

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Stepan Baryshev

PhD Program: Physics

Title of Thesis: Photon correlations of optically trapped polariton condensate

Supervisor: Professor Pavlos Lagoudakis

Co-supervisor: Dr. Anton Zasedatelev

Name of the Reviewer:

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	Date: 28-09-2022
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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 thesis authored by Mr Barychev Stepan is an account of photon statistics measurements which have been performed in light that is emitted from polariton condensates that have been formed in inorganic semiconductor microcavities. This is in my opinion an extremely novel work that is expanding the knowledge of this intricate light source. The work includes polarization resolved measurements which indicates rich spinor dynamics and will most certainly lead to interesting developments in the field of polaritonics. This thesis also includes the spectroscopic investigation of single carbon atom chains, which also may involve interesting photon statistics and is relevant in terms of the analytical methods that were used later in the polaritonic implementation.

The thesis is divided in six chapters with a rich introduction/background section, experimental/modelling sections and conclusions. The structure is appropriate and relevant to the presented work.

This thesis presents carefully designed experiments and the way that has been written reveals a deep understanding of both the physical system under investigation and the theory behind the relevant effects. The analysis of the results is solid and deep.

The research output is significant, with six publications in impactful international scientific journals while the candidate is the primary author in a Physical Review Letters paper, a prestigious journal that underlines the quality and importance of this work.

The methodology that has been used is very sophisticated and relevant to the work at hand and the quality of results is reflected in the quality of the research output.

However, I found that the thesis has a number of minor typos the corrections of which would improve the clarity of the text. Furthermore it is my opinion that the abstract is too specific and technical and lacks the vision and motivation elements. Likewise I found the conclusions/outlook section is too brief.

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