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Review of the PhD thesis of Daria Denisova, MSc. Entitled "Electroproduction of Hypernuclei"

Description of the work:
The doctoral thesis of Ms. Daria Denisova entitled "Electroproduction of Hypernuclei" contains almost 100 pages and describes various effects in computing the cross sections in electroproduction of hypernuclei. It consists of four chapters - introduction, description of the theoretical background, presentation of results and summary. The entire work is theoretical in nature and is closely related to experiments conducted, among others, at the Thomas Jefferson National Laboratory in the USA.

The model calculations are based on the impulse approximation assumed in the optimal factorization. The general two-component form of the elementary amplitude, developed in this work, allows for the motion of the initial proton in the nucleus. For the re-scattering of the kaon on the nucleus, the distortion of the wave function of the kaon final state is taken into account by means of the optical potential, which can be modified using different forms of nuclear density. The formalism used also allows for the inclusion of a sufficiently large model space of single-particle states, which is important in the production of hypernuclei of medium and large mass. It is also shown that different elementary amplitudes and wave functions of single particles can be used when calculating radial integrals.

Reviewer's comments:
This work is slightly different from those I know or know and have reviewed. It does not contain any spectacular experimental result or theoretical prediction, but it is an extremely reliable methodological analysis with comparisons of different theoretical approaches and with comparisons with experimental data where they were available. The distribution of the volume of individual parts of the work is also unusual, at least for me, e.g. a rather long introduction and description of methods and a relatively short description of the results themselves. The rather long and rich in content introduction and theoretical background is a detailed description of the subject matter together with a description of kinematics, a broad description of possible methods and literature relevant to each of them. Reading this one can have the impression of being guided by the author of the work from simple basics to developed and advanced analysis results. This in itself provides very valuable material for both beginners and advanced readers and deserves to be distinguished. It is also necessary to understand the relatively short but complete description of the results obtained in this work. This description is devoid of previously discussed technical issues and is therefore clear and easy to read and understand.

Analyzing such an advanced formalism enabled the study of various effects in the predicted cross sections for the electroproduction of a wide range of hypernuclei. For example, the effects of Fermi motion, kinematics and kaon distortion, as well as various many-body approaches and effective forms of hyperon-nucleon interactions.

The reliability is evidenced by the rich mathematical material in the appendices and, quite rarely, the description of the structure and operation of the numerical program used to obtain the discussed results. This gives the reader the luxury of access to the full substantive and methodological information used in this work.

The work is written in a very good and concise language in terms of content and linguistics. It is a good example of the language of a theoretical physicist and, in my opinion, is suitable for imitation by other physicists. Only a few places could be changed or supplemented, which is presented in remarks below.

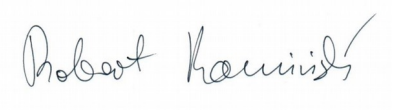
The work clearly distinguishes the joint participation of the PhD student and collaborators - mainly the scientific supervisor in the work performed and the results presented, as well as the personal participation in the learning of the PhD student herself (e.g. in Preface).

Remarks:
1. In equation (2) it should probably be "e' " and not "E'_e"
2. It would be good if in some places where the names of theories are used (e.g. Wigner-Eckart between equations (31) and (32)) there were references to the works where these theories were formulated.
3. In some figures where momentum names are used, Greek names should appear, and not, for example, no. (6) is the letter "L".
4. For an even more complete comparison of predictions with experimental data, as in, for example, figure (13), a discussion of the differences between them depending on energy would be useful.
5. It would be worth using units such as GeV right next to the numbers everywhere in the text, and not, as is the case on, for example, page 66, where they are on different lines of the text.
6. The title of Appendix D should be corrected so that there is no gap in the text.

These remarks are of very little importance and there are few of them, so they do not diminish the quality and significance of all the methods developed in the work and the results obtained. In my opinion, this work proves that Mrs. Daria Denisova has a high level of knowledge of theoretical physics, has considerable skills in presenting it in written form and great calculation skills in the scope of the research she conducted. Both the results of the work she performed and the methods she used testify to her great maturity as a physicist.

I believe that the statutory and customary requirements for doctoral dissertations have been fully met. I therefore request that the doctoral dissertation of Ms. Daria Denisova be accepted and that she be admitted to the further stages of the doctoral procedure.

Yours sincerely



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