REPORT

by Prof. Dr. Georgi Venkov, FAMI, TU – Sofia

on the competition for the academic position "Associate Professor" for the needs of the Institute of Mathematics and Informatics, Bulgarian Academy of Sciences

in direction of higher education 4 Natural sciences, mathematics and informatics

Professional field 4.5. Mathematics, Specialty "Equations of Mathematical Physics", announced in SG No. 108 / 22.12.2020

with candidate: Assistant Professor Dr. Tihomir Ilchev Valchev

I present my report on this competition as a member of the Scientific Jury, determined by the Order No. 29 of 19.02.2021 of the Director of Institute of Mathematics and Informatics (IMI), Bulgarian Academy of Sciences (BAS).

The report was prepared in accordance with the requirements of:

- the Law for the Development of Academic Staff in the Republic of Bulgaria (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 at IMI of BAS.

1. General information for the candidate

According to the documents submitted for participation in the competition, Assist. Prof. Dr. Tihomir Valchev obtained a Master's Degree at the Faculty of Physics, Sofia University "St. Kliment Ohridski" in 2003. In the period 2005-2007 he is a PhD student at INRNE-BAS, specialty "Theoretical and Mathematical Physics" and defends a thesis on the topic "Reductions of nonlinear equations of solitary type on homogeneous and symmetric spaces" in 2009. Dr. Tihomir Valchev's work experience began in 2004 as a physicist at INRNE-BAS and Assist. Prof. since 2009 at the same institute, and since 2015 he has been an assistant professor at IMI-BAS. In the period 2012-2014 he holds a postdoc position in Dublin Institute of Technology, Ireland. He participates as a manager and member of international research projects and projects with the National Science Fund. In 2007 Dr. Valchev was awarded by the governance of INRNE-BAS for the best theoretical work for his series of scientific publications "Multicomponent Nonlinear Evolution Equations".

2. General characteristics of the works submitted for the competition

For participation in the competition, Assist. Prof. Dr. Tihomir Valchev presented 15 articles that were not used for the acquisition of the PhD degree. 14 articles have been published in international refereed and indexed journals and conference proceedings, of which 6 are solo, 7 have impact factor (IF) and 5 have impact rating (SJR). Paper [1] from the list of publications is presented as a preprint (arXiv: 2011.13437v1[nlin.SI]). According to the

Annex 1 to Rules of BAS for the Implementation of the ZRASRB, giving the minimal scientific indicators to applicants going to occupy the academic position of Assoc. Professor in professional field 4.5. Mathematics, the following table is indicative:

	Q1	Q2	Q3	Q4	SJR	other	sum
public.	-	2	5	-	5	2	14
points		80	150		100	24	354

The presented publications of the candidate meet the minimum requirements of 100 points in Group of indicators B (B.4 = 100) and 220 points in Group of indicators Г (Г.7 = 254) of the Annex 1 to Rules of BAS for the Implementation of the ZRASRB. Moreover, the total IF and SJR of Dr. Valchev's articles are respectively 3,937 and 1,029.

According to the attached list, 9 of the candidate's entries for this competition are cited in 28 scientific publications, 23 of which are in international journals, referenced and indexed in Web of Science and / or Scopus and 5 – in Mathscinet. According to Indicator Д.11 of the Annex 1 to Rules of BAS for the Implementation of the ZRASRB, the citation index of Dr. Valchev equals 153 points, which far exceeds the minimum requirement of 70 points.

3. Basic scientific and applied contributions

Assist. Prof. Dr. Tihomir Valchev's main scientific interests are in the field of the Theory of continuous integrable systems and in particular – the study of systems of partial differential equations which are integrable in the sense of the method of the inverse scattering problem (MISP) (or S-integrable).

The main scientific and applied scientific contributions in these fields can be grouped as follows:

3.1. Quadratic bundles

This group includes the results contained in publications [7], [10] and [11]. In general, they treat scattering operators that are quadratic with respect to the spectral parameter and have coefficients in simple complex Lie algebra. One of the main goals of the study in these publications is to develop the formalism of the real scattering problem at zero boundary conditions. In publications [7] and [10] this was done for the case of quadratic bundles for the algebra $sl(m+n)$, and in paper [11] a similar result was achieved for quadratic bundles for an arbitrary simple Lie algebra. Other results are related to the study of the spectral properties of the scattering operator, to the construction of non-reflective potentials for quadratic bundles, to the derivation of soliton-type solutions.

3.2. Equations of magnetic type

To this direction belong publications [1-6] and [12-15]. In this group of results are studied multicomponent nonlinear evolution equations (NEE), which appear as analogs of the Heisenberg ferromagnet equation. The main purpose of these works is the construction and study of 1 + 1 dimensional NEE, which are S-integrable and have linear or rational bundles with coefficients in $sl(n,C)$ or $so(n,C)$ algebras.

3.3. Other S-integrable NEE

This group includes the works of the candidate [8] and [9]. Article [8] presents an approach for constructing quasi-rational solutions for multicomponent S-integrable NEE, based on the Zakharov-Shabat dressing method. This method is illustrated in obtaining quasi-rational solutions with zero asymptotics for the multicomponent nonlinear Schrödinger equation and quasi-rational solutions with constant asymptotics for a specific two-component system of magnetic type. In paper [9] a generalization of the concept of reduction in the sense of Mihailov is proposed. More precisely, here is used a finite group of symmetries of the scattering problem acting on the set of fundamental solutions, known as the group of reduction. This generalization is used in the study of classes of nonlocal NEE, as the nonlocal Schrödinger equation proposed by Ablowitz and Musslimani.

After using the "iThenticate" database platform (https://app.ithenticate.com/en_us/login), I can confirm the lack of any plagiarism in the scientific papers submitted by the applicant.

4. Critical notes and recommendations

As a critical comment on the materials of Assist. Prof. Dr. Tihomir Valchev for participation in this competition is that they are unsystematically prepared and provide inaccurate information about the main characteristics of the included publications (for example, for articles published in the period 2011-2014, the corresponding SJR is from 2019). Another critical comment is related to the list of citations - most of the citation sources are with authors V. Gerdjikov, A. Yanovski, G. Grahovski, R. Ivanov, who are co-authors of the candidate. This can be considered as self-citation. Last but not least, in the publications of the candidate there is no theorems or, if any, they are supported by short and formal proofs, which is unacceptable for a competition for an academic position in the specialty "Equations of Mathematical Physics". Therefore, I can recommend the candidate to participate in a similar competition with the specialty "Mathematical Modeling and Application of Mathematics (in Physics)".

5. Conclusion

In conclusion, I cannot suggest to the Honorable Scientific Jury to recommend to the Scientific Council of of IMI-BAS the choice of Assistant Professor Dr. Tihomir Ilchev Valchev for the academic position "Associate Professor" in the direction of higher education 4. Natural sciences, mathematics and informatics, professional field 4.5. Mathematics, specialty "Equations of Mathematical Physics".

19.04.2021 г.   Assessor:

Sofia   (Prof. PhD Georgi Venkov)