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Multidimensional hadron attenuation

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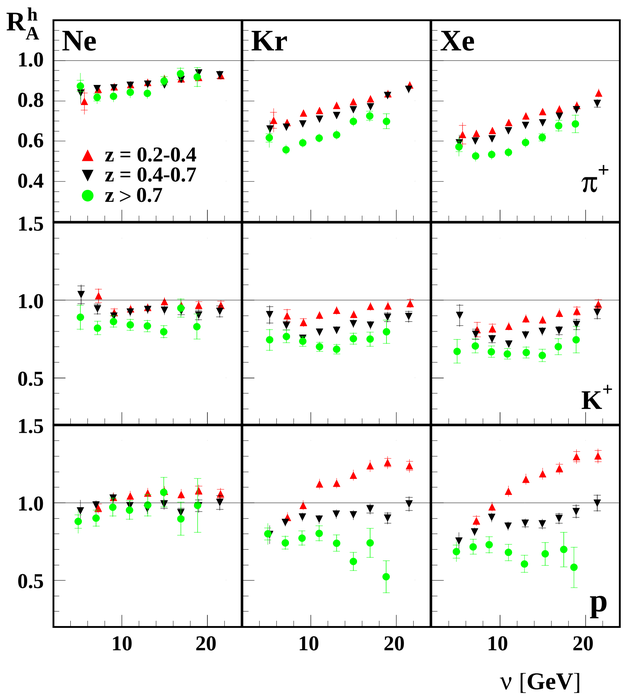
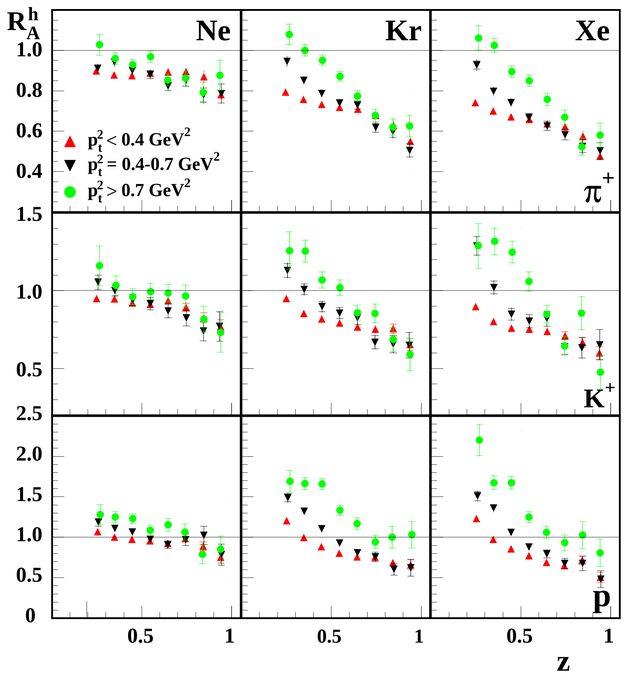
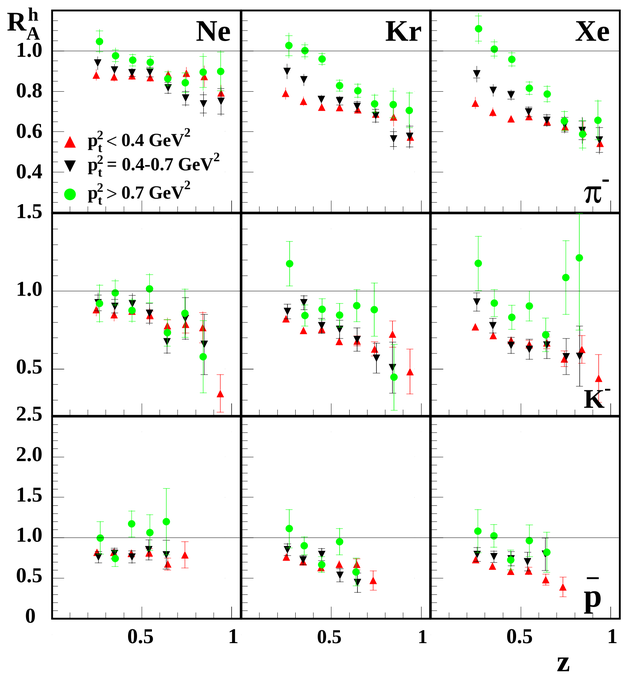


Dependence of R_A^h on ν for positively charged hadrons for three slices in z(scale uncertainties are 3%, 5%, 4% and 10% for π, K and protons respectively).



Dependence of R_A^h on z for positively charged hadrons for three slices in p_t^2.

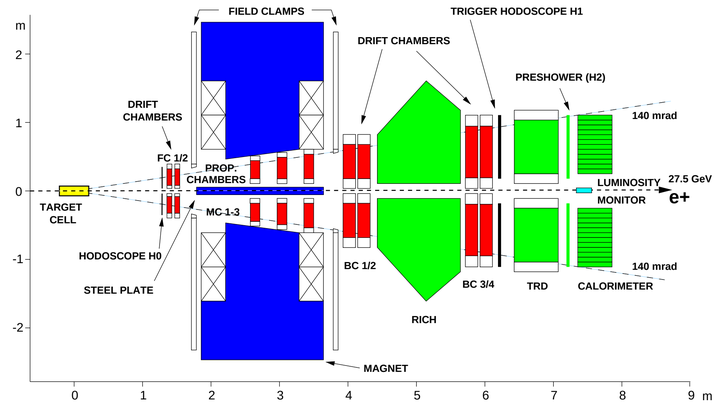


Dependence of R_A^h on z for negatively charged hadrons for three slices in p_t^2.

- **Attenuation is larger for heavy nuclei**
- **Protons behave very differently from the other hadrons**

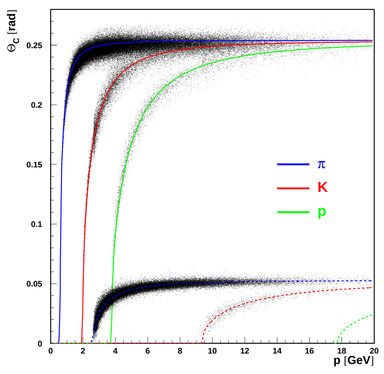
- **Semi-inclusive hadron electroproduction process** $e + N \to e' + h + X$
- e^-/e^+ **beam of** $27.6\,GeV$ **energy**
- **Nuclear targets** ${}^2D, {}^{20}Ne, {}^{84}Kr, {}^{131}Xe$

- **Good momentum resolution(** $\Delta p/p < 2\%$ **)**
- **Excellent particle identification capabilities**



The **HERMES** spectrometer.

- **Particle Tracking System**
- **Particle Identification System**



Momentum dependence of the Cherenkov angle for different hadron types and radiators. The upper band corresponds to the aerogel and the lower band to the C_4F_{10} gas respectively.

- **Charge separated** π, K, p
- **Separation of** π, K **and** p **in momentum range of** $2 - 15\,GeV$

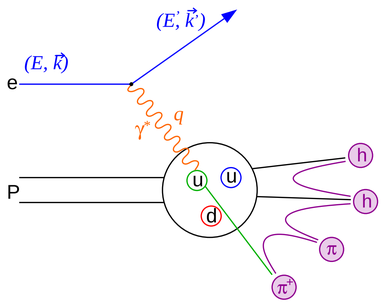
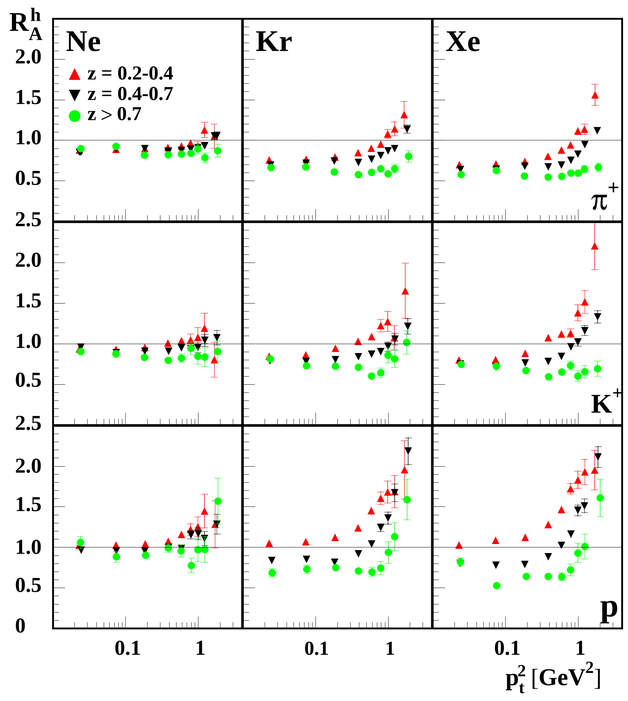


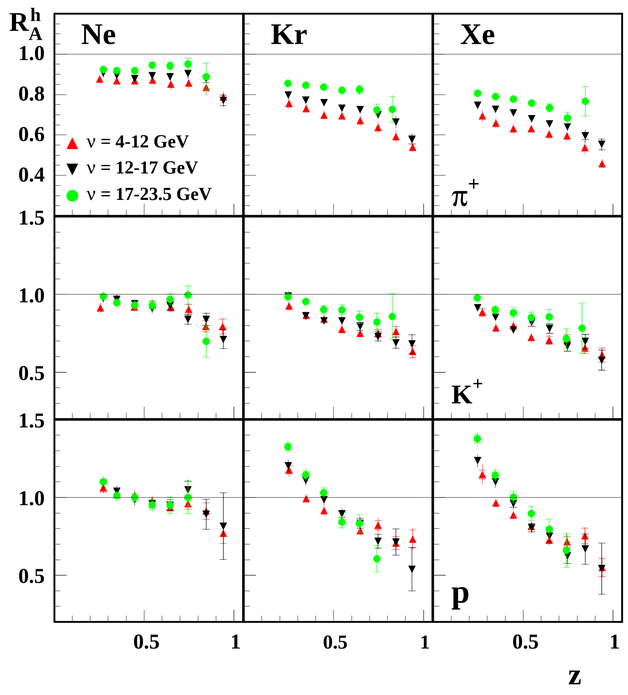
Diagram of semi-inclusive deep inelastic scattering.

$$R_A^h(\nu, Q^2, z, p_t^2) = \frac{\left(\frac{N^h(\nu,Q^2,z,p_t^2)}{N^e(\nu,Q^2)}\right)_A}{\left(\frac{N^h(\nu,Q^2,z,p_t^2)}{N^e(\nu,Q^2)}\right)_D} \qquad (1)$$

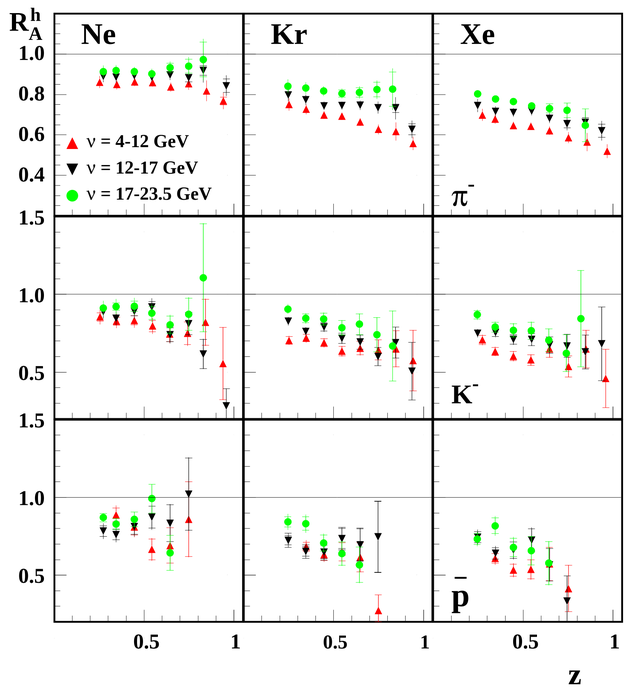
- $N^h(\nu, Q^2, z, p_t^2)$ - number of semi-inclusive hadrons in a given (ν, Q^2, z, p_t^2) bin
- $N^e(\nu, Q^2)$ - number of inclusive deep inelastic scattered leptons in the same (ν, Q^2) bin
- $\nu = E - E'$ - energy of a virtual photon
- $Q^2 = -q^2 = -(k - k')^2$ - negative squared four momentum transfer
- p_t^2 - transverse momentum square of a hadron
- $z = \frac{E_{had}}{\nu}$ - energy fraction of a hadron



Dependence of R_A^h on p_t^2 for positively charged hadrons for three slices in z.



Dependence of R_A^h on z for positively charged hadrons for three slices in ν.



Dependence of R_A^h on z for negatively charged hadrons for three slices in ν.

- **Cronin effect suppressed for large** z
- **Less attenuation with larger** ν **and small** z