

STATEMENT REPORT
for the competition for the academic position “Associate Professor”
in the Professional Field: 4.5. Mathematics (Mathematical Analysis)
for the needs of the Sofia University “St. Kliment Ohridski”
Faculty of Mathematics and Informatics (FMI-SU),
announced in State Gazette no. 30/15.04.2022
and on the websites of FMI and Sofia University

The statement report is written by **Prof. D.Sci. Vesselin Stoyanov Drensky, Full Member of the Bulgarian Academy of Sciences**, retired professor at the Institute of Mathematics and Informatics of the Bulgarian Academy of Sciences, Professional Field 4.5 Mathematics, as a member of the Scientific Jury for the competition by Order No. ПД 38-286/14.06.2022 of the Rector of the Sofia University.

The only applicant who has applied for the position is:

Chief Assistant Professor Ph.D. Nikolay Antonov Ivanov from the Department of Mathematical Analysis at the Faculty of Mathematics and Informatics of the Sofia University “St. Kliment Ohridski”.

I. Description of the presented documents

1. Information about the documentation

The documentation presented by the applicant is in accordance with the requirements of the law and the accompanying rules of the Sofia University.

The applicant for the position Chief Assist. Prof. Ph.D. Nikolay Antonov Ivanov participates in the competition with 7 publications in Bulgarian and foreign scientific issues. He has also added all other documents required for the application for the position which concern: CV, diplomas for M.Sci. and Ph.D.; documents confirming the scientific positions which he had; proofs that he covers the minimal scientific requirements of the law for the position; medical certificate; criminal record certificate; the announcement for the competition as well as data for the scientific activity of the applicant which we shall comment below.

2. Information for the applicant

The applicant Chief Assist. Prof. Ph.D. Nikolay Antonov Ivanov completed his secondary education at Vasil Drumev High School of Natural Sciences and Mathematics in Veliko Tarnovo, and then received a Master of Science diploma in Mathematics, specialization “Mathematical Analysis”. In 2007 he defended his Ph.D. Thesis on „On the Structure of Some Free Products of C^* -Algebras“ at A&M University of Texas with scientific advisor Kenneth Jay Dykema. He received a one year fellowship at Westfälische Wilhelms-Universität Münster in Germany and postdoc positions for 6 months at the Fields Institute and for 18 months at Queen’s University. After returning in Bulgaria the applicant worked at the University of Veliko Turnovo “St Cyril and St. Methodius” successively as part-time lecturer, Assistant Professor and Chief Assistant Professor. After that, he became Chief Assistant Professor at FMI-SU.

3. General characteristic of the scientific work and achievements of the applicant

The scientific results of Chief Assist. Prof. Ivanov are published in the period 2009–2020 and are in abstract harmonic analysis, functional analysis, operator theory, topological groups, K-theory and group theory. An essential part of the obtained results are in areas of analysis in the meeting point with algebra (the competition for Chief Assistant Professor at the University of Veliko Tarnovo was for the Department of Algebra and Geomertry and three of the members of the Scientific Jury for the competition were algebraists) and actively investigated in several

respectable scientific centers abroad. According to Mathematics Subject Classification MSC accepted by Mathematical Reviews and Zentralblatt his publications are in the fields:

- 19 K-theory
- 20 Group theory and generalizations
- 22 Topological groups, Lie groups
- 43 Abstract harmonic analysis
- 46 Functional analysis
- 47 Operator theory
- 58 Global analysis, analysis on manifolds.

The applicant is the author or coauthor of 8 scientific papers, all published after the defense of his Ph.D. Thesis and not included in the list of references there. Three of the papers were prepared before the defence of the Ph.D. Thesis and uploaded at the popular preprint database arXiv in 2006 and 2007. Of the papers, 6 of them are with the applicant as a single author and the other 2 are with a coauthor from Norway (one of them has also another coauthor from Denmark). Five of the papers have an impact factor, and one is in the proceedings of an international conference published by World Scientific and held in Bulgaria. It makes a pleasant impression that the applicant also publishes in Bulgarian journals - Annual of Sofia University "St. Kliment Ohridski" and Serdica Mathematical Journal, because these journals need quality papers to be published on time.

The applicant has presented a list of 8 citations (all by foreign authors) of one of his papers, which was not included for participation in the competition because it was used for the registration of the Ph.D. Thesis at NACID. These citations are also included as a proof that he covers the minimal scientific requirements of the law for the position. From my search in Internet, it can be seen that the applicant has at least 20 other citations, including the papers submitted for participation in the competition. I want to note that one of the papers was cited in a Master Thesis defended in Mexico. Usually such citations are not counted by scientific organizations as "real" citations, but for me personally this is a confirmation of the importance of the obtained result. The citation is one of the main indicators for the impact of the results of the scientist on the area of the research. In my opinion, the applicant should have presented a longer list of citations, because this would have shown him from a better point of view both for the Scientific Jury and for the Bulgarian mathematical audience. It would be also nice if he tries to involve to the field of his research other Bulgarian mathematicians.

One can see from the data presented for the application that starting in 2006 the obtained results were reported at international and national forums in Bulgaria, the USA and Canada.

It can be concluded from the applied documentation that:

- a) The scientific publications satisfy the minimal requirements of the law and the accompanying rules of the Sofia University for the academic position "Associate Professor" in the scientific field of the competition. With minimum requirements for groups of indicators B, D and E respectively 100, 200 and 50 points, the applicant has submitted information for 111 (+18), 210 and 64 points. In my opinion, it would be more convincing if the applicant had included more contributions in the list in order to meet the minimum requirements with a greater surplus;
- b) The scientific publications submitted for the position have not been used in previous applications;
- c) No plagiarism has been established in the presented for the competition works.

4. Characteristics and evaluation of the teaching activity of the applicant

The candidate has submitted quantitative data for his teaching as a Chief Assistant Professor at the FMI-SU which shows that he had a high academic workload at all times. Unfortunately, in the competition documentation, I did not find any information about what lectures

and seminars he had. I have no personal impressions, but from the information I received from his colleagues it is clear that he takes a responsible approach to his teaching activity.

5. Analysis of the scientific and scientific-applied achievements of the applicant contained in the documents and publications presented for the competition

The applicant has included for the competition 7 of his 8 papers. These are all publications which have not been used in previous applications. Six of the papers are in journals (2 in Journal of Functional Analysis and one in each of the journals: Transactions of the American Mathematical Society, Annales de L'institut Fourier, Serdica Mathematical Journal and Annual of Sofia University "St. Kliment Ohridski"), and one paper is in the proceedings of an international conference published by World Scientific and held in Bulgaria. The applicant has not presented data for the impact factor of the journals but for 2021 the first three journals are in quartiles Q1 and Q2.

C*-algebras are mathematical objects which collect properties typical for functional analysis, Euclidean geometry, topology and algebra. One of the main problems in the theory is to characterize the simple objects. These are the building blocks from which any C*-algebra is constructed. The paper [1] studies a class of C*-algebras – reduced free products of finite dimensional C*-algebras with given traces. The applicant gives sufficient and necessary conditions for the simplicity and the uniqueness of the trace in the considered class.

The group C*-algebra is a standard construction which from a given C*-algebra and a given group produces a new C*-algebra with multiplication table determined by the group operation. The results in the papers [4] and [6] are in the spirit of those in [1]. The papers study the simplicity and the uniqueness of the trace for group C*-algebras when the group is of a special and important for group theory kind (an amalgamated free product or an HNN-extension). Examples are given when the algebra is not simple but has a unique trace. The papers [4] and [6] are with coauthors. I accept that the coauthors have equal contributions.

The papers [5] and [7] are motivated by the results in [4] and [6], but are of more algebraic character. The applicant gives examples of group amalgams and HNN-extensions which have interesting algebraic properties and contain large simple normal subgroups. As a member of the Editorial Board of Serdica Mathematical Journal I communicated the paper [5] and want to add that the paper received a positive referee report by an established foreign expert in the field.

One of the branches of K-theory offers powerful methods for the study of operator algebras. In particular, it gives different algebraic invariants which are important for the understanding of the structure and the classification of C*-algebras. The paper [2] is in this direction. It studies a class of C*-algebras generated by operators of a special kind and contains structure results. Combined with known classification theorems this gives the complete description of the C*-algebras in the class in terms of tensor products of Cuntz algebras.

The paper [3] is in the noncommutative field theory and the related theory of the instantons. The instanton (or pseudoparticle) is a notion appearing in theoretical and mathematical physics. This is a classical solution to equations of motion either in quantum mechanics or in quantum field theory. The considerations are in three directions: (i) the noncommutative instantons in the four dimensional space with coordinate operators with relations depending on a real nondegenerate antisymmetric matrix; (ii) the noncommutative connections and curvatures in free modules; (iii) the topological index of the ADHM instantons.

I want to mention that in order to establish the results in the papers presented for the competition the applicant uses a large arsenal of techniques of different branches of Mathematics. He has also solved successfully a lot of problems from technical and principal character.

The character of the scientific contributions of the applicant is in developing of new methods and enriching of the existing knowledge. The obtained results may be used in the research of other scientists.

6. Critical remarks and recommendations

My main critical remark is that the applicant has prepared his documentation extremely economically, so in order to prepare my opinion I had to search in Internet and ask colleagues who know him better. In addition, I would recommend him to devote more time to scientific work: for 18 years (from the fellowship in Germany until now) he has published 8 papers. Although most of them were published in high level international journals and were subject to serious peer review, I think that this is a modest achievement for a young scientist with a very good education who has spent long time in established research centers abroad. I am convinced that the applicant has the potential for that.

7. Personal impressions for the applicant

I do not know the applicant personally, but from the submitted documentation for the competition, from his scientific publications and from my conversations with colleagues, I have the conclusion that he is a serious scientist and a responsible teacher.

8. Conclusion for the application

After my careful and critical reading of the documentation and the publications presented for the competition and my analysis of their significance and the scientific and scientific-applications contributions **I confirm** that the scientific contributions are sufficient as required by the law and the additional requirements of the Sofia University for the position “Associate Professor” in the scientific field of the competition. In particular, the applicant satisfies the minimal national requirements for the scientific field and there is not a plagiarism in the presented publications for the competition.

I give my **positive** evaluation for the application.

II. CONCLUSION

I **recommend** the Scientific Jury to suggest that the Council responsible for the election of the Faculty of Mathematics and Informatics of the Sofia University “St. Kliment Ohridski” to elect Chief Assist. Prof. Ph.D. Nikolay Antonov Ivanov for the academic position “Associate Professor” in the professional field 4.5 Mathematics (Mathematical Analysis).

August 11, 2022

Signature:

(Prof. D.Sci. Vesselin Drensky, Full member of the BAS)