

THE ADJUDICATION COMMITTEE'S EVALUATION OF THE CANDIDATE'S DISSERTATION

(Is to be submitted to the Department 5 weeks prior to the planned disputation, the evaluation must reach the Faculty no later than 4 week before the planned defence)

The adjudication committee has had the following members:

Professor Giuseppina Orlandini, University of Trento, Italy
Associate Professor Scott Bogner, Michigan State University, USA
Dr. Sølve Selstø, University of Oslo, Norway

Elise Bergli has written the dissertation with the title:
"Parquet theory in nuclear structure calculations"

Evaluation of the candidate's dissertation, each of the following aspects must be answered:

The dissertations field of research:

The thesis of Elise Bergli, written in the form of a monograph, is a contribution to the field of theoretical nuclear physics. In particular, it deals with the first implementation in nuclear structure calculations of an ab initio many-body method, called "Parquet theory", originated and mainly employed in different fields (particle physics, physics of matter). The well-known complexity of nuclear systems, due to their finiteness and to the complicated interaction governing their dynamics, makes this kind of research a real challenge.

The content and objective of the dissertation (short description, work of great merit and other important details on the theoretical and/or experimental side should be mentioned):

By trying to implement the Parquet method, first within a simplified model of the nucleus, and then to the realistic case of ^4He , the candidate intended to make a proof of principle, i.e. to understand whether this approach could reach a degree of accuracy comparable to that of the few methods at the forefront of the field, opening interesting perspectives for its application. The main conclusion of this thesis is that, while substantial technical difficulties remain, the method appears to be on the right track to becoming a useful ab initio many-body method for use in nuclear structure calculations.

The candidate's original contribution and independence in research:

In this thesis the numerous technical obstacles encountered in the implementation, as well as the necessary simplifications/approximations to overcome them, have been described and commented in detail, showing also the determination of the candidate in trying to overcome the stumbling blocks. The way the thesis is organized reflects the theoretical insight of the candidate into the many-body Green's function formalism and the number of results presented, in relation to all the crucial aspects of the implementation of the Parquet method, show a systematic attitude. The large amount of work the candidate has performed to reach her goal stems out clearly.

The scientific standard of the dissertation (strength and weaknesses):

The work is very focused. The discussion about the relation of this approach, of its advantages and disadvantages in relation to other methods is somewhat short, being limited to a few comments about a different implementation of the same method (Barbieri et al.) and to the coupled-cluster approach. Other methods are only shortly mentioned at the beginning.

The candidate's perspective on the research area and his/her ability to view own research in a greater context:

The intrinsic limit of any thesis about a topic like this is the lack of physical aspects. The number of observables is limited to binding energies and spectral functions. Though, a discussion in particular about the physical implications of the latter could have added a more substantial physical content to the thesis.

The technical quality of the dissertation (outline, depiction, general impression, level within an international setting):

The quality of the work certainly places the dissertation at a good international level. The opened perspectives, mentioned in the conclusion, look ambitious and maybe somewhat optimistic, but the work is a courageous start of a line that is worth to explore further.

Other comments (any dissents in the committee should be mentioned here):

The report shall conclude whether the dissertation is worthy of being defended:

☒ worthy of being defended

☐ refused

PLACE:

DATE:

SIGNATURES:

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Opponent 1

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Opponent 2

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Administrator