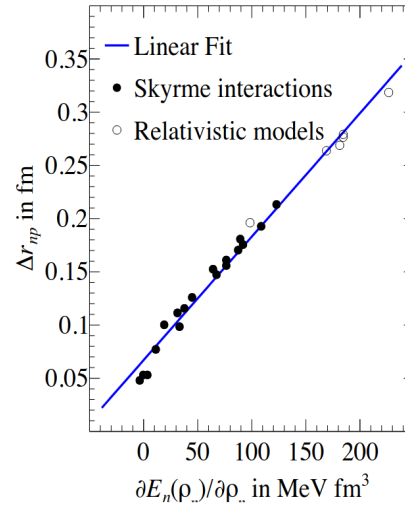
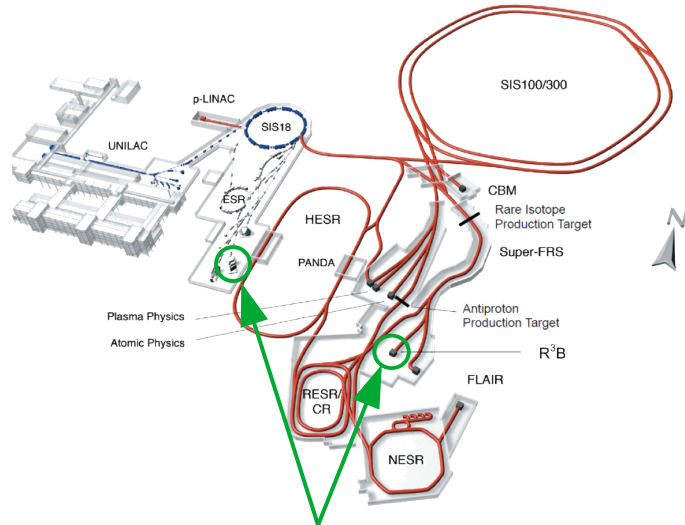
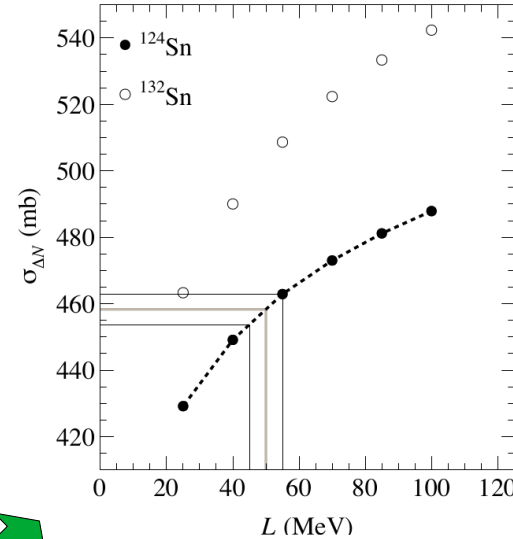


Motivation: Constraining the symmetry energy slope parameter L at ρ_0 via Δr_{np} in cross-section measurements with R^3B

R^3B at GSI/FAIR



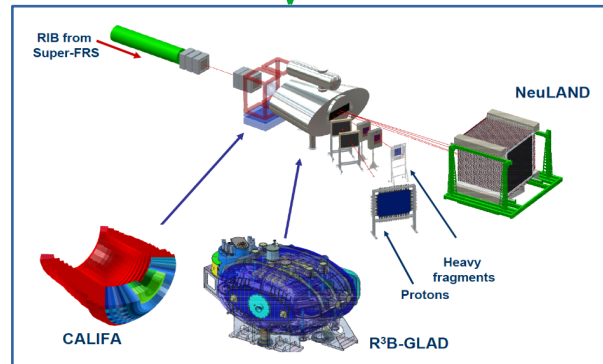
S. Typel, B.A. Brown, PRC 64, 027302 (2001)



T. Aumann et al, PRL 119, 262501 (2017)

$$\sigma_R = \sigma_I + \sigma_{inel.}$$

$$\sigma_I = \sigma_{\Delta N} + \sigma_{\Delta Z}$$



Transmission Measurement

$$\sigma_R = -\frac{1}{N_t} \ln \left(\frac{N_2^i / N_1^i}{N_2^o / N_1^o} \right)$$

Target-In
Target-Out

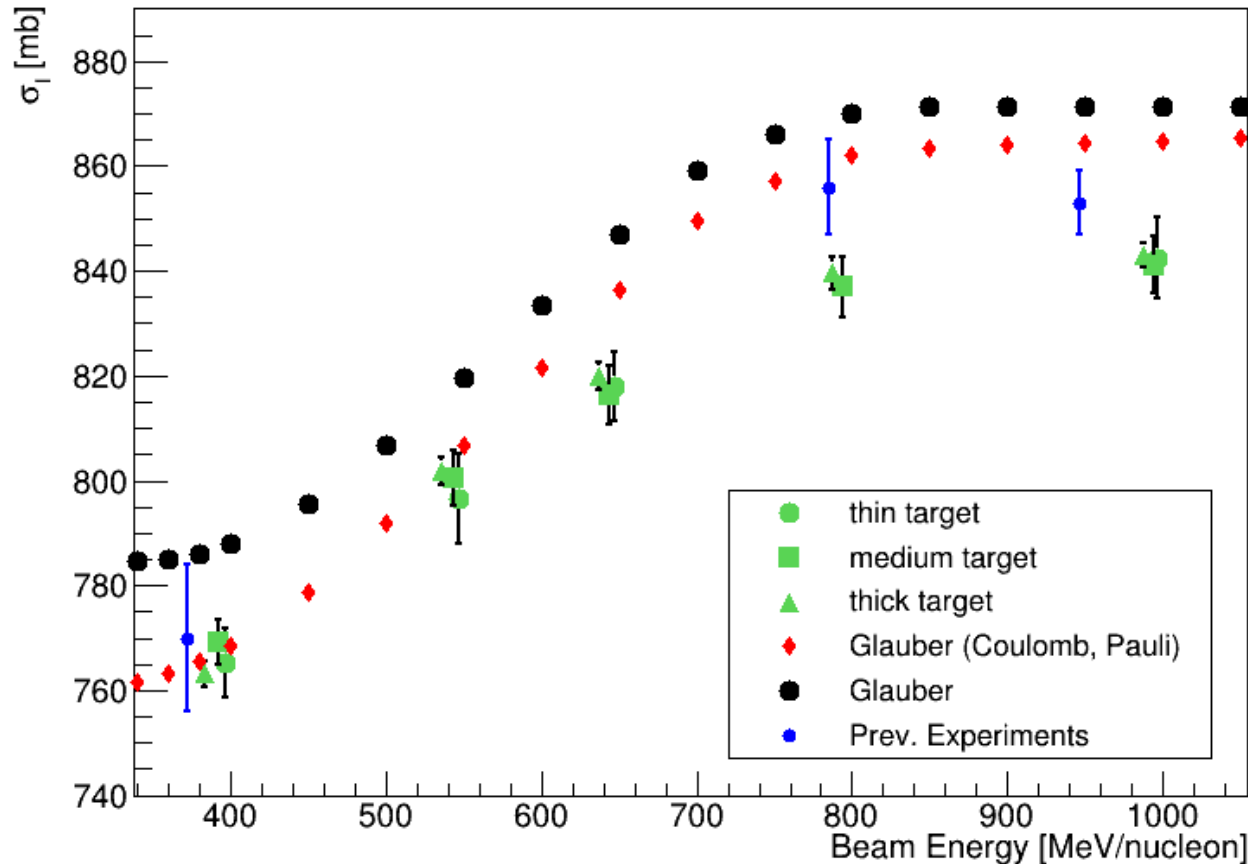
NuSym23

Total Reaction Cross Sections in the Glauber Reaction Model

$$\sigma_R = 2\pi \int d\vec{b} \left(1 - \exp \left(-\sigma_{NN} \int dz' \int d\vec{r} \rho_P(\vec{r}) \rho_T(\vec{r} - \vec{b}) \right) \right)$$

Pauli Blocking

Coulomb Repulsion



- Total experimental uncertainty +/- 0.4%
- Good agreement with theory between 400 and 550 MeV/nucleon
- Enhanced transparency at high energies not explained by theory so far

Supported by BMBF 05P21WOFN1 and 05P19WOFN1.

The results presented here are based on the experiment s444/s473, which was performed at the beam line/infrastructure Cave C at the GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt (Germany) in the frame of FAIR Phase-0.

Funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy – EXC 2094 – 390783311.

Prev. Experiments: I.Tanihata et al. (Radioactive Nuclear Beams 1990), M. Takechi et al. (PRC – 79 2009) , A. Ozawa et al. (Nuc. Phys. A – 691 2001)
 Glauber data: E.A. Teixeira, T. Aumann, C.A. Bertulani, B.V. Carlson (Eur. Phys. J.A – 58:205 2022)