

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Nikita Stroev

**PhD Program:** Physics

**Title of Thesis:** Modelling of exciton-polariton condensates for unconventional computing

**Supervisor:** Professor Natalia Berloff

**Name of the Reviewer:** Ildar Gabitov

I confirm the absence of any conflict of interest



**Date:** 19-11-2021

*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

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

The dissertation is devoted to a rapidly developing subject -- the use of physical phenomena in order to implement new computational technologies. The content of the dissertation is fully consistent with its topic; abstract adequately reflects the work performed. The author of the thesis uses a wide range of methods, including analysis, classical approaches used in computer modeling, and neuromorphic computation. The methods used are relevant to the topic under study and correspond to the modern approaches used by the international scientific community in this field.

The results presented in the dissertation meet the criteria of novelty, and are published in top scientific journals. Considering that presented results were published in co-authorship with the scientific supervisor, and the fact that for defense author of the thesis has to submit his original results, I propose to clearly formulate his personal contribution to these joint work.

On page 13, the author provides a key formulation of the approach to the analysis of the topic disclosed in the dissertation: "The best way to solve the problem of mapping a particular task into the hardware system is to use strict formalization of this task and the precise mathematical tools to analyze it and the system's possible states and behavior ". I propose in the considered examples to explain in more detail the physical principles and control mechanisms that allow to implement such a mapping, as well as indicate their limits of applicability.

Note also that the robustness analysis discussed on page 62 can be done analytically.

There are minor inaccuracies in the thesis, such as, for example, there is no reference to FIG. 3-14. However, the listed, as well as unspecified, shortcomings do not affect the overall positive assessment of the dissertation work.

#### **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*

