

REPORT

at the competition for the occupation of the academic position

“Associate Professor”

in the area of higher education 4. Natural sciences, mathematics and informatics,

the professional field 4.5 Mathematics,

scientific specialty “Equations of mathematical physics”,

at Institute of Mathematics and Informatics (IMI),

Bulgarian Academy of Sciences (BAS),

announced in State Gazette no. 108 of 22.12.2020 and on the web page of IMI-BAS

This report is prepared by: Assoc. Prof. Tsvetan Dimitrov Hristov, PhD from Faculty of Mathematics and Informatics, Sofia University “St. Kliment Ohridski”, as a member of the scientific jury for the competition according to Order No. № 29/ 19.02.2021 by the Director of IMI-BAS.

One candidate has submitted documents for participation in the announced competition: Chief Assistant Professor Tihomir Ilchev Valchev , PhD, in Section “Differential equations and mathematical physics”, IMI-BAS.

I. General description of the submitted documents

1. Application Details

For participation in the competition the candidate Chief Assistant Professor Tihomir Valchev, PhD has submitted:

Application for admission to the competition to the Director of IMI-BAS and

1. Curriculum vitae (european format), 2. Diplomas for higher education (master and bachelor degree), 3. Diploma for educational and scientific degree "Doctor", 4. Full list of publications, 5. Separate list of publications submitted for participation in the competition, 6. Hand-signed reference for original scientific contributions in papers, submitted for participation in the competition, 7. Abstracts of publications submitted for participation in the competition in Bulgarian and English, 8. Copies of the scientific papers submitted for participation in the competition, 9. Full list of citations, 10. Separate list of citations submitted for participation in the competition, 11. Copy of the competition announcement in the State Gazette, 12. Certificate of internship in the speciality according Art. 24, para. 1, item 2 of Act of the Development of the Academic Personnel of the Republic of Bulgaria (ZRASRB), 13. List of scientific projects, 14. Reference form for the fulfillment of the minimum national requirements under Art. 2b of ZRASRB, and additional requirements of BAS and IMI-BAS, 15. Declaration in a form (Appendix 3.2) that the publications, citations and other evidence presented in this competition have not been used to acquire the educational and scientific degree "Doctor", and 16. Declaration of consent for storage and processing of personal data (Appendix 4.2).

2. Data for the candidate

According to the documents submitted for participation in the competition, Chief Assistant Professor Dr. Tihomir Ilchev Valchev acquired a Bachelor's degree in Physics in 2002

and a Master's degree in Theoretical and Mathematical Physics in 2003 at the Faculty of Physics at Sofia University "St. Kliment Ohridski". In the period 2005-2007 he was a PhD student at the Institute for Nuclear Research and Nuclear Energy (INRNE) at BAS, where in 2009 he acquired the educational and scientific degree "Doctor" in the scientific specialty "Theoretical and mathematical physics". He worked as a Physicist in 2004 and between 2008 and 2009, and in the period 2009-2014 he held the academic position of "Chief Assistant Professor" at the same institute of BAS. In the period 2012-2014 he was a postdoc at the Dublin Institute of Technology, Ireland. Since 2015 he has been working as a Chief Assistant Professor in the section "Differential Equations and Mathematical Physics" of IMI-BAS. In 2007 he received an award from the INRNE for the best theoretical work for the series of works "Multicomponent nonlinear evolution equations". Dr. Tihomir Valchev has 41 scientific publications, 25 of them have impact factor (IF) or impact rank (SJR). The candidate has not presented a reference for his participation in international and national conferences and scientific forums. Undoubtedly, he has such an activity, as 24 (11 single-authored) of his publications are reports at conferences and workshops.

3. General characteristics of the applicant's scientific work and achievements

For participation in the competition, Dr. Tihomir Valchev has presented 14 scientific publications, published in the period 2010-2020, that do not repeat those of the procedure for acquiring the educational and scientific degree "Doctor" in 2009. A preprint [1] of a single-authored report published in arXiv in 2021 is also presented. I use the numeration in the separate list of publications presented for participation in the competition. He is the single author in six of the publications [7] - [12] and eight of papers are co-authored [2] - [6], [13] - [15]. The candidate has not submitted declarations from his co-authors to certify his scientific contribution in their joint publications. I assume that the candidate's contributions are equal in all collective publications. The applicant's research interests and specifically the submitted scientific papers are in the field of competition.

Seven of publications are in journals with Impact Factor: "Journal of Nonlinear Mathematical Physics" (2 papers), "Physics Letters A: General, Atomic and Solid State Physics", "Journal of Mathematical Physics", "Symmetry, Integrability and Geometry: Methods and Applications", "Theoretical and Mathematical Physics", "Journal of Physics A: Mathematical and Theoretical". Five of papers are in journals with Impact Rank (SJR): one paper in "Journal of Geometry and Symmetry in Physics", two reports in "AIP Conference Proceedings", one in "Geometry, Integrability and Quantization" and one in "Journal of Physics: Conference Series". Two reports are published in journal "Pliska Studia Mathematica", which is referenced in Zentralblatt.

Dr. Valchev presented a list of two international and three national projects in which he participated. Three of them are in different parts of the period 2004-2011. With other two he participates in the present competition, indicating them in the reference for fulfillment of the minimum national requirements: 1. Personal Grant: Irish Research Council Postdoctoral Research Project „Multi-component Nonlinear Evolution Equations Related to Homogeneous and Symmetric Spaces and Their Types of Solutions“, 2012-2014. The candidate has not provided evidence of his participation in this international project, but I assume that it is a fact. 2. From May 2019 (during the half of the project period) he is manager of an active project on

"Algebraic and geometric methods in differential equations, integrability and nonintegrability" with the Bulgarian NSF № DH 02/5 with budget BGN 120 000 which started on December 2016 with another manager. Dr. Valchev was not the project manager when the funds for the project were raised, as well as when its first stage was reported. The applicant has not provided evidence in these circumstances. I do not think that he should be awarded points on indicator 18.

The candidate has submitted a list of 28 citations for participation in the competition. Among the authors of 18 of the citing papers there are Bulgarian colleagues who are co-authors of the candidate in other papers different from the cited and citing ones (there are no self-citations). The other 10 citations are from foreign authors in the field.

The numerical indicators of the candidate by groups of indicators are the following:

Group	Indicator	Minimum points required for "Associate Professor"	Candidate's points
A	1. PhD thesis	50	50
B	4. Habilitation work–scientific publications	100	100 IF(JCR-WoS): [9] in Q2, [5] and [7] in Q3.
Г	7. Scientific publications	220	254 IF(JCR-WoS): [15] in Q2, [6], [13] and [14] in Q3. - 130 p. SJR(Scopus): [2], [3], [10], [11], [12]-100 p. Zentralblatt: [4], [8] – 24 p.
Д	11. Citations	70	153 23 citations in Scopus (138 p.) and 5 citations in Zentralblatt (15 p.)
E	12 - 20	20	35 Scientific project: international 1- member (20 p.); national 1 - member during stage 1 (5 p.) and manager during stage 2 (10 p.)
IMI-BAS	Publications with IF or SJR	5	12 [2], [3], [5]-[7], [9]-[15]

The candidate meets the set of criteria and indicators for occupation the academic position "associate professor" in the scientific area and professional field of the competition, according to the minimum national requirements (under Art. 2b, para. 2 and 3 of ZRASRB) and respectively the additional requirements of BAS and IMI-BAS.

4. Characterization and evaluation of the applicant's teaching activity

The submitted documents for participation in the competition do not contain information about the educational and pedagogical activity of the candidate.

5. Substantive analysis of the scientific and applied scientific achievements of the applicant, according to the submitted publications

The scientific interests of Dr. Tihomir Valchev are in the field of S-integrable systems nonlinear partial differential equations (PDEs) with two independent variables. The main scientific and applied contributions of the candidate can be grouped in the following areas:

- (A) Quadratic bundles associated with classes of nonlinear evolution equations (NLEEs)
- (B) Equations of magnetic type
- (C) Reduction in the sense of Mikhailov, quasi-rational solutions

In group (A) are papers [7], [10] and [11]. They deal with some classes of quadratic scattering operators $L(\lambda)$, which appear in the Lax representations of NLEEs, which are generalizations of some multicomponent analogues of the Kaup-Newell equation. Under homogeneous boundary conditions the dressing Zakharov-Shabat method to the corresponding quadratic bundles is applied and soliton or rational type solutions of the associated systems of NLEEs are found.

In group (B) are publications [2] – [6] and [12] - [15]. In papers [5], [6] and [13] systems of NLEEs have been studied, which can be considered as two-component generalizations of the classical Heisenberg Ferromagnet Equation (HF). Lax representations have been found in which the Lax operators $L(\lambda)$ are linear functions of λ . The scattering problem under constant boundary conditions is studied in detail. Recursion operators are constructed to describe the corresponding integrable hierarchy. With the help of the dressing method, different types of partial solutions were obtained. Similar results in the more delicate case of a system of nonlocal nonlinear equations are obtained in [2]. In papers [3] and [4] new multicomponent S-integrable generalization of HF equation is introduced and integrable hierarchy connected with it is describe. Again, with the help of the dressing method, depending on the poles of the dressing multiplier, different special solutions are constructed. Papers [14] and [15] deal with multicomponent NLEE, which Lax operator $L(\lambda)$ is rational function of spectral parameter. The spectrum of the scattering operator under different constant boundary conditions has been studied. A recursion operator is construct for the rational bundle under consideration.

In group (C) are papers [8] and [9]. In [9] a generalization of the concept of reduction in the sense of Mikhailov, allowing the transformation of independent variables is considered. This allows certain classes of nonlocal NLEEs to be studied using the inverse scattering problem method. In [8], an algorithm, based on dressing method, for constructing quasi-rational solutions of a class of multicomponent S-integrable nonlinear evolution PDEs under constant boundary conditions is developed. The described algorithm is applied to the generalized Heisenberg ferromagnetic system and solutions with or without singularities are obtained. With the help of this algorithm, singular solutions of one specific system of magnetic type are also given.

6. Critical notes

I will systematize my critical notes, some of which I mentioned during the presentation. The documents submitted by the applicant are not clearly marked and are not arranged, which makes it difficult to work with them. In the Application to the Director of IMI-BAS the candidate has indicated a list of attached documents, which does not contain three of the documents I received - 14, 15 and 16 of those listed in Section 1. The applicant did not provide evidence of his participation in the scientific projects listed in document 13. 28 citations are presented in the competition, 18 of them are from colleagues with whom the candidate has other joint publications (without self-citations). According to the submitted documents, the candidate has no educational and pedagogical activity.

7. Personal impressions of the applicant

I do not know Dr. Tihomir Ilchev Valchev personally and I have no personal impressions of him.

8. Conclusion on the application

Despite the critical notes listed above, based on the analysis I made, I think that the materials and scientific works submitted by the candidate, as well as the scientific and scientific-applied contributions contained in them meet the requirements of ZRASRB, the Rules for the Implementation of the ZRASRB, the Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at BAS and the Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at IMI-BAS for the occupation the academic position "Associate Professor" in the scientific field and professional direction of the competition. In particular, the candidate satisfies the minimum national requirements and the additional requirements of BAS and IMI-BAS in the professional field and no plagiarism has been established in the scientific papers submitted at the competition. I give a positive assessment to the application of Ch. Asst. Prof. Tichomir Valchev.

II. GENERAL CONCLUSION

Based on the above, I recommend the scientific jury to propose to the competent electoral body of the Institute of Mathematics and Informatics at Bulgarian Academy of Sciences to elect Ch. Asst. Prof. Dr. Tihomir Ilchev Valchev for the academic position "Associate Professor" in the professional field 4.5 Mathematics, scientific specialty "Equations of mathematical physics".

16.04.2021

Author of the Report:
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