INSTITUTE OF ROBOTICS – BULGARIAN ACADEMY OF SCIENCES
Section "Sensors and Measurement Technologies in Robotics and Mechatronics"
STATEMENT

for the competition for the academic position of "Associate Professor"
in professional field 5.2 "Electrical Engineering, Electronics, and Automation"
(Additive and Inhomogeneous Structures in Sensor Technology)
announced in State Gazette, issue no. 64/30.07.2024
with candidate: Dr. Eng. Martin Lachezarov Ralchev
Member of the scientific jury: Prof. Dr. Eng. Georgi Mitkov Pavlov

1. Short biographical data of the candidate

The candidate for the competition, Dr. Eng. Martin Lachezarov Ralchev, completed his higher education at the Technical University of Sofia with a Bachelor's degree in 2018 and a Master's degree in 2020, specializing in "Electrical Power Engineering and Electrical Equipment." Since 2024, he holds a Ph.D. in the scientific specialty "Elements and Devices of Automation and Computing Technology." In 2016 and 2017, he completed two training programs at SIEMENS - Bulgaria and the Institute of System Engineering and Robotics – BAS, from which he received certificates for acquired skills, implementing experience and innovations, attached to the documents. Since 2023, he holds design qualifications in the field of "Electrical Supply and Electrical Equipment."

From the attached documents, it is evident that from 2016 to the present, he has been working at the Institute of Robotics at BAS, actively developing research activities in the fields of sensor technology and mechatronics, with applications in various areas of engineering and medicine. From 2020 to 2023, he held the position of "Multisensor Device Specialist", and from 2020 to 2024, he also served as an Assistant at the Institute of Robotics. Since 2024, he has held the position of "Engineer, Electrical Machines and Apparatus". His main engineering and research activities focus on the development and improvement of sensor devices and the applicability of specialized equipment. He has been awarded first place and prizes in national competitions in 2021 and 2023, organized by several foundations and BAS, with the certificates received attached to the documents for the associate professor competition. His developments are in the fields of 3D printing of polymer composite materials for electrical and magnetic applications, development of a system for nanoparticle analysis, and more.

The candidate has participated in three research projects with significant European funding through BAS, with topics relevant to the competition field. He has a very good command of English and excellent computer skills, utilizing specialized software products.

2. Research and applied scientific activity of the candidate

The 33 scientific works presented in the competition for "Associate Professor" can be classified as follows:

- Scientific publications (10 in total) published in journals that are peer-reviewed and indexed in globally recognized scientific information databases (Scopus, Web of Science), equivalent to a monograph (MT) on the topic: "Additive Sensor Systems with Applications in Electrical Engineering," under indicator B4;
- Scientific publications (16 in total) published in journals that are peer-reviewed and indexed in globally recognized scientific information databases (Scopus, Web of Science), under indicator G7;
- Scientific publications (7 in total) in non-refereed journals with scientific peer review or published in edited collective volumes, under indicator G8.

Several of the publications were presented at international scientific conferences under the aegis of IEEE and are indexed in Scopus. Six of the publications are indexed in Scopus and Web of Science, and one publication is in Q4, with an SJR of 0.147. All publications are in English and are collaborative, with the candidate being the first author in 9 of them, the second author in 18, and the third author in the remaining ones.

A total of 28 citations have been submitted for participation in the competition for associate professor. All citations are in journals that are peer-reviewed and indexed in globally recognized databases (Scopus).

The research work of Dr. Martin Ralchev is also represented by 4 recognized inventions with patents and 4 filed patent applications (indicator E). This indicator is not mandatory according to the minimum national requirements for the academic position of "Associate Professor," but it should be duly acknowledged. The presented materials and contributions demonstrate a rich practical and developmental activity, as well as a high level of implementation of the research results.

The result obtained from the data processing of the candidate's submitted works for Associate Professor, in relation to meeting the minimum national requirements of the Development of Academic Staff Act (ZRASRB) and the Regulations for its application, is presented in Table 1.

Table 1

Group of Indicators	**Required Minimum Number of Points**	**Number of Points of the Candidate**	**Number of Points for the Individual Indicators from the Corresponding Group**
А	50	50	**50 p.** (Indicator А1)
В	100	165	**165 p.** (Indicator В4)
Г	200	262,8	**262,8 p.:** 206,2 p. (Indicator Г7) 56,6 p. (Indicator Г8)
Д	50	280	**280 p.:** 280 p. (Indicator Д12)
	400	**757,8**	

It is evident that the points accumulated by the candidate (757.8 points) exceed nearly three times the required minimum number of points (400) for this academic position. In this regard, the candidate meets the requirements of the Development of Academic Staff Act (ZRASRB) and the Regulations for its application.

From what has been written so far, my conclusion is that the overall research and applied scientific activity of Dr. Eng. Ralchev is current, sufficient in volume, and of a high scientific level. It is entirely within the scope of the competition and has been sufficiently publicized both nationally and internationally.

3. Scientific and applied scientific contributions

In the monograph (MT) submitted for the competition, which includes 10 publications, analytical and experimental studies of various objects have been conducted with the aim of increasing their efficiency and reliability in operation. An additive method for filtering the harmonic spectrum has been developed and improved for more precise signal analysis, which enhances the accuracy and reliability of sensor systems. A new technology for rapid prototyping of rotary flux-modulation systems has been proposed. A system for real-time remote monitoring of transformer operation modes has been designed, constructed, and tested using additive acoustic sensors. An additive silicon sensor (multisensor) has been created and studied, measuring the three components of the magnetic field (X, Y, and Z) simultaneously and independently, improving the accuracy of examining complex magnetic fields. Innovative Hall

methods for measuring the mobility of charge carriers in semiconductor wafers have been designed, constructed, and verified, providing opportunities for the study and analysis of semiconductor materials used in technology.

In all other developments, the main goal of the research is to explore opportunities for optimizing specific parameters and characteristics to improve the efficiency of the operating modes of the studied objects. Simulation models in environments such as AUTOCAD, MATLAB, LABVIEW, DIALUX 4.13, and others, as well as appropriate mathematical models, have been used, which has improved the quality of the achieved results. Real experimental studies have been conducted to verify the results. The candidate's contributions are distinctly scientific-applied and practical.

I agree with the contributions formulated by the author regarding the works submitted for the competition. Most of the presented developments can be categorized according to the following general criteria for contributions: Formulating (justifying) new solutions to an existing problem; Creating new classifications, methods, constructions, technologies; Obtaining confirmatory facts.

The conducted research and the obtained results, in my opinion, represent an original contribution to science and practice. The publications, their authorship, and the forums where they were presented indicate that the stated contributions are the personal work of the candidate or achieved with his decisive involvement.

4. Significance of the contributions to science and technology

I assess the significance of the contributions as high, due to the fact that the scientific developments are in a promising area of technology, related to the development of new methods for measuring and analyzing various processes in electronics and electrical engineering, the improvement of sensor systems and devices, and the implementation of new technologies for monitoring and controlling different electrical parameters. A large percentage of the scientific and experimental developments have found practical application. The candidate is a recognized scientist both in Bulgaria and abroad.

5. Critical remarks and recommendations

The exceptionally high quality and meticulous formatting of the materials submitted for the competition are noteworthy. In relation to them, I have the following recommendations:

- To deepen his research activities in this promising area of technology and work even more actively toward the implementation of its results;
- To structure and consolidate the content of the publications into a book, so that it can be used in research activities by professionals in practice, as well as for the training of PhD students and students.

7. Conclusion

From the analysis of the submitted materials, it is clear that Dr. Eng. Martin Lachezarov Ralchev meets all the conditions and requirements of the Development of Academic Staff Act (ZRASRB) and the regulations for its application.

My conclusion is that Dr. Eng. Martin Lachezarov Ralchev is eligible to hold the academic position of "Associate Professor" in professional field 5.2 "Electrical Engineering, Electronics, and Automation" (Additive and Inhomogeneous Structures in Sensor Technology).

14. 10. 2024
Sofia

Statement prepared by.
/Prof. Dr. Eng. G. Pavlov/