Medium Induced Modification of Negative
Kaons Spectra in SIDIS

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On behalf of HERMES Collaboration

Correlations in Partonic and Hadronic Interactions
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Physics Motivations

› In DIS events with larger values of x_B, the initial struck quarks are completely dominated by valence quarks of the nucleus

› One should expect to see enhancement of K^- due to medium-induced flavor conversion in the mFF's:

Possible production mechanisms for…

$K^-(\bar{u}\,s)$
› *Indirect*: valence quarks (u, d) shower evolution
› *Direct*: sea quarks: $(\bar{u}\,s)$

› The spectrum is suppressed at intermediate values of z due to parton energy loss. But at large z, the modification factor starts to increase and approaches or exceeds 1, due to contributions from gluons and constituent quarks via medium-induced flavor conversion
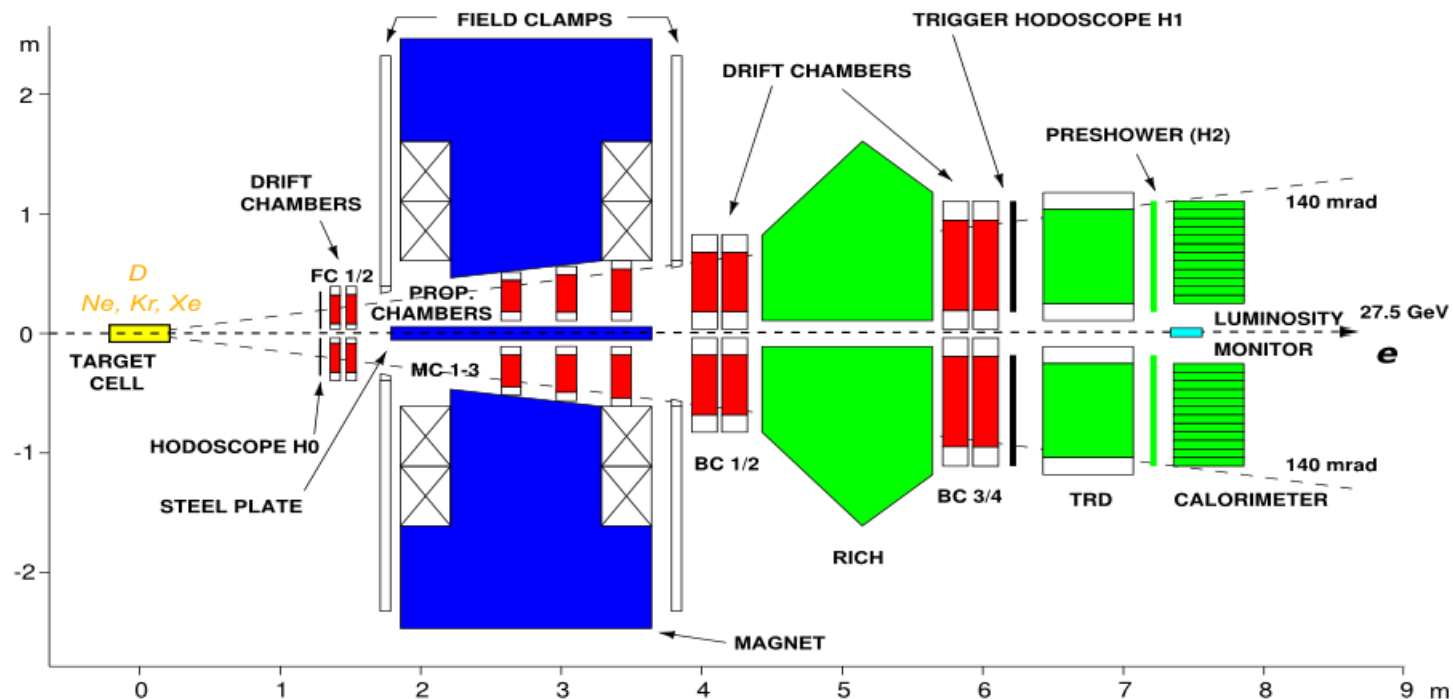
Physics Motivations: (Ning-Bo Chang, Wei-Tian Deng and Xin-Nian Wang, e-Print: arXiv:1411.7007, [hep-ph], Nov. 25, 2014; Phys.Rev. C92 (2015) no.5, 055207)
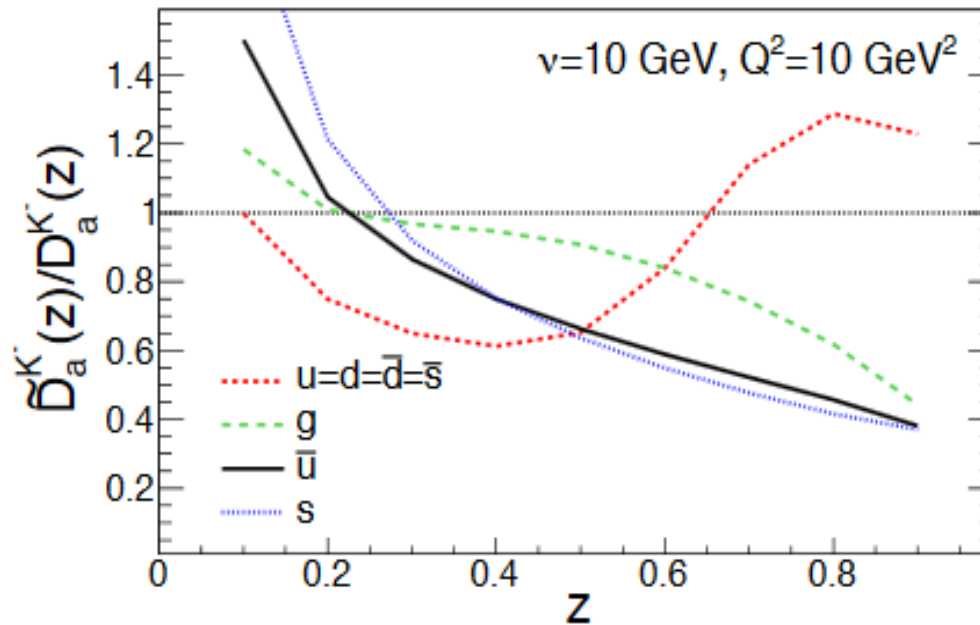
Physics Motivations
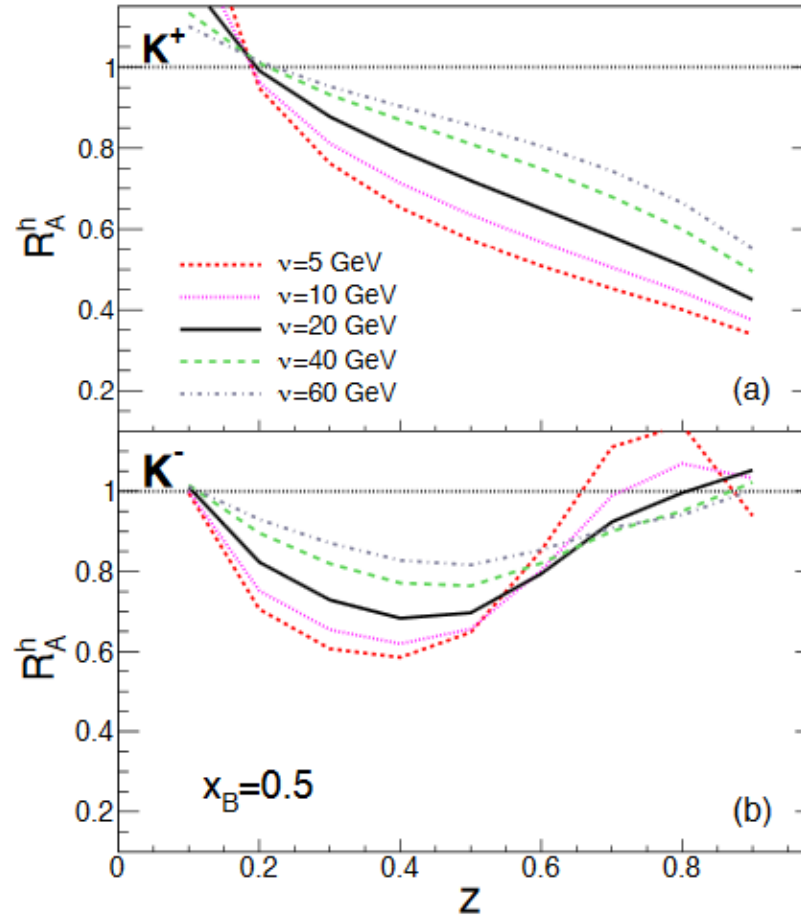
HERMES spectrometer: 27.6 GeV e-/e⁺ beams, angular acceptance of ±(40 - 140) mrad in vertical and ± 170 mrad in horizontal directions, 1.5% /0.8 mrad – momentum/angular resolution, lepton/hadron separation efficiency – 98%

Data Analysis

› HERMES collected a lot of data with the unpolarized nuclear targets: *Ne, Kr* and *Xe,* as well with the **deuterium**, which allow to extract the nuclear modification factor *R:*

$$R^h(x_B, z, ..) = [N^h_{sidis}/N_{dis}]^A / [N^h_{sidis}/N_{dis}]^D$$

*Kaons/pions separation with high efficiency has been achieved by use of the **RICH** detector*

Data Analysis

› DIS cuts used for analysis:

$Q^2 > 1 \; GeV^2$; $W^2 > 10 \; GeV^2$; $y=v/E_0 <0.78$

› SIDIS cuts: $2 < p_h < 15$ GeV to maximize the efficiency of **RICH**

› Double binning : on x_B [0 - 0.1 – 0.15 – 0.25 – 0.35 – 1] and z [0.2 - 0.3 – 0.4 – 0.55 – 1.2]

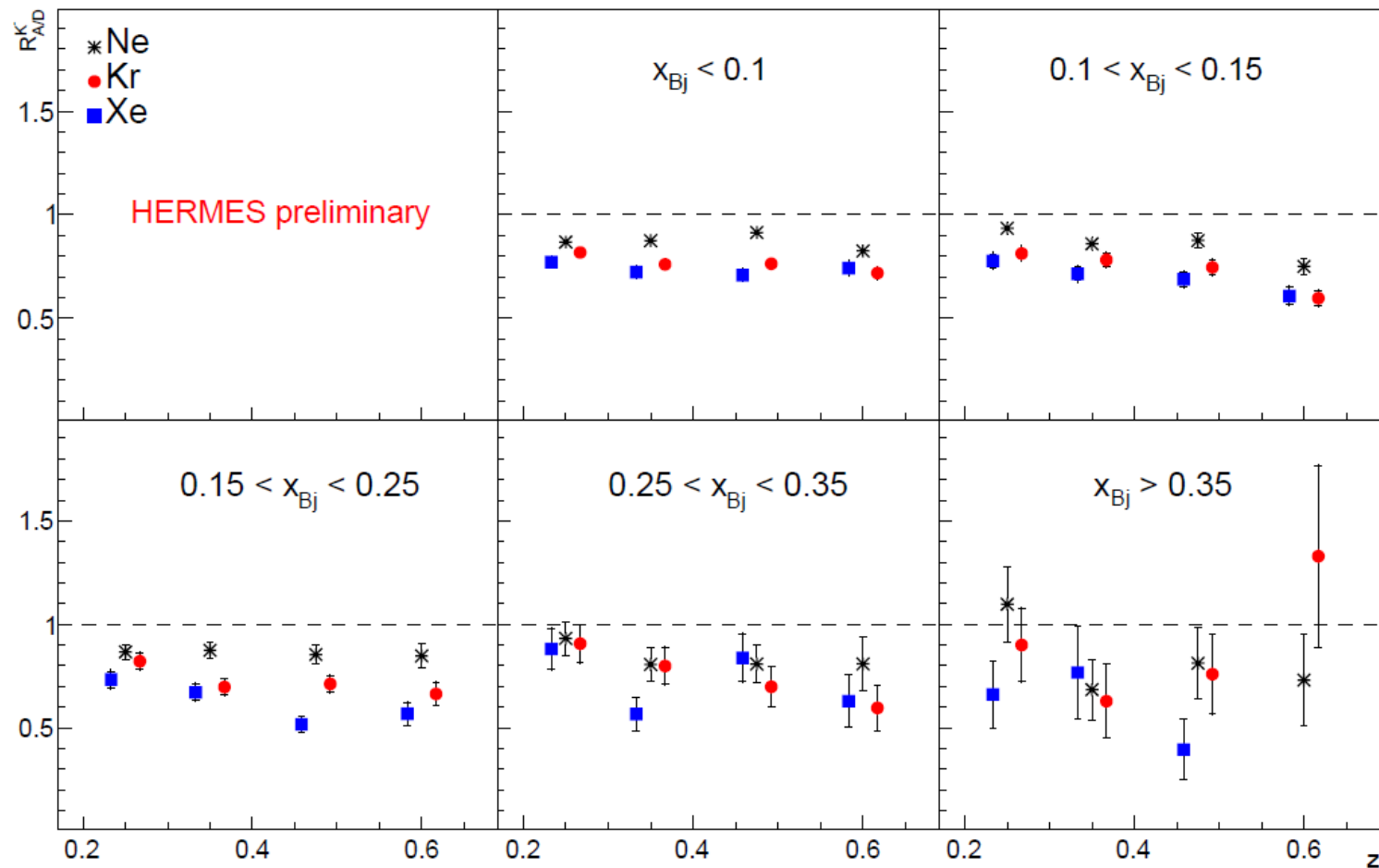› Fiducial volume cuts were applied for both **DIS** and **SIDIS**

Data Analysis

› Main source of **systematic uncertainties** is the time dependent factor due to used data samples for different targets collected during different years: maximum ~3.5% for kaons and ~2% for pions

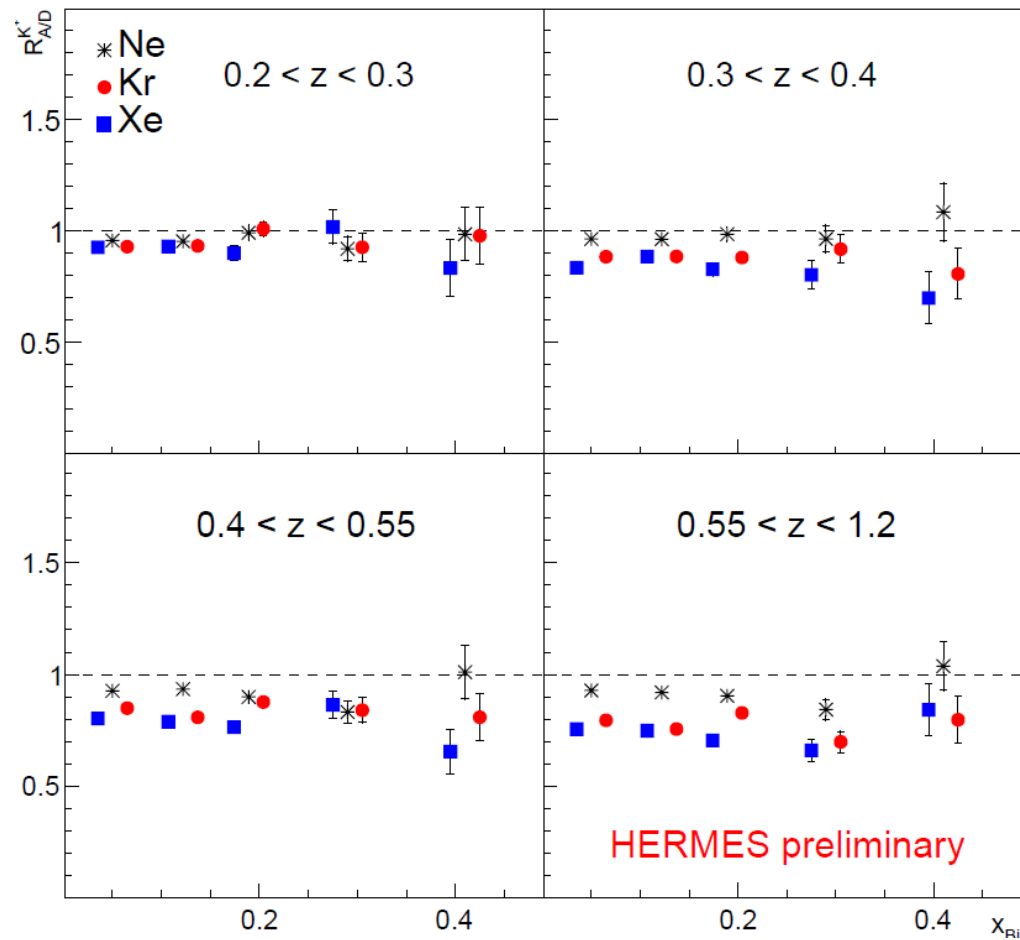› The radiative corrections for nuclear factor to be maximal ~3 (3.5)% for Kr/Xe and ~2% for Ne at lowest x_B

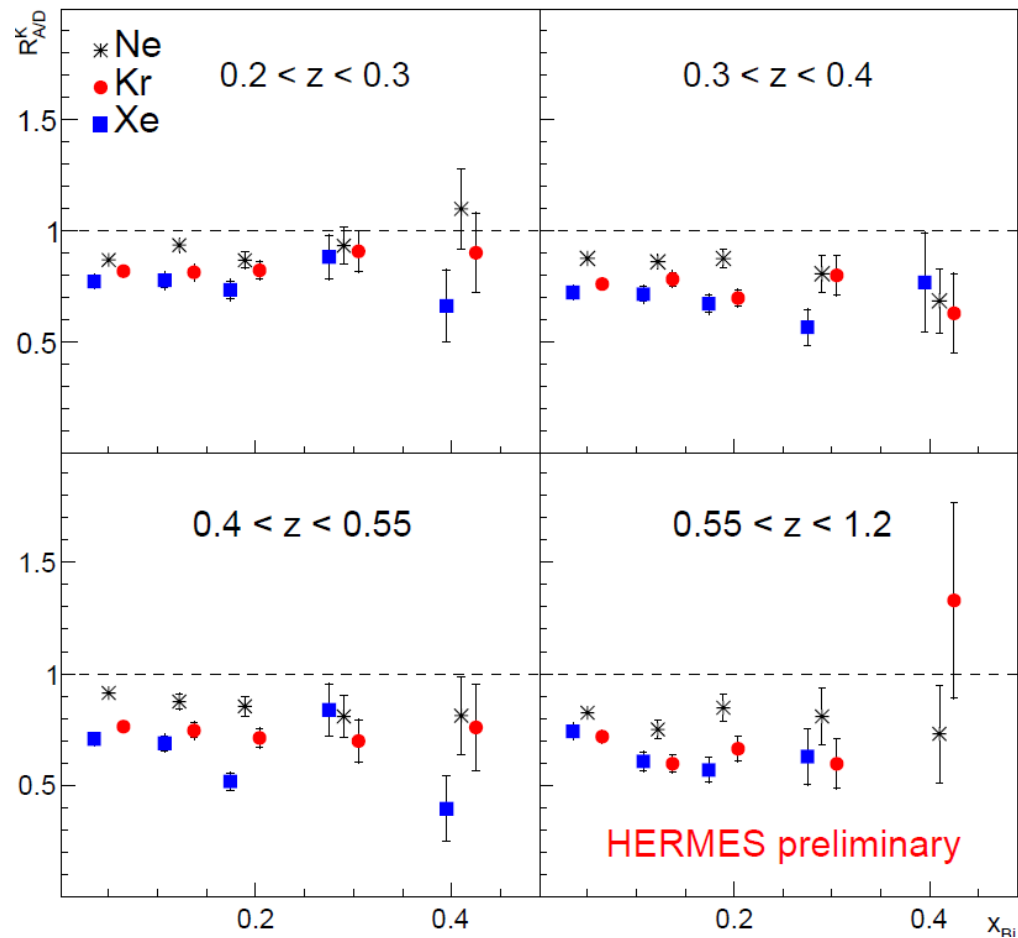# Results: *z* dependences at different x_B slices for the K^+ nuclear factor
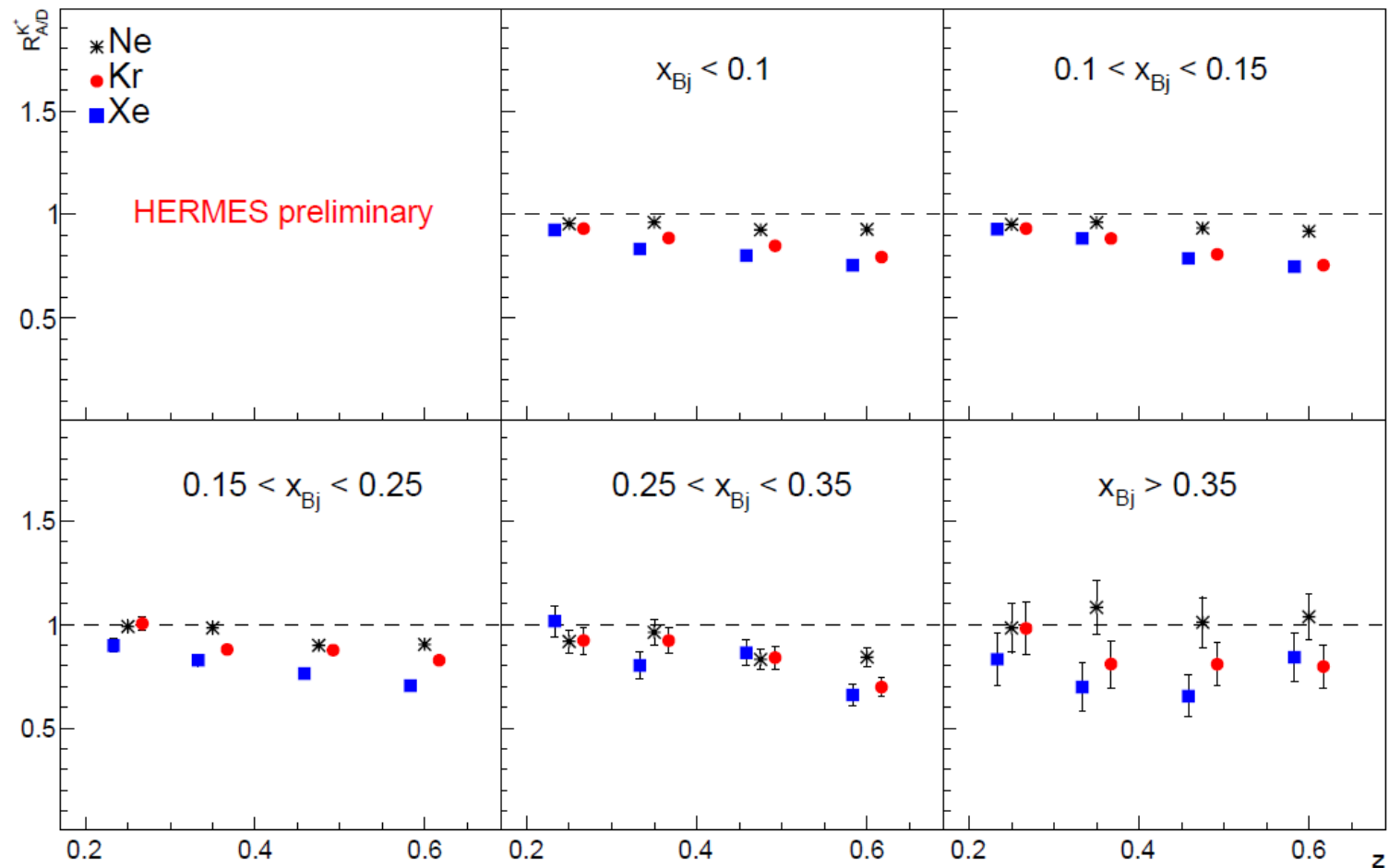
Results: *z* dependences at different x_B slices for the K^- nuclear factor
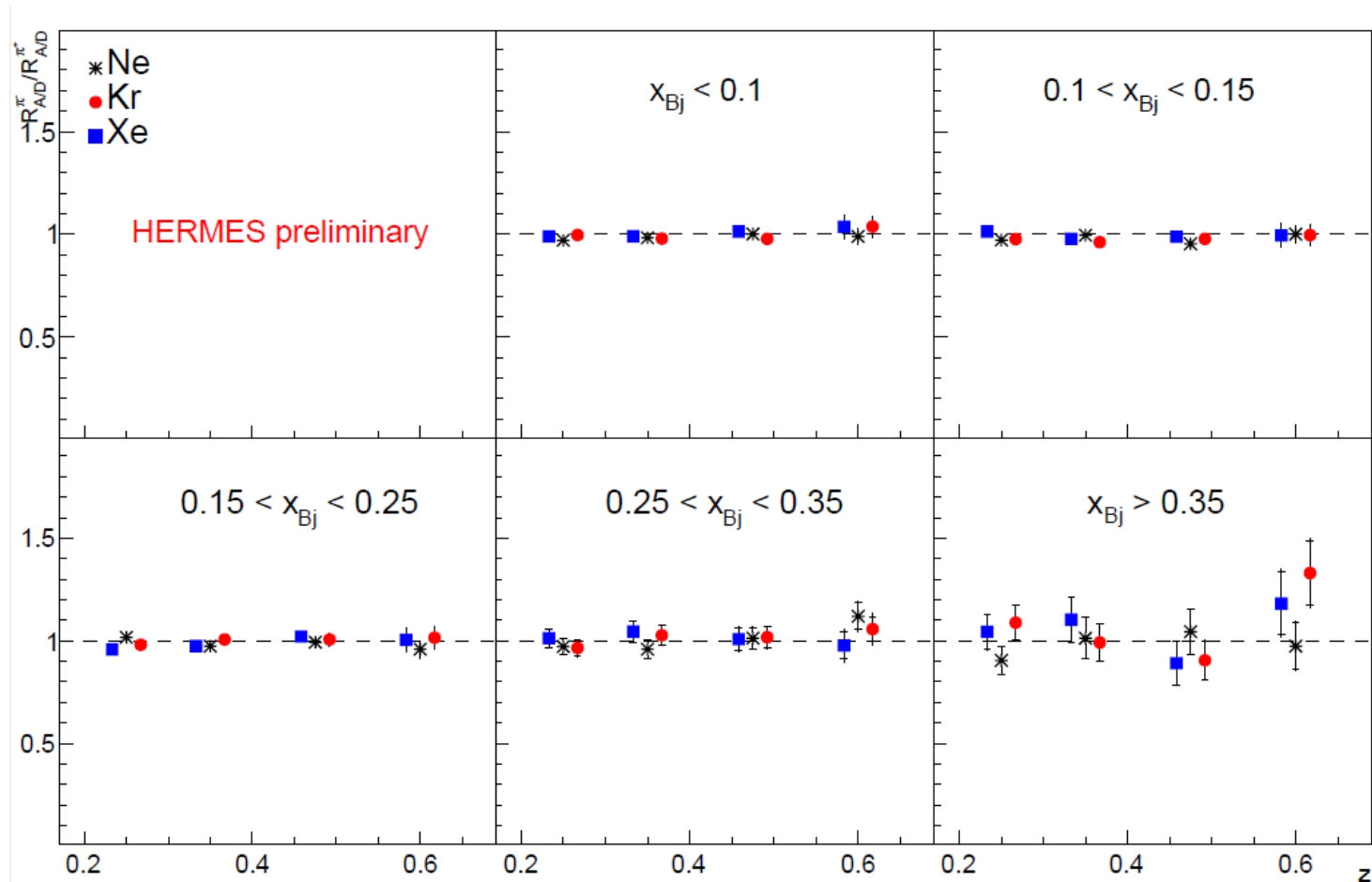
Results: x_B dependences at different z slices for the K^+ nuclear factor
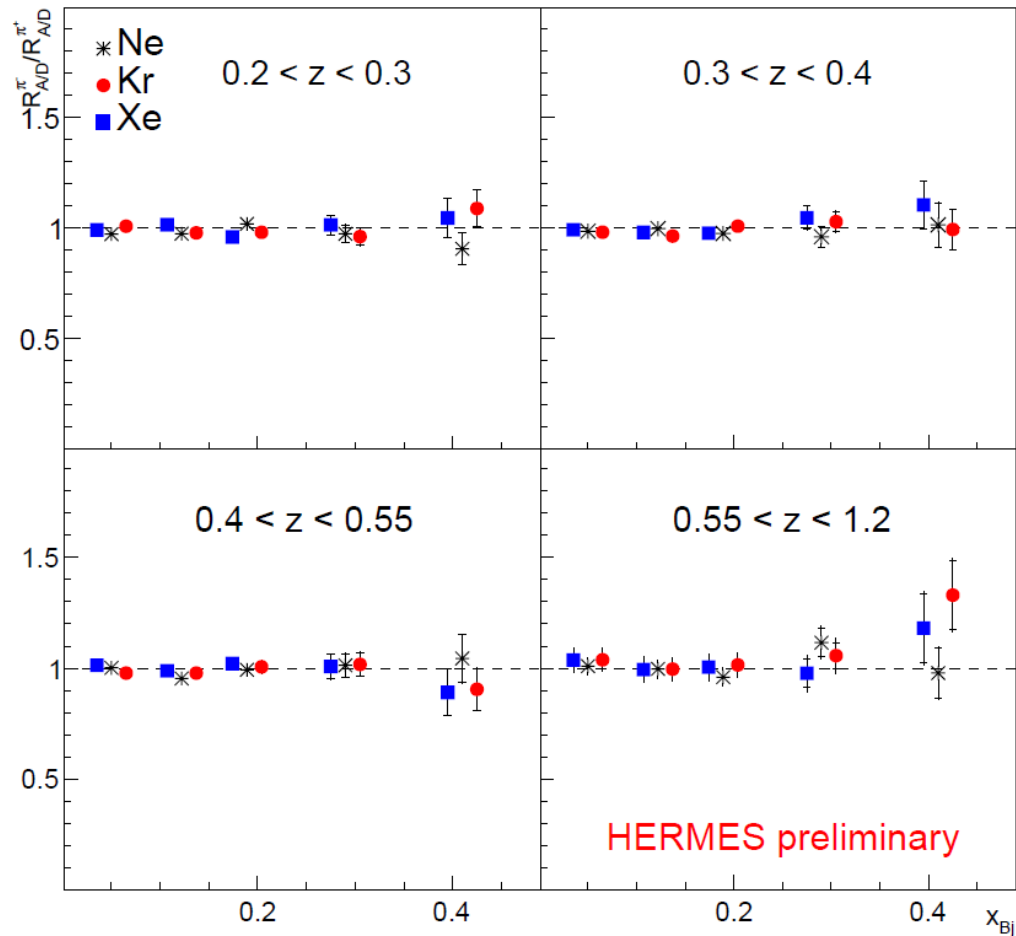
Results: x_B dependences at different z slices for the K^- nuclear factor

Results: z dependences at different x_B slices for the ratio of pions nuclear factor

Results: x_B dependences at different z slices for the ratio of pions nuclear factor

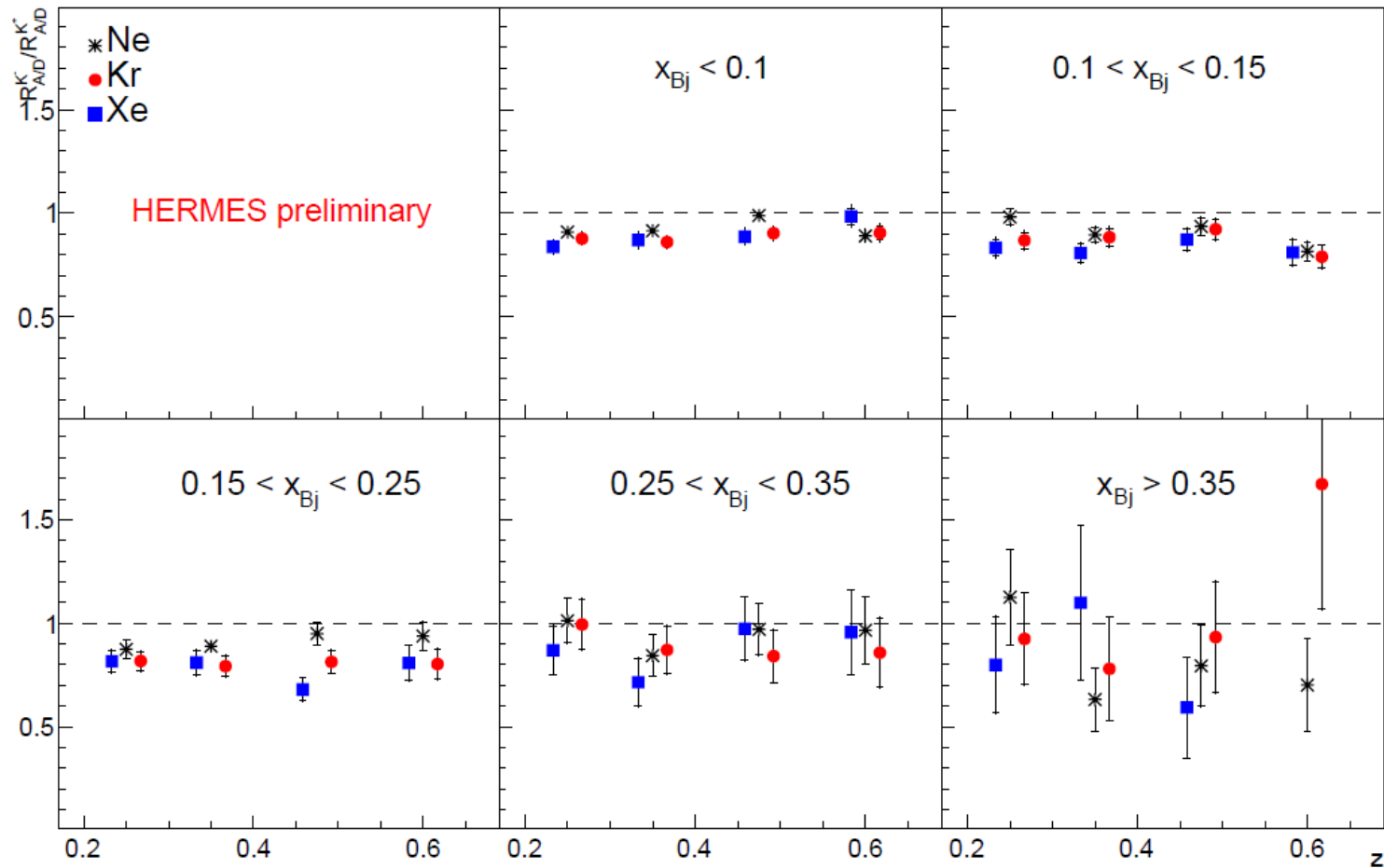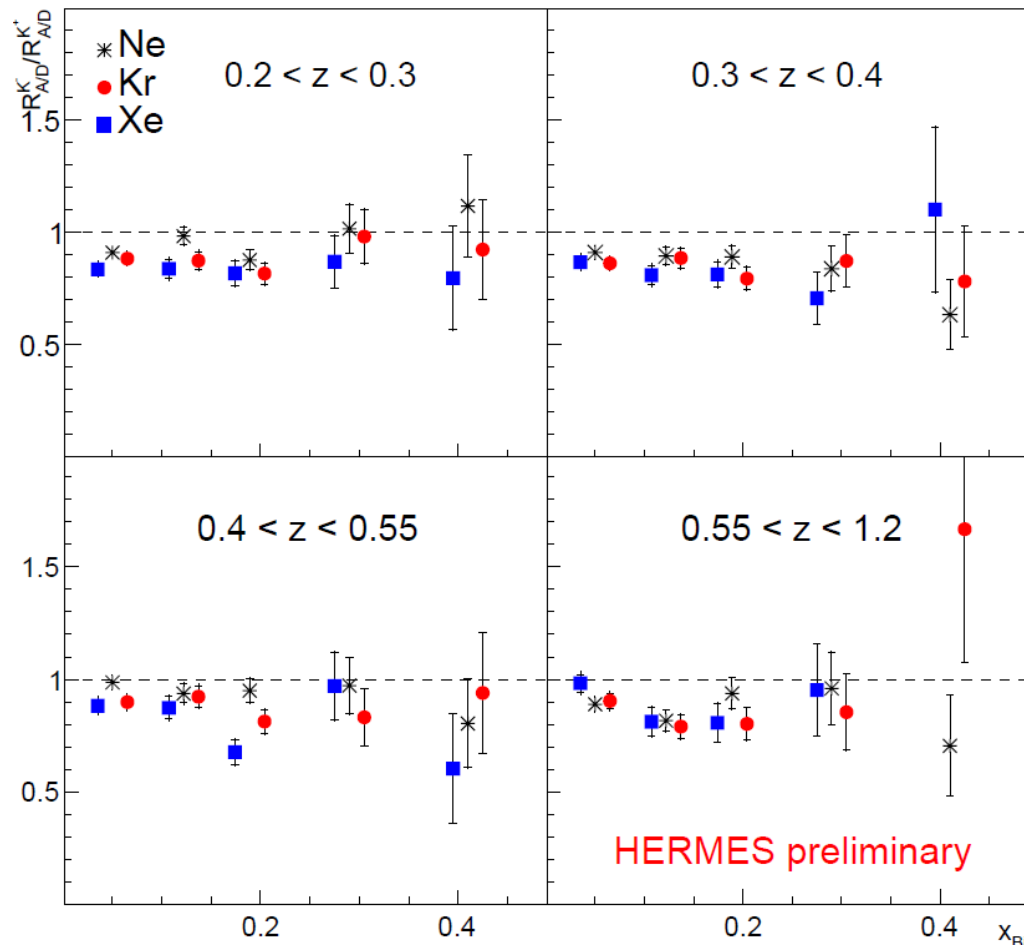# **Results**: *z* dependences at different x_B slices for the ratio of kaons nuclear factor

Results: x_B dependences at different z slices for the ratio of kaons nuclear factor

Conclusions

Indication on QCD predicted enhancement of nuclear modification factor at high x_B, z region for negative kaons produced on **Kr** <u>is observed</u>

Due to low statistics at high x_B, z , also possible specific nuclear effects the same indication is not seen for **Xe**

The paper draft with the detailed tables of data points is close to be finished soon

Obtained results will be useful also to improve the nuclear **PDFs** parameterizations