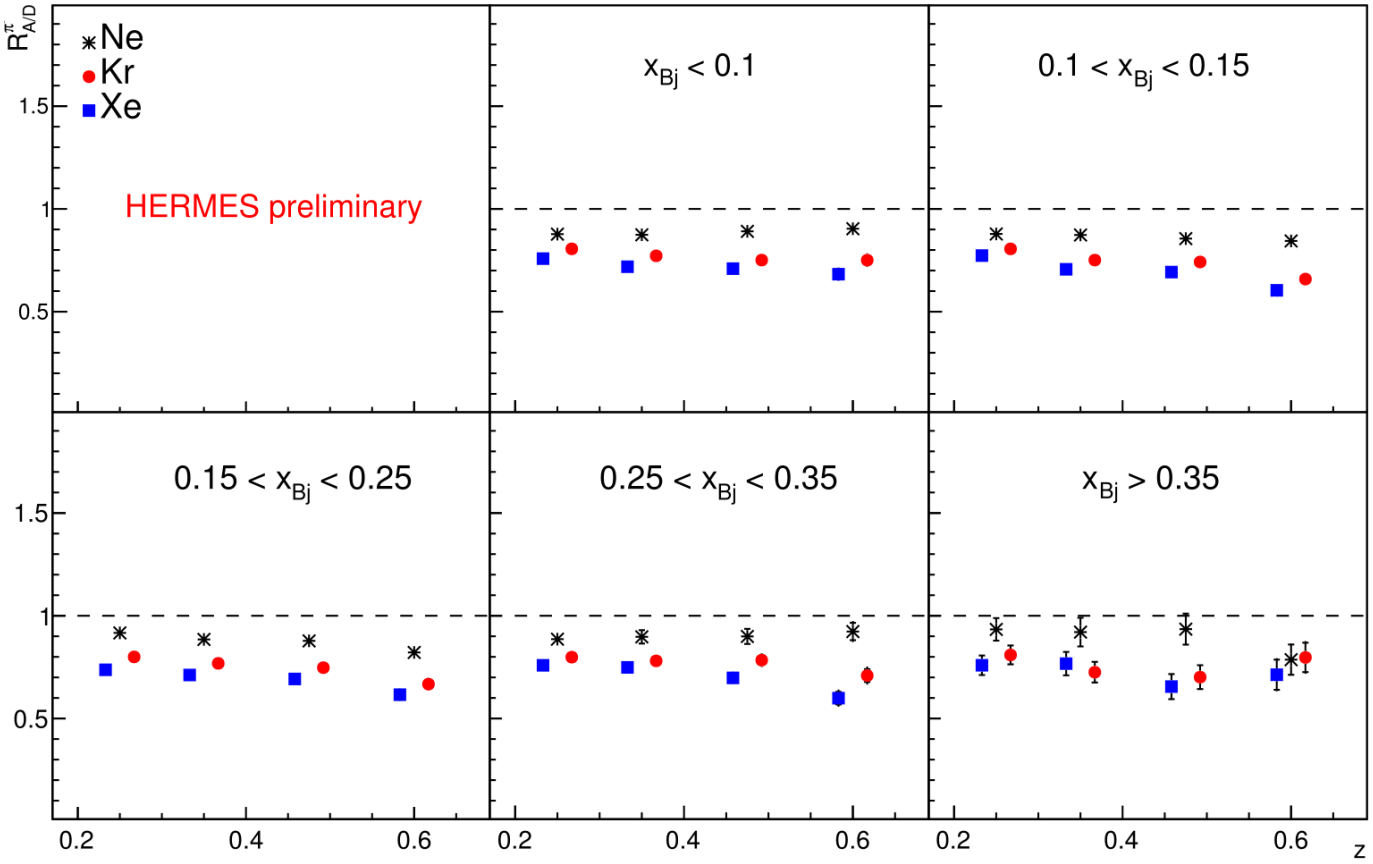
Conclusion

1. For K^- in case of Kr target at x_{Bj} greater than 0.35 certain indication of enhancement of the $R^h_{A/D}(z)$ with the increasing of z is observed.

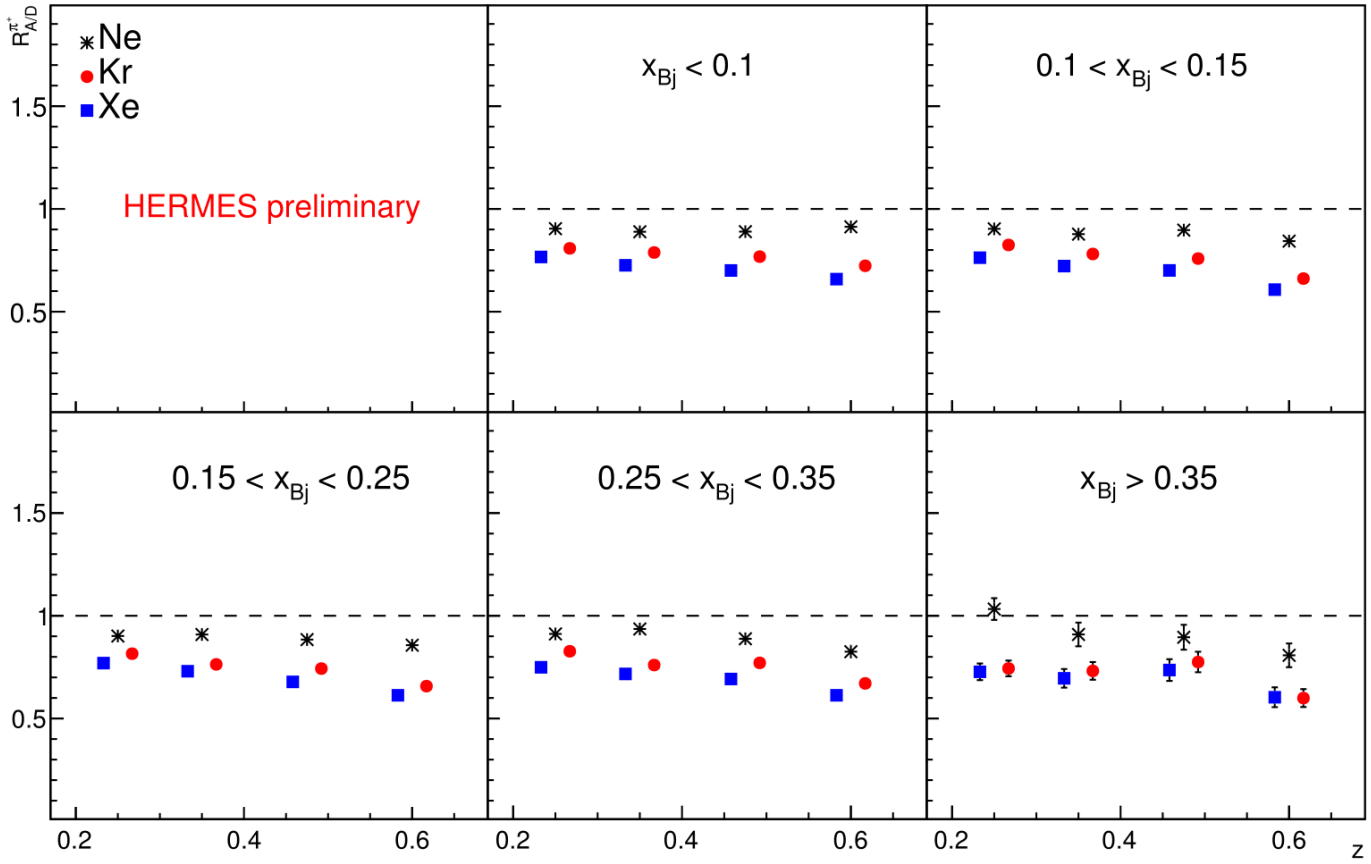
2. Ratio $R^{K^-}_{A/D} \Big/ R^{K^+}_{A/D}$ at highest z becomes even greater than unity for Kr.

Thank you for your attention !

$R_{A/D}^{\pi^-}$



The $R_{A/D}^{h}(z)$ ratios at five x_{Bj} slices for negativly charged pions



The $R_{A/D}^{h}(z)$ ratios at five x_{Bj} slices for positively charged pions