

OPINION

**on the competition for the academic position "Associate Professor"
in professional field 4.1 Physical sciences (String theory and high energy physics)
for the needs of Sofia University "St. Kliment Ohridski" (SU),
Faculty of Physics, announced in SG No. 2015/ 63 of 30.07.2021**

The opinion was prepared by: Prof. Dr.Sc. Leander Borisov Litov, University of Sofia “St. Kl. Ohridski” in his capacity as a member of the scientific jury on the competition for Associate Professor in professional field 4.1 Physical sciences (String theory and high energy physics), according to Order No **RD-38-488/01.10.2021** of the Rector of Sofia University.

There is a single candidate for the position - Dr. Tsvetan Ivanov Vetsov, Ph.D., Department of Theoretical Physics, Faculty of Physics, Sofia University.

I. General description of the presented materials

1. Application data

The documents submitted in the competition by the applicant comply with the requirements of the ZZRB, the PPRB and the Rules of Procedure for acquiring scientific degrees and holding academic positions at [SU "St. Kliment Ohridski"](#) (PUPNAZADSU).

For participation in the competition, the candidate Tsvetan Ivanov Vesov has presented a list of 18 titles, including 17 publications in Bulgarian and foreign scientific journals and scientific forums and 1 chapter of a book. There are also 17 other documents (in the form of official notes and certificates from an employer, various lists of publications and projects, reports from databases) supporting the achievements of the applicant.

The submitted documents reflect sufficiently fully the scientific achievements and pedagogical work of the applicant.

2. Applicant data

The candidate Tsvetan Vetsov was born August 11, 1986 in Razlog. He obtained a bachelor degree in Physics in 2009 and master degree in “Theoretical and mathematical physics” in 2011. In 2015 he completed a PhD degree with a successful defend of dissertation on "String approach to calibration theories" in professional field 4.1 Physical Sciences (Theoretical and Mathematical Physics) under the supervision of Prof. Dr.Sc. Radoslav Rashkov. In the same year he was appointed Head Assistant Professor in the Department of Theoretical Physics of the Faculty of Physics of Sofia University "St. Kliment Ohridski". In recent years he has established himself as one of the most active young scientists and lecturers in the Faculty of Physics of Sofia University.

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

The candidate works actively in several directions related to string theory, holographic duality, models of modified gravity and their application for different quantum and classical systems and determination of their statistical and thermodynamic parameters. The main directions of his activity can be defined as follows; Information geometry and Fisher metric, Entanglement Entropy, Black holes thermodynamics, Supergravity solutions with non-abelian T-duality and Relativistic images of thin discs around dark compact objects. His scientific results are presented in 23 publications, 15 of which are in high impact factor journals. In the competition, Ts.. Vetsov participates with 18 publications, 11 of which had quartile Q1, 1 in quartile Q2, 1 in Q3 and 1 in Q4. Three of the publications do not have quartile, but they are in journals with an IF and a SJR. One of the publications is a chapter of a book. These papers have been quoted 81 times according to Web of Science and 125 times according to the Inspire-Hep database which is a more realistic estimate. According to these two databases, the candidate's Hirsh index is 5 (Web of Science) and 6 (Inspire - Hep). Vetsov has participated in 14 national scientific projects (SU and NSF) and one international, leading three of them (two of the SU and one of the NSF).

In summary, we can conclude that the applicant not only meets all the requirements (under Art. 2b, paragraphs 2 and 3 of the LARSBR) and the additional requirements of SU "St. Kliment Ohridski" for the academic position "Associate Professor" in the scientific field and professional direction of the competition, but also exceeds most of them to a significant extent.

The scientific works presented by the candidate with which he participates in the competition are not used in the acquisition of the scientific and educational degree doctor, as well as in the competition for the position of Head assistant professor.

Up to my knowledge there are no evidence of plagiarism in the scientific papers presented in the competition.

4. Characteristic and evaluation of the applicant's teaching activities

It is evident from the attached report that in the last 5 years the candidate has a full teaching workload at the Faculty of Physics. What impresses is the wide range of lectures and exercises that Ts.. Vetsov has led. He has lectured on Mathematical analysis of one variable; Vector and tensor analysis; Functional analysis; Quantum Field Theory; Quantum Field Theory in a curved space time and has conducted seminar classes on: Mathematical analysis of one variable in Bulgarian and English; Vector and tensor analysis; Quantum field theory; Theoretical mechanics and Electrodynamics. It can be said that he is a shaped lecturer, with enough experience, not only in conducting exercises, but also in reading lectures. In this sense, he meets all the requirements for associate professor.

5. Analysis of the applicant's scientific achievements included in the competition materials

Ts.Vetsov's research is in an actual and an extremely fast developing field of modern theoretical and mathematical physics. As it was already mentioned he is active in several directions. In the first one connected with Information geometry approach a number of different systems was investigated (4-dimensional black halls in modified gravity with high order derivatives, 3 dimensional holographic black halls, boson strings in flat- parallel space-time background, Pais–Uhlenbeck oscillator chains with higher derivatives; holographic systems with non-relativistic Schrödinger symmetry) building the corresponding Fischer metric. The results obtained are published in 9 articles in the majority of which the applicant’s contribution can be assessed as significant.

Another interesting strand in the Ts.. Vetsov research is associated with the determination of the entanglement entropy for various quantum systems including boson strings in a flat-parallel space-time background, chains of Pais-Uhlenbeck oscillators with higher derivatives, condensed bosons and fermion systems and dissipative quantum systems. The results of these studies are presented in two publications.

In two of the presented publications, the thermodynamics of black holes were examined, on the examples of a four-dimensional static black hole of Deser-Sarioglu-Tekin with dark matter and a three-dimensional rotating hole of Lifschitz in New Massive Gravity.

Some of the contributions of Ts. Vetsov are related to the study of different aspects of the dynamics of three types of string solutions: spike and geant magnon strings and folded three-spin semiclassical string. The results of these studies are published in 4 articles.

Two of the publications are dedicated to finding new supergravity solutions with T-duality in string theory.

The applicant has also a major contribution to numerical and graphical modeling to obtain relativistic images of the properties of matter in a field of strong gravity around black holes and naked singularities in modified gravity theories (two publications).

The personal contributions of Ts.. Vetsov in all scientific publications used for this competition are specified clearly and accurately. In general, his contributions can be defined as enriching existing knowledge by suggesting new hypotheses and applying new methods for their development.

The scientific papers of Ts. Vetsov has been cited over 120 times, which is a clear high estimate of their value and reflection in the works of other authors.

6. Critical notes and recommendations

The majority of the candidate's works are published in reputable leading journals, distinguished by high quality, clarity of the text and numerous interesting results, which are accepted with interest from the scientific community. Essentially, I have no critical notes on the materials presented. The wide range of tasks on which the candidate has worked is impressive. That's nice, but it also leads to some thematic diversity. Maybe it's time for Tsvetan to consider focusing on a particular class of tasks and research with a slightly more distant goals.

7. Personal impressions

I know Ts. Vetsov since many years. I have not worked directly with him, but I can say that he is one of the most active young scientists in the Department of Theoretical Physics, with proven qualities to engage in research. He has shown that he can work in a collective and is well integrated in the group of Prof. Dr.Sc. Rashkov and as well as in the group of Prof. Dr.Sc. Yizadzhiev. I know from his students that he is an excellent teacher who explains the material clearly and with a deep understanding. In the Faculty he is considered as one of the best young lecturers. I see a wonderful prospects for him to develop - both as a scientist and as a lecturer.

8. Conclusion on the application

Having become acquainted with the materials and scientific works presented in the competition and on the basis of the analysis of their significance and the scientific contributions contained therein, I confirm that the scientific achievements not only meet but also go beyond the requirements of the IARB, its Implementing Regulations and the relevant Regulations of the Sofia University "St. Kliment Ohridski". In particular, the candidate meets the minimal national requirements in the professional field and plagiarism has not been established in the scientific papers presented in the competition.

I give my **positive** assessment of the candidacy.

II. GENERAL CONCLUSION

On the basis of the above, I recommend to the scientific jury to propose to the Faculty Council of the Faculty of Physics to appoint Dr. Tsvetan Vetsov at the academic position "Associate Professor" in professional field 4.1 Physical sciences, (Theory of strings and high energy physics).

20.11. 2021.



/Prof. Dr.Sc. Leandar Litov/