Determination of double-differential cross sections for subthreshold K^+-production at ANKE

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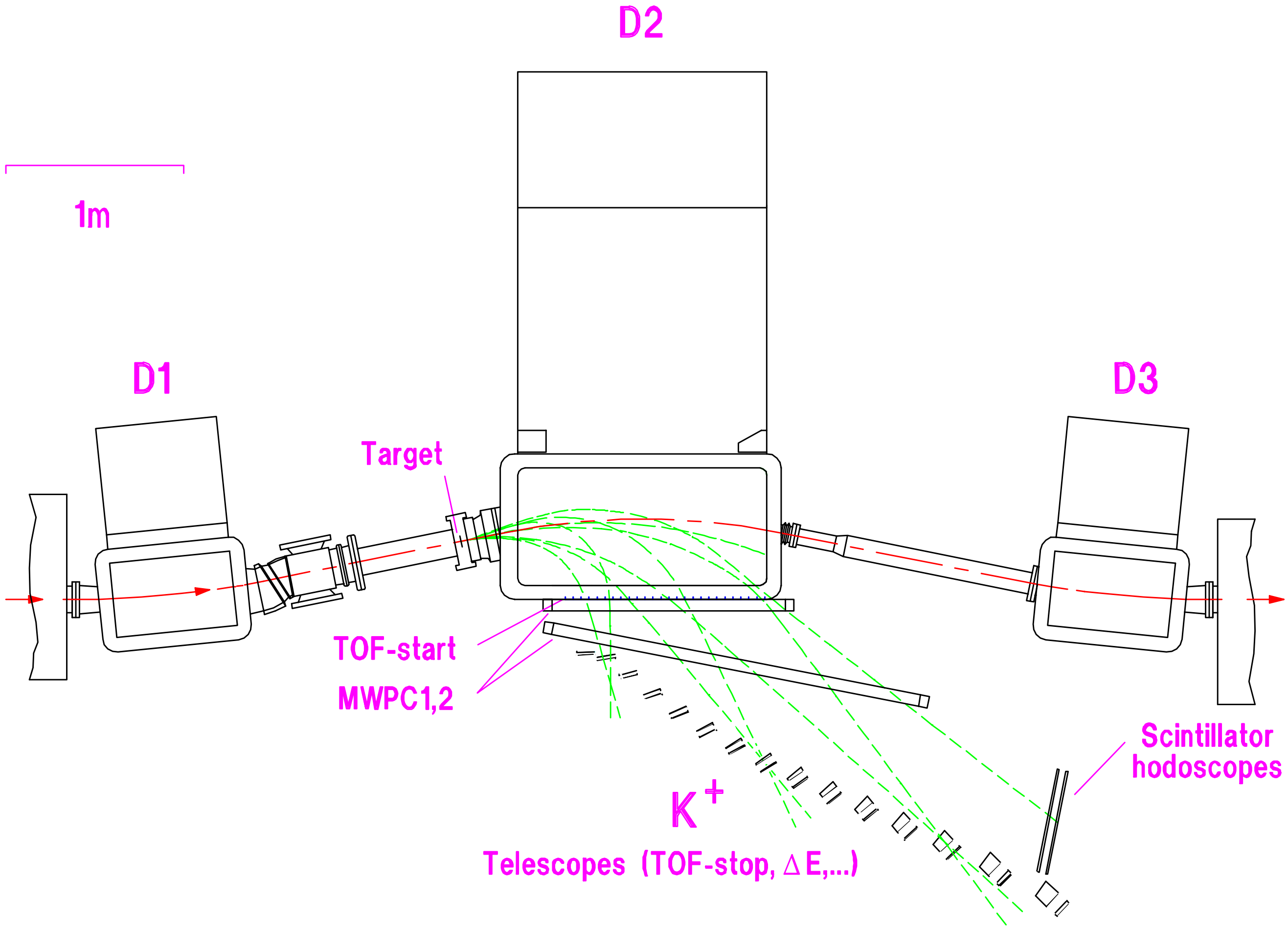
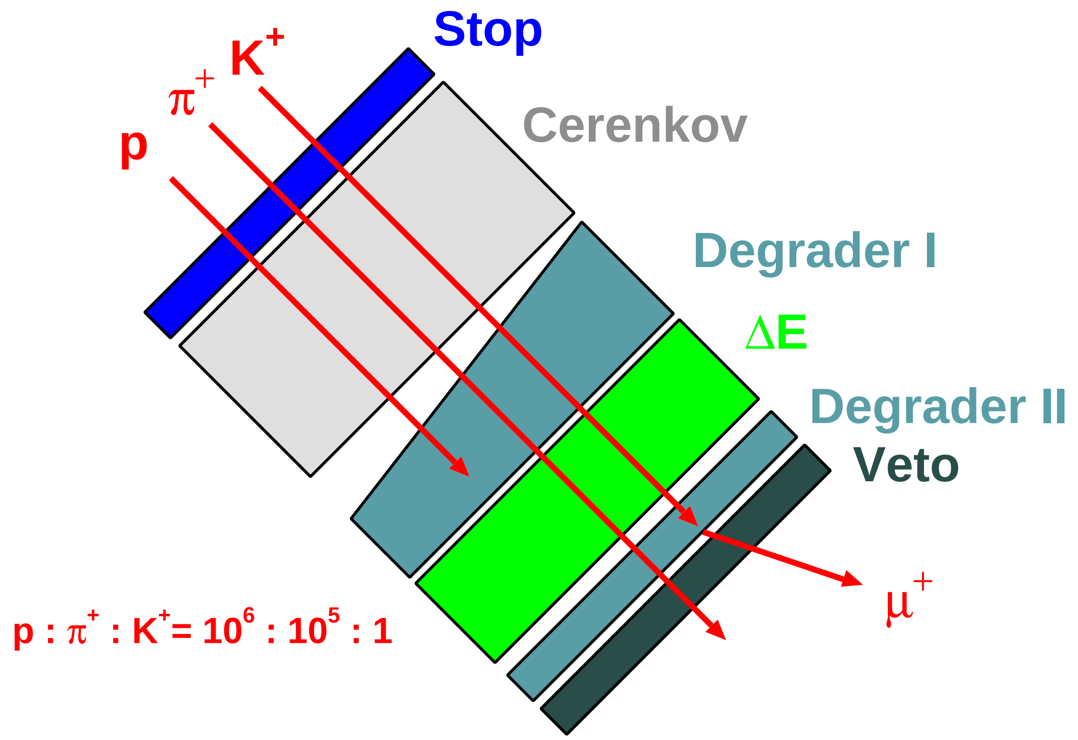
- Goal: study of in-medium effects by subthreshold K^+-production in proton-nucleus reactions
- Difficulty: signal to background ratio of $\sim 1 : 10^6$
- Measurements: at energies between 1.0 – 2.3 GeV with C, Cu, Au targets

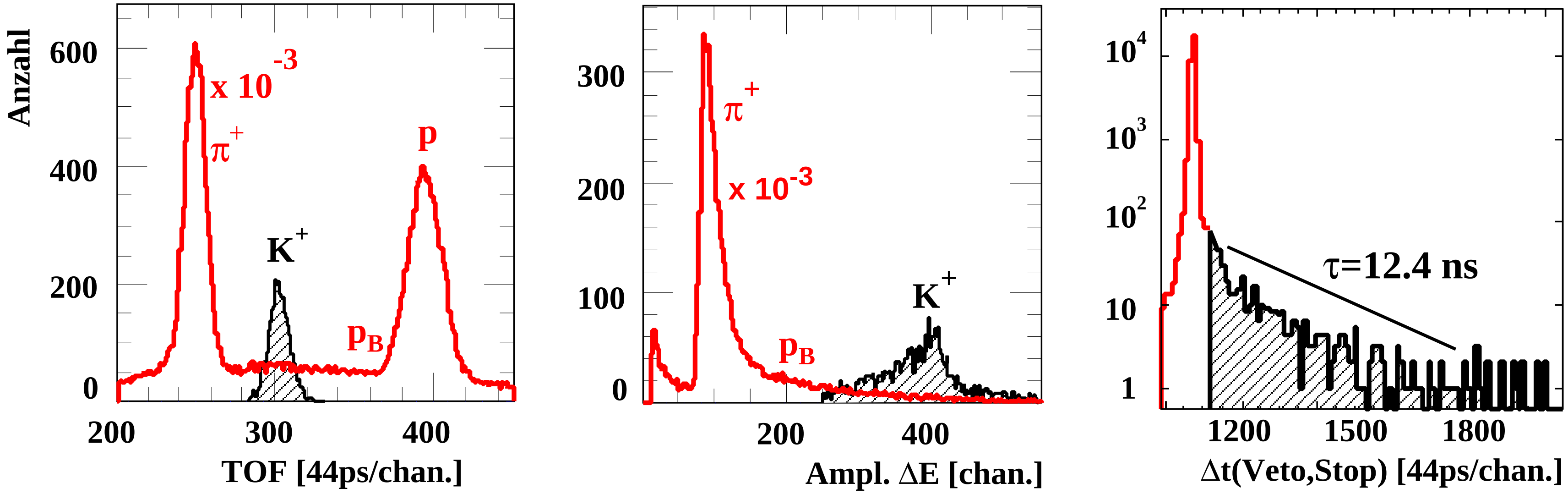
23. March 2000

The Spectrometer ANKE

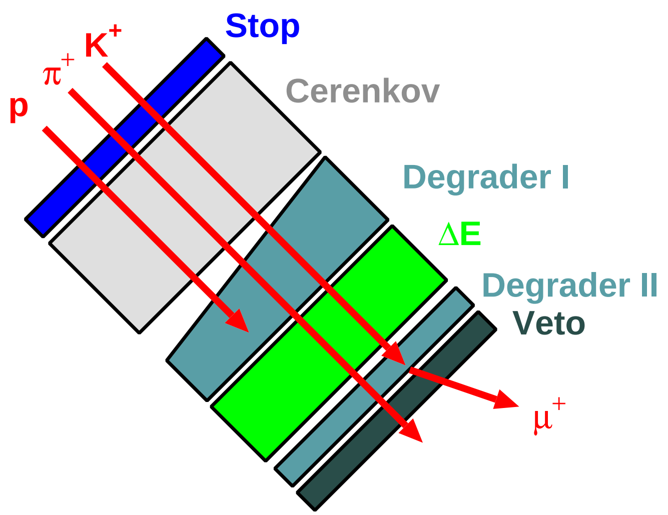




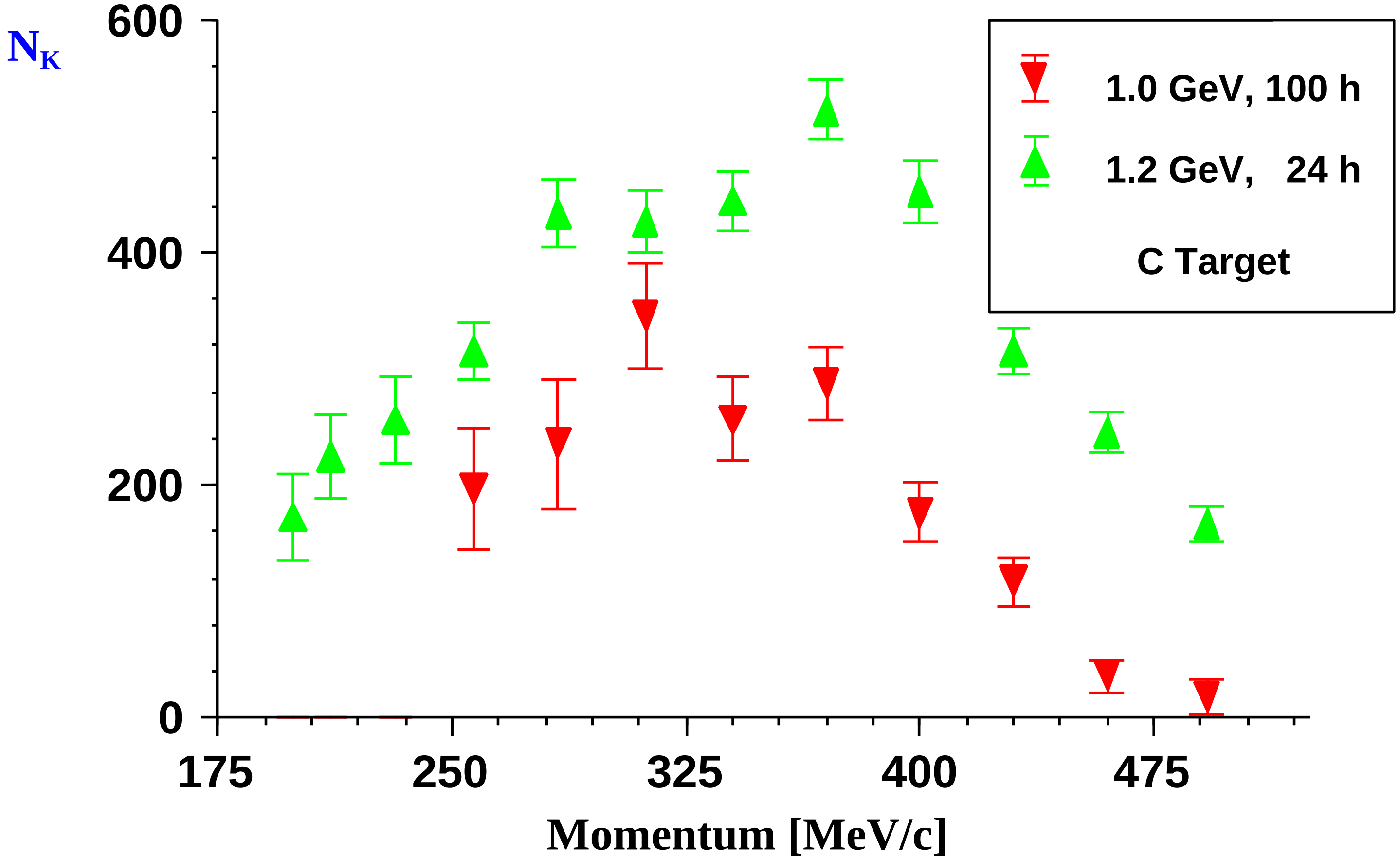
C target, 2.3 GeV beam energy (T_{NN}=1.58 GeV)



+ MWPC cuts

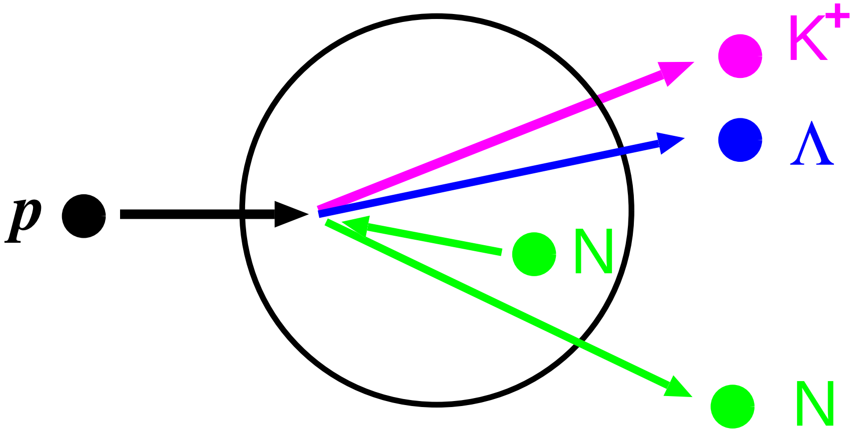


$$\frac{\mathrm{d}^2\sigma_\mathrm{K}}{\mathrm{d}\Omega \mathrm{d}p} = \frac{N_\mathrm{K}}{\Delta\Omega\Delta p} \cdot \frac{1}{\int L \mathrm{d}t} \cdot \epsilon_{K\to\ldots} \cdot \epsilon_\mathrm{K}$$



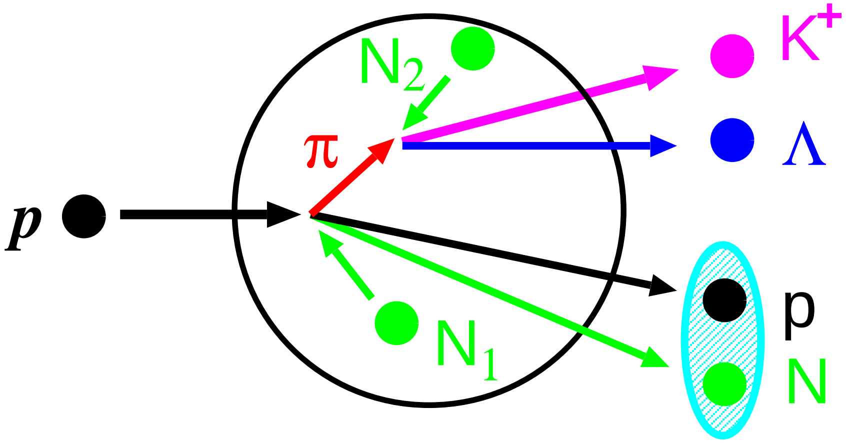
$$\frac{\mathrm{d}^2\sigma_\mathrm{K}}{\mathrm{d}\Omega \mathrm{d}p} = \frac{\mathrm{d}^2\sigma_\pi}{\mathrm{d}\Omega \mathrm{d}p} \cdot \frac{N_\mathrm{K}}{N_\pi} \cdot \frac{\epsilon_{\pi\to\mu}}{\epsilon_{K\to\ldots}} \cdot \frac{\epsilon_\pi}{\epsilon_\mathrm{K}}$$

Processes for K^+-production



1-step mechanism

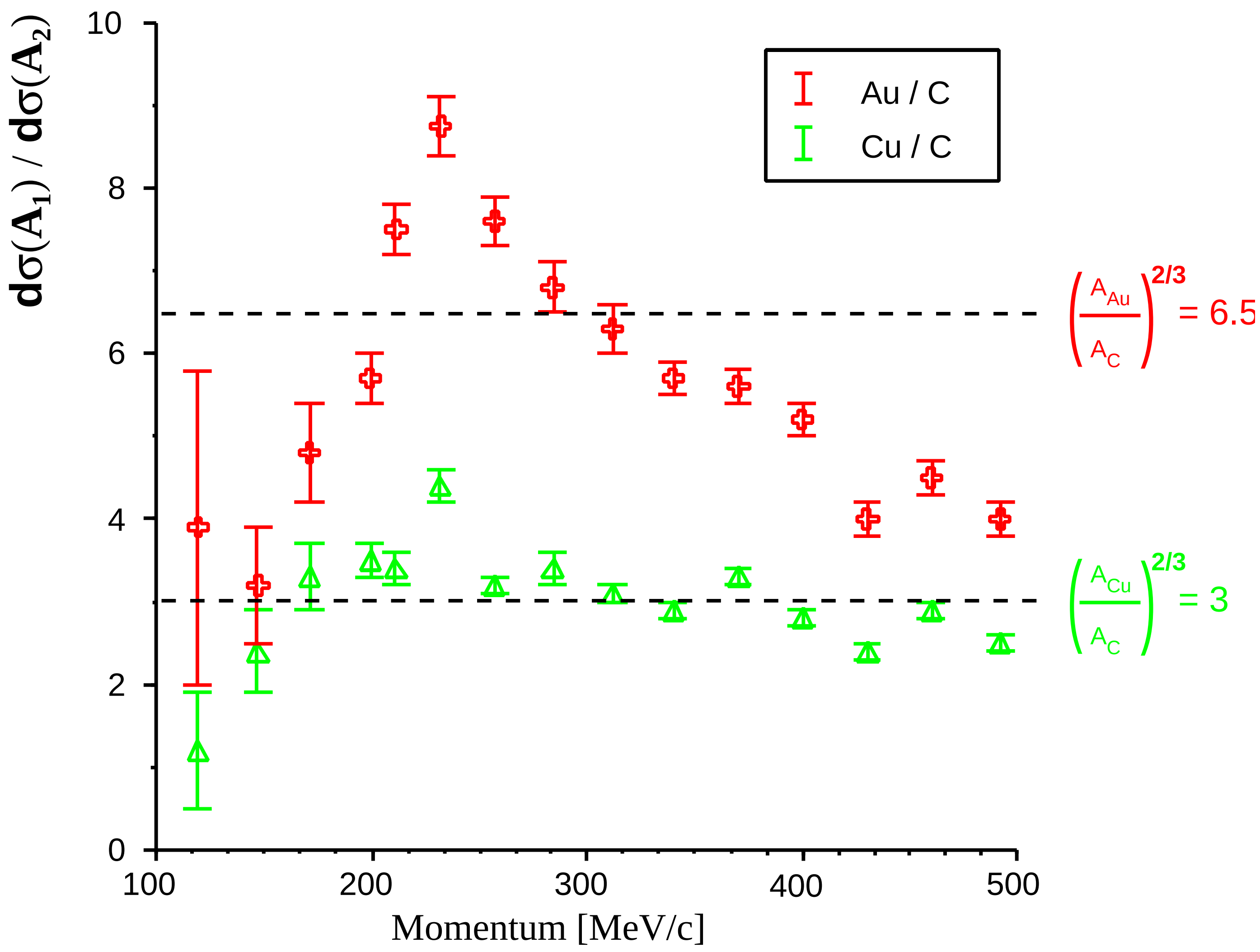
$\sigma \sim A^{2/3} \sim R^2$



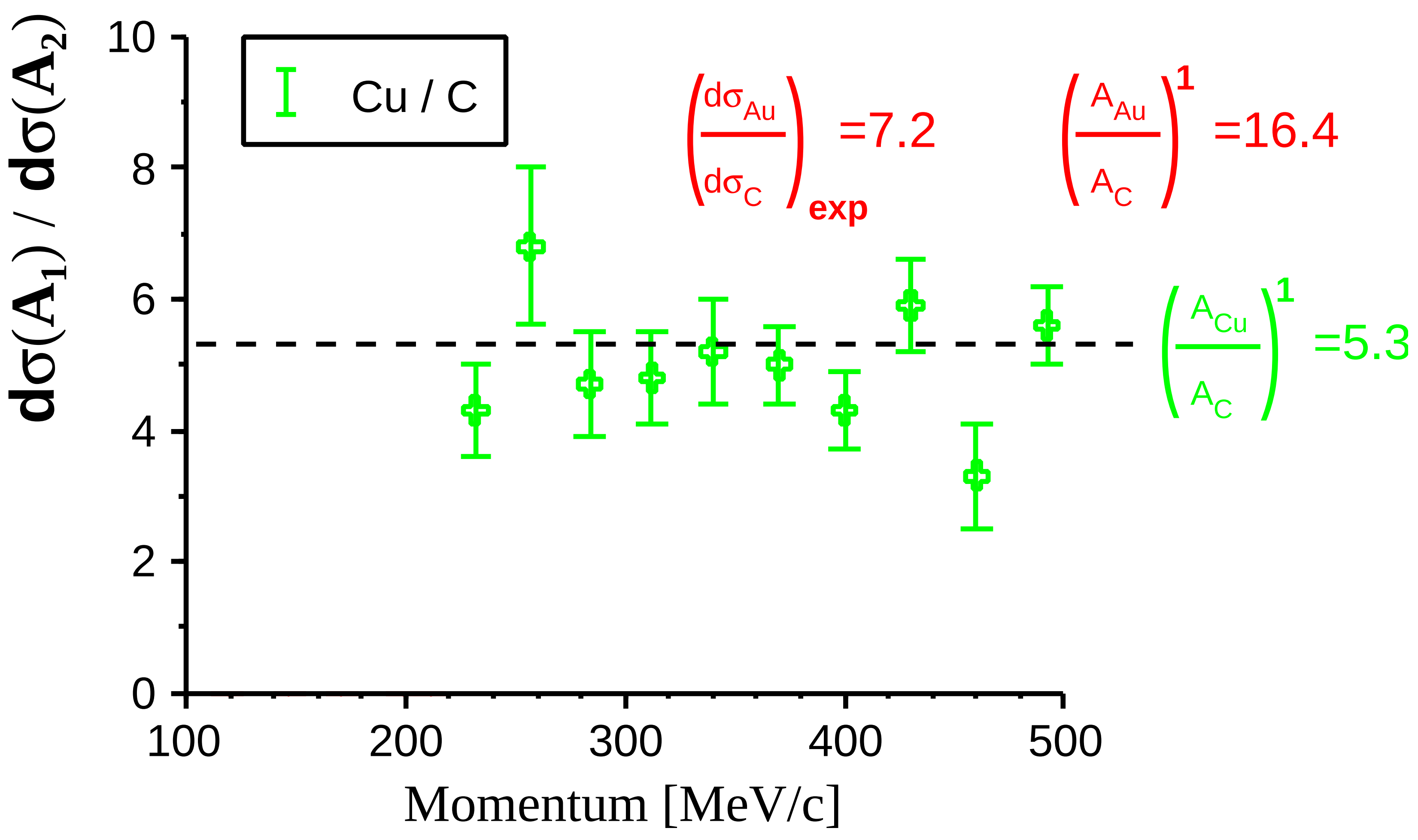
2-step mechanism

$\sigma \sim A^1$

A-Dependence at 2.3 GeV



A-Dependence at 1.0 GeV



Summary

- K^+-momentum spectra at energies down to 1.0 GeV
- A-dependence:

  1-step mechanism for Cu at 2.3 GeV
  2-step mechanism for Cu at 1.0 GeV

Near Future

- Understand the shape and the A-dependence of momentum spectra of Au
- Determination of double-differential cross sections
- Measurements of K^+p and K^+d correlations