

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Anton Baranikov

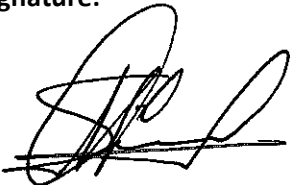
PhD Program: Physics

Title of Thesis: Dynamic polariton condensation in organic microcavities

Supervisor: Prof. Pavlos Lagoudakis

Date of Thesis Defense: 8 November 2019

Name of the Reviewer: Sakellaris Mailis

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	<p>Signature:</p>  <p>Date: 08-10-2019</p>
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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 by Mr Baranikov Anton contains research results that are associated with polariton condensates in organic semiconductor microcavities and their utilization for the production of polariton-condensate based optical amplifiers and logic gates.

The thesis contains a combination of fundamental research to investigate the physical processes that govern the formation of polariton condensates in organic semiconductor microcavities along with the presentation of laboratory prototypes that utilize these condensates demonstrating the potential for practical applications of this physical system.

The thesis consists of two introductory chapters followed by three experimental chapters and conclusions. This is a clear, logical and intuitive arrangement, which makes the work easy to follow. The introductory and background sections are clear and informative, introducing the topic of exciton polaritons in the strong coupling regime. The first experimental chapter demonstrates the use of vibronic mediated polariton condensation. This work is significant as it allows for energy efficient condensate formation, which is beneficial for any future practical uses of this physical system.

The second experimental chapter investigates the formation of an optical amplifier based on bosonic stimulation, while the third experimental chapter takes advantage of the nonlinear response of seeded polariton condensates to produce optical switches and logic gates thus demonstrating the utility of this physical system for future applications.

The thesis presents high quality experimental results, which are both significant and timely in this area of scientific research. Of particular importance is the fact that the experimental demonstrators that are presented here do not need cryogenic temperatures, which is a prerequisite for practical applications. The scientific and technological importance of these results is demonstrated by the high impact publications that resulted from this work.

One point of criticism is that the level of citations is probably at a bare minimum given the rich publication pool that is associated with this field. Perhaps the candidate could consider enriching the citation list of the thesis for the benefit of future students that will follow up on this research.

Additionally, the thesis could benefit from a careful examination to eliminate typos that have remained undetected.

To conclude, my opinion is that the candidate has fulfilled the conditions to formally defend this thesis.

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