Statement

by Professor Sci. D. Geno Petkov Nikolov, Faculty of Mathematics and Informatics of Sofia University St. Kliment Ohridski

on the materials submitted for participation in the contest for occupation of the academic position *Associate Professor* in the Faculty of Mathematics and Informatics of Plovdiv University Paisii Hilendarski in Area of Higher Education 4. Natural Sciences, Mathematics and Informatics, Professional Field 4.5 Mathematics (Computational Mathematics), announced in *State Gazette* No 31/12.04.2019

1 Subject of assessment

In the Contest for the academic position *Associate Professor* announced in *State Gazette* No 31/12.04.2019 and on the web site of Plovdiv University Paisii Hilendarski (in short, henceforth abbreviated as PU) for the needs of Faculty of Mathematics and Informatics (FMI) participates only one candidate: Assistant Professor Dr. Pavlina Hristova Atanasova.

By Order No P33-3378/12.07.2019 of the Chancellor of PU I was appointed as a member of the Scientific Jury of the aforementioned Contest. By a decision of this Scientific Jury from 18.07.2019 I was assigned to write a review of the Contest.

As a member of the Scientific Jury I have received from Assistant Professor Dr. Pavlina Atanassova in electronic format the following documents:

1. Application Form to the Chancellor of PU;
2. Curriculum Vitae (in Bulgarian);
3. Photocopy of Diploma for Master's degree PU-2001 issued by PU along with a Statement that the names Pavlina Hristova Semerdzhieva and Pavlina Hristova Atanassova represent the same person;
4. Photocopy of PhD Diploma No 1000003/23.05.2011, issued by PU (in Bulgarian and English);
5. Work Experience Certificate У-2114/ 10.06.2019;
6. Documents certifying the scientific activity of the Applicant, including: 6.1 list of all publications; 6.2 list of papers deposed for the Contest; 6.3 abstracts of the papers in Bulgarian; 6.4 Abstracts of the papers in English; 6.5 list of applicant's citations for the last 5 years; 6.6 list of applicant's citations deposed for the Contest; 6.7 self–assessment of applicant's contributions in Bulgarian; 6.8 self–assessment of applicant's contributions in Bulgarian;
7. References confirming applicant's compliance with the minimal national requirements postulated in the Development of Academic Staff in the Republic of Bulgaria Act (DASRBA) in Scientific Field 4.5, including: 7.1 Table with the minimal national requirements for Scientific Field 4.5 and 7.2 Table with Applicant's records related to Scientific Field 4.5;
8. Documents certifying the teaching activity of the Applicant, including: 8.1 Reference for applicant's Teaching Load; 8.2 References for the Teaching Courses prepared by the Applicant, guidance of Diploma Theses published Textbooks;
9. Documents certifying Applicant's participation in Research Projects and Conferences, including: 9.1 list of the national and international Research Projects, 9.2 Reference from the Scientific and Project Activity Office of PU about candidate's participation in Scientific and Educational Projects; 9.3 list of the talks of the Applicant in International Conferences;

10. Copies of Applicant's publications;
11. Copy of a textbook 11.1, along with: 11.2 declaration of all authors for equal contribution and 11.3: reference for deposed 3 copies of the textbook in St. St. Cyril and Methodius National Library;
12. Abstract of Applicant's Ph.D. Thesis;
13. Reference for compliance with the additional requirements of Faculty of Mathematics and Informatics of PU, according to art. 65 of the Rules for Application of DASRBA of PU;
14. declaration of originality and authenticity of the deposed documents.

The deposed set of documents contributes for the objective and complete assessment of the candidate according to the Development of Academic Staff in the Republic of Bulgaria Act (DASRBA) and the Rules for its application as well as the regulations of Plovdiv University Paisii Hilendarski and of Faculty of Mathematics and Informatics.

2 Biographical Data, Teaching and Project Activity of the Applicant

The applicant Pavlina Hristova Atanassova graduated in 2001 from Plovdiv University Paisii Hilendarski in Mathematics, specialty Informatics.

During the period 2004–2010 Pavlina Atanassova works as Researcher in the IT Laboratory of the United Institute for Nuclear Research (UINR) in Dubna, Russia. In 2012 Atanassova acquired Ph.D. Degree with a Ph.D. Thesis entitled *Numerical Methods and Algorithms for Study of Nonlinear Parametric Problems in Physics*. She started teaching at PU in 2010 initially as Assistant Professor, and since 2012 is Chief Assistant Professor in the Faculty of Mathematics and Informatics of PU. Thus, the Applicant meets the additional requirements postulated in art. 65 (2, 3) of the Rules for Application of DASRBA of PU.

For the purposes of her teaching Dr. Atanassova has prepared 8 facultative Courses for Bachelor and/or Master Degree students in FMI: *Analogies and Generalizations in Mathematics*, *Numerical Modeling in Nano-Physics*, *Graphical Data Representation*, *Introduction to Web Programming with Python and Django*, *Methods for Solving Extremal Problems*, *Visualization with c Wolfram Mathematica*, *Mathematical Aspects in Description of Natural Systems*, and *Mathematical Models of Classical and Quantum Systems*. Dr. Atanassova is co-author of one printed textbook and of 9 electronic records of the courses she worked out. She has been advisor of 6 Diploma Works of students of Bachelor Degree and of one Diploma Work of a Master Degree Student. At present she is a scientific advisor of one Ph.D. student in FMI.

The applicant has participated in four research projects of PU, one international ERASMUS+ project, and in 12 bilateral Research projects with the United Institute for Nuclear Research (UINR) in Dubna, Russia. She managed 9 of the latter projects. Dr. Atanassova has given talks in 15 international and two national conferences.

3 General Description of Applicant's Publications

Assistant Professor Dr. Pavlina Atanassova has submitted for Contest 16 papers, one printed textbook and two electronic lecture notes. All the 16 papers are joint (two with one co-author, 6 with two co-authors, and the remaining are with four or more co-authors); 15 of the papers are written in English, and one paper is in Russian.

Six of the papers are in journals, with three of them having impact factor. The remaining 10 papers are published in the proceedings of international conferences. 13 of the papers are in journals or series with SJR (Scientific Journal Rankings).

This means that that the additional requirements of FMI of PU for publications (at least 8 papers, which have not been deposed for the preceding promotion of the applicant, 5 of these papers published in journals, with at least 3 with impact factor, at least one textbook or lecture notes) are satisfied in full.

The Applicant has submitted for the Contest a list of 12 citations of his work in journals or series indexed in Web of Science and/or Scopus (here the minimal requirement of FMI is for 5 citations). In a separate list the applicant has presented a list of 27 citations from the last five years.

The papers deposed for the Contest by Assistant Professor Dr. Pavlina Atanassova can be classified in three groups:

- Numerical Modeling of Josephson NanoStructures (12 papers);
- Numerical Simulation of Dynamic Polaron Models (2 papers);
- Analytic Study of Volterra Integral equations and of Linear Impulsive Differential Equations (2 papers).

4 Brief Analysis of the Applicant Research Achievement

The main part of the publications submitted by the Applicant for the Contest consists of 10 papers devoted to the numerical investigation and simulation of Josephson nanostructures, also called as Josephson Junctions (JJ). Josephson contacts are subject to intensive theoretical and experimental investigations because of their attractive prospective application в Nano-Physics and Quantum Physics. In the simplest case the mathematical model of DC is described by the so-called sine-Gordon equation. This is a highly non-linear problem depending on many parameters, e.g. the geometry and the number of the layers, possibility for including of ferromagnetic or metal layers, the boundary conditions, possibility of including magnetic impulses, etc. The more complex models are described by double sine-Gordon equation or by a system of ordinary differential equations. Numerical simulations are performed to confirm theoretically justified properties of the models, but also to reveal new phenomena which have not been predicted by the theory.

The complexity and multiparametric setup of JJ assumes work of interdisciplinary research teams (involving physicists, mathematicians, programmers), implementation of effective numerical methods, involving parallel computations, and usage of supercomputers. For me it is clear that Dr. Atanassova has significant contribution to the development of numerical algorithms, their computer realization and the analysis of the results obtained in the research team of UINR - Dubna. An evidence for this conclusion is the 10 papers on the topic, submitted for the Contest, and the long-term bilateral collaboration, managed from Bulgarian side by Dr. Atanassova.

The second group of papers deposed for the Contest [6, 14] concerns the states of a hydrated electron (dynamic polaron model). The mathematical model is described by a system of three non-linear partial differential equations with appropriate initial and boundary conditions. For the numerical solution of this system Dr Atanassova developed a parallel numerical algorithm, which was realized in [6] on a 4-core *CPU Intel(R) Core(TM) i73630QM*, simulating 8 threads, and in [14] on the high performance computer (supercomputer) *Avitohol*. The performed simulations show an agreement of the numerical results and the experimental data on the absorbtion of the light by the hydrated electron.

In the third group of applicant's paper deposed for participation in the Contest analytical results are obtained concerning the existence of solutions of perturbed Volterra integral equations [9] and of $L_p(h;k)$-solutions of linear impulsive differential equations in Banach spaces [12], with a possible application to linear control systems with impulses. These results are illustrated with appropriate examples.

5 Conclusion

The documents submitted for the Contest by Chief Assistant Professor Dr. Pavlina Atanassova show that the pedagogical experience and research competencies of the applicant comply with the Contest specificity. I am convinced that the results claimed by Dr. Atanassova in the publications deposed for the Contest are achievements of the applicant, and did not find any plagiarism.

On the basis of the analysis made above I conclude that the Applicant meets in full the requirements of the Development of Academic Staff in the Republic of Bulgaria Act (DASRBA) and the Rules for its implementation, the relevant Rules of Plovdiv University Paisii Hilendarski postulated in art. 65 as well as the specific requirements of the Faculty of Mathematics and Informatics for occupying position *Associate Professor* in *Professional Field 4.5 Mathematics*.

All this gives me the reason to give my positive assessment to the Applicant and recommend to the respected Scientific Jury to prepare a report-proposal to the Scientific Council of the Faculty of Mathematics and Informatics for the election of Chief Assistant Professor Dr. PAVLINA HRISTOVA ATANASSOVA for the academic position ASSOCIATE PROFESSOR in Plovdiv University Paisii Hilendarski in Professional Field *4.5 Mathematics*, Specialty *Computational Mathematics*.

Date: 9.09.2019 Reviewer Signature:

(G. Nikolov)