

REVIEW

by prof. Nikola Petkov Ziapkov, PhD

on the competition for acquiring the academic position „associate professor”
in professional area: “4.5. Mathematics”, specialty Mathematical methods in

Physics (Algebraic and statistical methods)

for Institute of Mathematics and Informatics,

Bulgarian Academy of Sciences,

published in State Gazette No 89/16.10.2020

By an order № 216/14.12.2020 of the IMI-BAS Director (according to a decision by Scientific Council of IMI (protocol № 11 /27.11.2020), I'm appointed as a member of the scientific jury in the competition for acquiring the academic position „associate professor” in professional area: “4.5. Mathematics”, specialty Mathematical methods in Physics (Algebraic and statistical methods) for the needs of IMI-BAS

The sole candidate for this position is ch. assist. prof. Veselin Georgiev Filev, PhD from the Department „Algebra and logic“, IMI-BAS.

As a jury member I have received for this review the following documents:

1. Statement for participation submitted to IMI-BAS's Director.
2. Professional CV, EU standard.
3. Diploma for higher education.
4. Diploma for the scientific and educational degree „doctor“ (PhD).
5. A list of all publications, inventions and applied-scientific results.
6. A list of publications, inventions and applied-scientific results submitted for this competition.
7. Signed statement for the scientific contributions in the publications submitted for this competition.
8. Resumes of all publications (in Bulgarian and English) submitted for this competition.
9. Copies of all publication in 7.
10. A list of all citations.
11. A list of citations submitted for this competition.

12. A copy of the State Gazette with the competition announcement.
13. Certificate of experience in the specialty according to the requirements of Art. 24, para.1, p. 2 of LDASRB (the Law for the development of the academic staff in the Republic of Bulgaria).
14. Certificate of lectures given by the candidate.
15. Certificate in according to a model for fulfillment of the minimum national requirements (Art. 26, para. 2 & 3, and Art. 26, para. 5) of LDASRB, as well as the minimal requirements of IMI-BAS. To this certificate are attached evidences supporting the claims (Attachment 2.2).
16. A declaration according to the model (Attachment 3.2).
17. A declaration of consent for storage and processing of personal data (Attachment 4.2).

All needed documents for inclusion to this competition are prepared according to LDASRB, RALDASRB (Rules on the application of the Law for the development of the academic staff in the Republic of Bulgaria), The Regulations for holding academic positions in the Bulgarian Academy of Sciences and the Regulations for application of LDASRB (RALDASRB) in the Institute of Mathematics and Informatics.

Brief biographical data about the candidate

In 2002 Veselin Georgiev Filev graduated with a bachelor's degree in Physics from the Faculty of Physics (FP) – SU „Saint K. Ohridski“ and master's program „Theoretical and mathematical Physics“ from FP – in 2003. He defended a thesis titled „Aspects of the Holographic Study of Flavor Dynamics” in 2008 at the University of Southern California in Los Angeles, USA. Between 2003 and 2008 r. he was a scholar and teacher in University of Southern California in Los Angeles, USA. During 08/2008–06/2010 and 03/2012–08/2016 he is a postdoc in Research Institute in Dublin, Ireland, where he conducted research in the field of theoretical and mathematical physics. He had also a postdoc position Max Planck Institute – Munich in the time period 07/2010 – 02/2012.

From March 2017 until now he has been successively assistant and chief assistant at IMI at BAS, Department „Algebra and logic“. Form 01/2020 ch. assist. prof. Veselin Georgiev Filev, PhD is also a mathematics and physics teacher at the American University in Bulgaria.

General presentation of the materials for the competition. Compliance with the minimum requirements

The candidate possesses a PhD degree – he defended a thesis titled „Aspects of the Holographic Study of Flavor Dynamics” (Diploma from University of Southern California in Los Angeles, USA that has been recognized by BAS 20.06.2008/certificate №000066). This means that the applicant meets the requirements of Art. 24 para 1. of LDASRB. From the reference for work experience issued by IMI at BAS, it can be seen that the candidate meets the requirements of Art. 24 para. 2. of LDASRB.

According to the specific requirements of Art. 3, para. 1, p. 2 of RALDASRB, IMI at BAS there are 7 publications (6 having impact-factor and 1 having SJR). The inspection showed that the publication [4] is in journal with SJR, and the other 6 have IF, i.e. at least 5 publications with IF or SJR have been submitted for the competition.

Minimum requirements for admission to the "Associate Professor" competition according to Art 2, para 2 of RALDASRB, IMI at BAS:

Indicator group	Indicator	Required number of point	Candidate's point
A	1	50	50
B	3-4	100	100
Г	5-10	220	220
Д	11	70	72
E	12-	20	20

For group B, Indicator 4 with publications [1] and [2] from the list of publications submitted for the competition was used and both publications are in IF editions and are from the top quartile Q1. The inspection established the accuracy of the submitted data.

Indicator 7 was used for group D. Publications [3, 5, 6, 7] are in editions with IF and are from the highest quartile Q1, and [4] is indexed in Scopus and is in edition with SJR. The inspection established the accuracy of the submitted data.

For group E, Indicator 11, publications [1, 2, 3] were used. All are cited in publications indexed in the Web of Science. The inspection established the accuracy of the submitted data.

Indicators 14 were used for group E. The applicant submitted participation in two research projects funded by the National Research Fund.

I accept that the candidate satisfies the minimum requirements of LDASRB, RALDASRB, RALDASRB in the Institute of Mathematics and Informatics for participation in a competition for the academic position "Associate Professor".

No plagiarism has been found in candidate's scientific works.

General characteristics of the scientific and applied-scientific activity of the candidate and his contributions in the presented publications

Vesselin Filev has submitted 7 publications for the competition, all in English. The publications were made in the period 2012-2019. All are co-authored. The candidate is the first author in 3 of them, and in the other articles he is the second author. No reference is made to the individual contributions of the candidate, but the systematic nature of the results presented in these publications testifies to his significant role. The articles [1,2,3, 5, 6, 7] have a high total impact factor of 36,819 and are from the highest quartile Q1. The article [4] has an impact rank of 0.117 (the numbering of the publications is according to the presented list of seven publications).

The attached publications are related to the holographic principle, which states that gravity in a three-dimensional object can be described by the quantum theory of a two-dimensional surface. Different generalizations of AdS / CFT compliance are used. AdS/CFT compliance is a powerful analytical tool providing a non-perturbative dual description of non-Abelian calibration theories defined on appropriate space-time. In its extended form, the AdS / CFT correspondence describes fundamental matter in supersymmetric theories related to quantum chromodynamics. (QCD). Quantum chromodynamics is a type of quantum field theory called non-Abelian calibration theory with the symmetric group SU (3).

In [7], the holographic gauge theory dual to the D3/D5 intersection is studied. The dual calibration theory is N = 4 SYM coupled with N = 2 fundamental

hypermultiplet. An external magnetic field in the form of a Kalb-Ramon B-field is also applied. The main object of the study is the magnetic catalysis of spontaneous violation of chiral symmetry. The main contribution of the article is the construction of a new space-time taking into account the effect of the trial D7-dims on the geometry. In dual calibration theory, this corresponds to the restoration of the dynamics of fundamental fields, all previous considerations (mostly the work of the author) of this system in a magnetic field are in a mode where the dynamics of fundamental fields are neglected. This makes the field theory of adjoint fields noncommutative, and that the effect of magnetic catalysis is enhanced by taking into account the dynamics of the fundamental fields.

AdS / CFT compliance in the case of D3 / D5 intersection system is applied in the publication [1]. The flow of the B-field through an inner two-sphere enveloped by the D5-brane, is considered, which corresponds to a non-commutative configuration of adjoint scalars. It has been proven that the system There is a domain wall separating the theory into regions with different ranks of the adjoint group, a critical point of a second order phase transition. Critical exponents and find that the second derivatives of the free energy, with respect to the bare mass and the magnetic field is shown.

In the publication [6] the BFSS matrix model is simulated with lattice theory. The results were compared with the predictions of AdS / CFT compliance and good consistency at low temperatures was demonstrated.

In the publication [5] a computer simulation of the matrix model of Berkooz-Douglas (BD), holographic dual of D0 / D4 intersection system was performed. One of the most non-trivial tests of AdS / CFT compliance with completely broken supersymmetry has been performed. This is the first direct compliance test in the presence of fundamental fields. The fundamental condensate curve with respect to the mass of the theory has been studied and excellent agreement with the holographic predictions in the deconfiguration phase of the theory has been shown.

The study of the Berkooz-Douglas (BD) matrix model was continued in publications [4] and [2]. The main contribution is the study of the second derivative of free energy with respect to the mass (mass susceptibility). The dependence of this quantity on the temperature is obtained in three different ways. High temperature perturbation theory, low temperature AdS / CFT compliance and full mode computer simulation.

Excellent agreement was found with the AdS /CFT compliance forecasts. In publication [3] a computer simulation of the BMN matrix model was performed at a final temperature T . The main contribution is to study the phase structure of the model through computer simulations. A Padé approximation of some modes of the theory is also obtained. It is shown that the phase transition curve approaches the prediction of AdS / CFT compliance at a small mass parameter.

All publications of Dr. V. Filev are 38, of which: 34 publications are in scientific journals with impact factor (IF) and 3 are in scientific journals with impact rank (SJR). Of the articles with an impact factor: 32 are in the highest quartile (Q1), one is in the second quartile (Q2) and one is in the fourth quartile (Q4).

Citations

The citations of candidate's works in scientific paper, reviewed and indexed in the international scientific databases (Web of Science and Scopus) are 12. Both the cited articles and the cited articles have an impact factor IF in the first quartile (Q1).

I was very impressed by the following fact: 33 articles by Chief Assistant Dr. V. Filev have 813 citations indexed mainly in Web of Science and Scopus. The corresponding h-index is 14. The most cited article has 145 citations.

Personal impressions

I do not know the candidate personally, but my impressions of Dr. V. Filev as a specialist and researcher in modern theoretical and mathematical physics are excellent.

Critical remarks and recommendations

I do not have critical remarks and recommendations to the scientific works of the candidate.

Conclusion

All requirements of LDASRB, RALDASRB, RALDASRB in the Institute of Mathematics and Informatics have been fulfilled by the candidate. Based on the acquaintance with the presented scientific works, their significance, the scientific contributions contained in them, I find it reasonable to propose ch. assist. prof. Veselin Georgiev Filev, PhD to take the academic position “Associate Professor” at IMI at BAS in the professional field 4.5. Mathematics, scientific specialty “Mathematical methods in physics” (Algebraic and statistical methods).

13.01.2021 г.
Sofia

Reviewer:
/Prof. Nikola Ziapkov, PhD /