Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Ilias Giannakopoulos

PhD Program: Computational and Data Science and Engineering

Title of Thesis: Memory compression of the Galerkin volume integral equations and coil modeling for the electrical property mapping of biological tissue

Supervisor: Professor Maxim Fedorov

Date of Thesis Defense: 12 May 2020

Name of the Reviewer: Huang Shaoying

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	Signature: *[signature]* **Date: 22-04-2020**

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

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.

  The thesis is well structured and carried good scientific quality. The main contributions are a memory foot print reduction for FFT-based volume integral equation method (VIE) based on piecewise linear basis function (PWL) for magnetic resonance imaging (MRI) safety, and RF coils designs that favors one type of the algorithms for magnetic resonance electrical property tomography (MREPT) called global Maxwell tomography (GMT).

- The relevance of the topic of dissertation work to its actual content

The topic exactly reflects the actual content of the dissertation

- The relevance of the methods used in the dissertation

  Based on the presented data, the methods employed to attach the problems are effective.

- The scientific significance of the results obtained and their compliance with the international level and current state of the art

  For the two problems this dissertation is tackling, one is a fast calculation of electromagnet (EM) field in an MRI setup to evaluate MRI safety and the other is the design of a more realistic RF coil for the MREPT method, GMT, they are both important problems in MRI. In terms of the solution, for the first problem, using tensor decomposition for compression has shown the effectiveness to reduce the memory footprint of a VIE with a higher order, which accelerate the calculation of EM fields in an MRI setup for MRI safety. For the solution of the second problem, the coil design is both practical and favors the GMT algorithm for MREPT.

- The relevance of the obtained results to applications (if applicable)
- The quality of publications
  The publications are in good international conferences and journals.

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

1. **Abstract:** The significance of the thesis can be added as a third paragraph to the abstract

2. List of publications: separate conference papers and journal papers; highlight your name

3. In the introduction of chapter 5, adding more specific characteristics of excitation that will favor GMT, i.e. the characteristics of the field distribution of the RF coil, will make the introduction clearer. The location could be paragraph 3 on page 105.

4. In chapter 5, I understand that a cylindrical 8-channel transmit-receive triangular loop array is designed, based on a previous design [119, 120]. However, the reason of choosing this design is not clear to me. Please add an explanation on this at the beginning of section 5.2.

5. Add a summary to each chapter will make the thesis easier to read.

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*