Referee's statement about the doctoral thesis of Ingrid Knapová

Title of the thesis: Study of gamma decay in ^{168}Er from neutron capture

The main content of the thesis "Study of gamma decay in ^{168}Er from neutron capture" is an analysis of gamma cascades induced by neutron capture in ^{168}Er within the DANCE detector at the Los Alamos Neutron Science Center. To make the simulation of this process possible there is necessary to have a reasonable model(s) for the density of states of the studied nucleus as well as of a theoretical description of the strength functions of electromagnetic transitions of various multipolarities occuring in the gamma cascades. The student described various phenomenological as well as microscopical models for both – the density of states and strength functions – and than used them in the simulations of the gamma cascades to identify which approach gives most reasonable agreement with the experimental measurements. It was concluded that for the studied nucleus ^{168}Er, regarding the level density, the most reasonable model is the HFB model based on Gorieli's Skyrme parametrization [Phys. Rev. C 78, 064307 (2008)]. Regarding the strength functions of the electromagnetic transitions the HFB model based on a selection of various Skyrme parametrizations and D1M Gogny force did not provide reasonable results within the analysis. Here the photon strength functions extracted from previous experimental measurements on (^{3}He,^{3}He'gamma)^{166}Er using the Oslo method provided rather good description.

I have the following comments and questions to the student:

1) Microscopical calculations within the HFB and QRPA methods are always strongly dependent on what Skyrme or Gogny parametrization was used for the calculation. It is not very precise to write about performance of HFB and/or QRPA model without adding information within what interaction or parametrization it was used. Although in the Appendices (i.e. the published papers) there is enough detailed description of the used parametrizations it would have been more accurate to mention such information also in the remaining parts of the text, especially in the paragraphs where the conclusive statements about the HFB model are mentioned.

2) Results of HFB+QRPA calculations might depend on some technical input parameters as $\hbar\Omega$ and total number of major oscillation shells of the initial single particle basis. How big single particle space was used for the microscopic calculations used in the analysis? Are the results of these calculations insensitive to choice of used technical parameters? Or if not, were these parameters set in order to reproduce some expected characteristics of studied nucleus (e.g. radius, binding energy..)?

3) In the paper at the Appendix B there is mentioned that within the tested Skyrme-QRPA models usually the same Skyrme parametrization was used for both E1 and M1 strength functions (see Figs. 6-7). But it might be that Skyrme parametrization suitable for the description of E1 is not proper for the description of M1 and *vice versa*. Do you have any guess if taking one Skyrme parametrization for calculating E1 and another for calculating M1 could improve the performance of Skyrme-QRPA model within this analysis?

The above mentioned comments/questions are stated here just to clarify in more detail the main achievements of the thesis. The student I. Knapová achieved very valuable results within her experimental work and analysis. I consider her work as very high quality and satisfactory for an

PhD thesis. This thesis shows that the author has skills and qualities for her independent and creative scientific work.

In Prague on 23th August 2022

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