Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Andrey Tarkhov

PhD Program: Physics

Title of Thesis: Ergodization dynamics of the Gross-Pitaevskii equation on a lattice

Supervisor: Associate Professor Boris Fine, Skoltech

Name of the Reviewer:

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)6	**Signature:**  **Date: 22-09-2020**

The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.

If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.

Reviewer's Report

The thesis by Andrey Tarkhov deals with nonlinear dynamics on a lattice, i.e. with many degrees of freedom. Specifically, he investigates the chaotic and ergodic dynamics of such systems. This is highly relevant, because these are related to equilibration and non-equilibrium behaviour. The large number of degrees of freedom complicates analytical approaches, and therefore the candidate has harnessed instead the growing power of modern computers. This area of high-dimensional nonlinear dynamics is usually quite mathematical, and results are impractical to verify experimentally. I therefore find it especially commendable that the candidate has related his work to experimental situations.

The thesis is well-structured and well-written. Two of the chapters have already been published in journals with very solid reputations. The work is interesting and relevant, and the methods are appropriate. The thesis builds up the results nicely through the chapters. The final chapter, chapter 5, is supposed to link the previous chapters together, and back to the thesis topic, but is lacking in this regard.

It is now just a summary. It would have been interesting to see the candidate's ideas on the usefulness for example of his ergodization time for the experimental setting of chapter 4, and in a broader context. I find the ergodization time an interesting concept, but I am left with questions on both its relevance for non-equilibrium systems and relation to the mathematical concept of ergodicity.

In my opinion this thesis contains sufficient new material to meet the international standards for defense. To improve the thesis further, I do recommend that the candidate expands on the discussion in chapter 5.

Provisional Recommendation

☒ *I recommend that the candidate should defend the thesis by means of a formal thesis defense*

☐ *I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*

☐ *The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*