

# REPORT

by Prof. D.Sci. Angela Slavova Popivanova

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for the academic position of Associate Professor in Professional field 4.1 Physical Sciences,

Scientific subject: Gravity, Relativity theory

In the competition for Associate Professor announced in Government Journal vol. 65 from 16.08.2019 and on the web site of Sofia University “St. Kliment Ohridski” for the needs of Department of Theoretical Physics the only candidate is principal Assist. Prof. Dr. Petia Georgieva Nedkova.

## 1. Short biography

Principal Assist. Prof. Dr. Petia Nedkova graduated language school “Geo Milev” in Dobrich in 2000. In the period 2000-2003 she studied subject Scandinavian Philology in Sofia University and subject Scandinavian languages and culture in Aarhus University, Denmark. In 2007 she graduated bachelor in Physics at Physical Faculty of Sofia University and in 2008 she graduated masters in Theoretical and Mathematical Physics in the same faculty. In 2012 she defended Ph.D. thesis entitled “Exact solutions of the Einstein- Maxwell equations describing black holes in space-time with additional dimension and its thermodynamics” with advisor Prof. D.Sci. Stoycho Yazadzhiev.

Dr. Nedkova was Post Doc at University of Oldenburg, Germany in the period 2012-2103. From 2013 she is Assistant Prof. at the department of Theoretical Physics, Physical Faculty, Sofia University, and from 2014 she became Principal Assistant Prof. in the same department. She was visiting for short time University of Oldenburg and Tubingen, Germany. She was given talks at different scientific conferences in Bulgaria and abroad and she was organized three international schools and conferences in Bulgaria.

Pedagogical work of Dr. Nedkova includes lectures in Mathematics I, Mathematical methods in physics – differential equations, Theoretical astrophysics, Partial differential equations, Mathematical methods in physics II, Introduction in physics of black holes and Partial differential equations (in English) at Physical Faculty, Sofia University. She was teaching seminars on Mathematics I, Mathematical methods in physics – differential equations, Partial differential equations, Mathematical methods in physics II, Theoretical mechanics, Partial differential

equations (in English) at the same faculty. She was adviser of one diploma thesis at Sofia University and one diploma thesis at University of Oldenburg, Germany.

Dr. Nedkova was head of two projects – one at Sofia University and one at FNI. She was participants in 12 other projects, 2 of which was under theCOST action.

In 2006 she received the award on the name of Dr. Michael Klett for high student achievements.

## **2. General description of the presented materials.**

The participant Dr. Petia Nedkova presented the following materials in the competition:

- Monographs - 1;
- Publications - 20.

**The publications can be classified as follows:**

**According to the type:**

- Publications in scientific journals - 15;
- Reports at the conferences - 5.

**According to the rating:**

- Publications with IF - 15 Q1 rating;
- Publications with SJR - 3;
- Publications in conference proceedings- 2.

**According to the co-authors:**

- One co-author - 6;
- Two coauthors – 8;
- Three and more coauthors – 6.

The impact factor of the presented publications is 70.

## **3. Citations of the candidate's publications**

- Citations – 158;
- H-index - 6.

The publications, impact factor and the rating Q1 of them are much more that the scientific criteria according to the Statutes for the conditions and regulations for acquiring academic degrees and occupying academic posts in the Physical Faculty at Sofia University and LADASRB. I accept the monography, papers and reports for this report.

## **4. Characteristics of the activities of the candidate.**

### **4.1. Pedagogical activities**

According to the pedagogical activities tables shown in the application documents of Assist. Dr. Petia Nedkova it is obvious that during the last 6 years she has 7 times more lectures and seminars than the full norm at Sofia University. She has been advisor of the diploma thesis of 1

person who defended at Sofia University in 2015 and 1 person defended at University of Oldenburg, Germany in 2013 together with prof. Jutta Kunz.

### **3.2. Scientific and scientific applied activities.**

Principal Assist. Prof. Dr. Petia Nedkova has one monography (C1): P. Nedkova, S. Yazadjiev, "Mathematical aspects of static and stationary higher dimensional spacetimes", in press at the Academic Publishing House "St. Kliment Ohridski" (certificates from the publishing house and for the author contribution are presented). In the monography systematic analysis of the exact solutions describing stationary and axial-symmetric compact objects with horizon of the events in space-time with additional dimension is presented.

Scientific contributions of the papers of Dr. Nedkova can be classified in the following tracks:

-Obtaining of new solutions of the generalized gravity field equations in space-time - papers A.7, A.11, A.12, A.13, A.15, A.16, B.5, B.6, B.7. In these papers new exact solutions of the Einstein-Maxwell equations in 5-dimensional space-time are obtained, which describe compact objects with horizon of the events.

-Obtaining and investigation of exact solutions of gravity field equations describing black holes which interact with astrophysical motivated medium – papers A.6, A.8, A.9, B.1, B.4. In these papers a class of exact solutions of the Einstein equations is investigated which describes quasi-stationary systems of black holes and gravity substance. They are known as degenerate black holes.

-Classification of the solutions describing space-time tunnels in the frames of Einstein-Maxwell dilaton gravity- papers A.5, B.3. In this publications the theorem for the uniqueness of the static solutions describing passing tunnels in space-time of the Einstein-Maxwell dilaton gravity is formulated and proved for the first time in the case when there are phantom scalar and/or electromagnetic fields.

-Investigation of scalar black holes in the generalized scalar-tensor theories of gravity – paper A.2. In it numerical solutions describing scalar charged black holes of the scalar-tensor Gauss-Bonnet gravity are obtained in the case of different coupling functions between Gauss-Bonnet invariant and scalar field.

- Investigation of the thermodynamic properties of the compact objects – black holes, gravity instantons – papers A.7, A.12, A.13, A.14, A.16, A.17, B.5. In these papers thermodynamics of such configurations of compact objects having horizon of the events and gravity instantons is investigated. Different cases of Einstein-Maxwell dilaton gravity in space time with additional dimension are considered and formula of Smarr are obtained as well as the first principle of thermodynamics. These investigations are generalized for configurations of magnetic black holes and Taub-NUT instantons.

- Studying of the shadows of compact objects, as black holes, space-time tunnels, etc. – papers A.3, A.4, A.10, B.2. In these publications the images of the shadows of different compact objects are obtained and they are analyzed. Moreover, for the first time shadows of rotating space-time tunnels are investigated. It is shown that the space-time tunnels lead to the formation of the shadow and the obtained images are equal to the Kerr's black hole.

#### 4. Critical notes

I don't have essential critical notes. I only want to recommend in her future investigations to publish papers only be herself.

**Conclusion: Based on the above report I positively recommend principal Assist. Prof. Dr. Petia Georgieva Nedkova to be elected for Associate Professor in Professional field 4.1 Physical Sciences, Scientific subject: Gravity, Relativity theory for the needs of the Department of Theoretical Physics at Physical Faculty of Sofia University "St. Kliment Ohridski".**

25.11.2019 г.  
Sofia

Signature:

(Prof. D.Sci. Angela Slavova Popivanova)