

Measurements of polarization transfer to a bound proton in light nuclei by quasi-elastic scattering at MAMI

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I will report on recent polarization transfer experiments carried out at the Mainz Microtron (MAMI), via the quasi-elastic $A(e, e' p)$ reaction, over a wide range of missing momentum and virtuality. We measured the ratio $(P_x/P_z)_A$ of the transverse to longitudinal components of polarization transferred from an electron to a bound proton in ^2H and ^{12}C [1, 2], and transverse (P_x and P_y) and longitudinal (P_z) components of the polarization transfer to a bound proton in ^2H [3].

We observed consistent deviations from unity of the above ratio normalized to the free-proton ratio, $(P_x/P_z)_A/(P_x/P_z)_1\text{H}$, for both s- and p-shell knocked out protons, even though they are embedded in averaged local densities that differ by about a factor of two. The dependence of the double ratio on proton virtuality is similar to the one for knocked out protons from ^2H and previous ^4He data, suggesting a universal behavior, which seems to be independent of nuclear size, density and Q^2 .

A precise determination of the electron beam polarization, along with a novel analysis method [4], enabled a detailed comparison of the measured polarization transfer components to a bound proton in ^2H to a state-of-the-art calculation, which uses free-proton electromagnetic form factors. We observe very good agreement between the measured and the calculated $(P_x/P_z)_2\text{H}$ ratios, but deviations of the individual components. Our results cannot be explained by medium modified electromagnetic form factors (FFs), unless the GE/GM ratio is kept intact. Excluding FF modifications, these deviations point to an incomplete description of the nuclear reaction mechanism in the calculation.

References

- [1] I. Yaron, D. Izraeli, et al., Phys. Lett. B769 (2017) 21-24
- [2] D. Izraeli, T. Breceelj, et al., Phys. Lett. B781 (2018) 95-98
- [3] D. Izraeli, I. Yaron, B. S. Schlimme, et al., Phys. Lett. B781 (2018) 107-111
- [4] D. Izraeli, I. Mardor, et al., arXiv:1803.06729 (2018)

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