MINISTRY OF DEFENCE

Bulgarian Defence Institute „Professor Tsetan Lazarov"

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REVIEW

by assoc. prof. PhD Sevdalin Ivanov Spassov,
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of scientific papers in a competition announced in issue 29 of 04.04.2025 of the "State Gazette" and in accordance with item IV. of the Decree of the Minister of Defence № OX-293/25.03.2025, for the appointment of an academic position of "associate professor" in the field of higher education "Technical Sciences", professional direction 5.3. "Communication and computer equipment", scientific specialty "Radio transmitting and receiving equipment" in the department "Communication networks and systems" of the Institute of Defense "Prof. Tsvetan Lazarov",

with candidate:
Colonel PhD Ivan Penchev Ivanov
Director of the Directorate "Development of C4I Systems"
at the Institute of Defense "Prof. Tsvetan Lazarov"

1. **Which works submitted by the candidate are accepted for evaluation by the reviewer?**

The materials submitted by the candidate for the competition consist of: a list of scientific works and developments, copies of the scientific works for participation in the competition, a creative biography, an author's reference for scientific contributions, a list of citations, a list of scientific activity by groups of indicators and a self-assessment for fulfilling the minimum national requirements for the academic position of "associate professor".

The candidate has demonstrated scientific production, which includes 39 articles and reports, a monograph and a dissertation for the ONS "doctor". One monograph and 24 articles/reports have been proposed for review, which the reviewer accepts for review. Five of the publications are written in English, and the rest are in Bulgarian. The candidate is the sole author in ten of the submitted scientific works, and in four of them he is in first place. The works submitted for review have not participated in the procedure for acquiring the educational and scientific degree "doctor". The candidate's scientific and applied contributions such as participation in two international projects (II.3.1 and II.3.2) and in working groups for developing a vision and doctrine for the CIS of the Armed Forces of the Republic of Bulgaria (III.1 and III.2) are accepted for information by the reviewer, but are not reviewed due to the lack of accurate data on the candidate's participation.

The candidate meets the scientometric indicators for the scientific position of "associate professor" by having a total of 703 points, with a required minimum of 400 points, according to the Regulations and Procedure for Holding Academic Positions at the Defense Institute. The analysis of the documents and scientific works proposed for review allows us to conclude that the legal and procedural requirements of the Law on the Armed Forces of the Republic of Bulgaria, its Regulations and the Regulations and Procedure for Holding Academic Positions at the Defense Institute have been met.

2. General characteristics of the candidate's research, applied science and pedagogical activities

The scientific research activity of Col. Dr. Ivan P. Ivanov is in the professional field and scientific specialty in which the competition is held. His scientific and applied research and results are mainly in the areas of: architectures and prototypes in the improvement of communication and information systems, architectures and modeling of software-defined cognitive radio stations, as well as perspectives and architectures of software-defined active and passive radar systems.

It is characteristic of his scientific production that it covers problems related to the analysis and synthesis of multifunctional radio engineering systems, applying software-defined radio in the areas of communications, radar and electronic warfare. One of the main publications in these areas is the monograph (II.1.1) and articles and reports on the essence of a software-defined radio station (SDR) and a cognitive radio station, enriching the ideas about their essence and content (II.1.1 and II.2.2). The improved architectures for the implementation of SDR, using cognitive machines [II.2.2] and cloud technologies [II.2.11, II.2.17, II.2.19], as well as a managed communication environment [II.2.21] stand out. A significant part of his scientific output is related to the development of methods, algorithms, as well as practical applications of software-defined and cognitive radio platforms. The candidate's ability to analyze problems and solve specific scientific and scientific-applied tasks in the field of communication and information technologies for military purposes is evident.

The candidate has participated in the development of several basic communication systems for the Bulgarian Army, which have been adopted and put into operation. In addition, he has over 25 years of experience as a researcher in research organizations such as the Military Scientific and Technical Institute, the Military Academy "G. S. Rakovski" and the Defense Institute "Prof. Tsvetan Lazarov". He has developed a series of various scientific and applied documents such as numerous tactical and technical assignments and technical and economic reports, test programs, test methodologies, and has been a member of teams that

have developed a doctrine, a vision and a manual for the needs of the Ministry of Defense and the Armed Forces. From everything said so far, it is clear that the candidate can be defined as a researcher and implementer who combines the aforementioned qualities with those of an organizer in science.

The presented reference shows that Col. Dr. Ivan Penchev Ivanov has participated in two international and one national scientific projects, as well as in a number of departmental technical projects for the construction of radio communication networks and control systems. The general characteristics of the candidate show that he is a scientist, researcher and developer of communication and other radio engineering systems, who also possesses the qualities of an expert and a manager.

From the analysis of the quality of the presented works, their citations, from the developed numerous application documents such as TTZ, TID, programs and methodologies for testing military products and communication and information systems and from his participation in projects, it follows that the candidate is a successful scientist and researcher in the professional field 5.3. "Communication and computer technology", scientific specialty "Radio transmitting and receiving technology".

3. Assessment of the candidate's special training and activities

Col. Dr. Ivan Penchev Ivanov has worked for over 30 years in scientific, development and expert units at the Ministry of Defense. He graduated from the V. Levski Military University in 1993 with a military specialty in "Signal Troops – Radio and Radio Relay Communication Equipment". He has worked in the military and military-scientific field as part of various military formations and scientific institutes, as well as specialized units for the development of communication systems and technologies for the needs of defense. He has held positions as a research associate at the Military Scientific and Technical Institute, assistant head of a department in the Office of the General Designer of the KAS, head of the "Communication Networks and Systems" department at the Defense Institute,

director of the "C4I Systems Development" directorate.

In 2004. acquired the educational and scientific degree "Doctor" in the scientific specialty 02.07.04 "Radio transmitting and receiving equipment" after defending a dissertation on the topic: "Research of a radio communication system for high-speed data transmission in mobile networks for military purposes".

In the period 2012-2023, Colonel Dr. Ivan Ivanov was a national representative in the "System Concepts and Integration" panel of the NATO Science & Technology Organisation (STO). His participation in the European scientific project Covert and Advanced multi-modal Sensor Systems for tArget acquisiTion and reconnaissance (CASSATA) and in the project under the national scientific programme "Security and Defence" is directly related to his scientific expertise in the fields of radiocommunication and multifunctional radiotechnical systems based on software-defined radio platforms. Dr. Ivan Ivanov is the author of the monograph "Software-Defined Radiocommunication Systems", which covers the analysis, design and construction of radiocommunication networks and systems based on the concept of software-defined radio (SDR). Based on the analysis, the architecture of such systems has been defined and subsequently, through modeling and simulation, the main blocks of a radio communication system implemented as a software-defined radio station have been studied. In the GNU radio environment, a computer model of a radio communication system for data exchange has been synthesized. Practical implementations of radio communication systems based on software-defined radio have also been created, which implement some of the main protocols for information exchange.

4. Main scientific results and contributions

The scope of the scientific results and contributions of the candidate in the competition includes scientific areas such as communication and information methods, tools and technologies, as well as radio engineering systems using software-defined radio platforms. These scientific results and contributions are with an emphasis on their application in the fields of military communications, radar,

radio navigation and electronic warfare.

The main contributions of Col. Dr. Ivan Ivanov can be classified into the following areas:

✓ Architecture, modeling and design of software-defined, cognitive radio stations and radio engineering systems. The main contributions consist in the proposals for improved architectures for the implementation of SDR, using cognitive machines [II.2.2], cloud technologies [II.2.11, II.2.17, II.2.19] and multiphase filtration/synthesis [II.2.18]. In the monograph [II.1.1], each of the blocks is described, modeled and simulated independently using the SDR concept based on a functional diagram of a radio communication system. A model of a software-defined radio communication system with QPSK modulation is synthesized in the GNU Radio software environment. Through several implementations of basic communication protocols using SDR, the advantages of the technology for easy transition from model to prototype have been practically established.

✓ Perspectives, architectures and prototypes in improving communication and information systems and technologies. Prospective technologies for communication and information systems and their practical application in security and defense are analyzed [II.2.3, II.2.6, II.2.8]. Hybrid architectural solutions of cloud technologies applicable for military purposes are proposed [II.2.10, II.2.12, II.2.14]. Some of the prospective technologies for communication and information systems and their practical application in the spheres of security and defense are demonstrated [II.2.3, II.2.6, II.2.8].

✓ Perspectives, architectures and improvement of software-defined active and passive radar systems. Prospective technologies for building radar systems are analyzed [II.2.15]. The place and function of software-defined radio platforms in the development of prospective radars are shown [II.2.9]. Passive single-band and dual-band radar architectures using DVB-T and LTE signals are proposed. The monitoring and security capabilities of the dual-band architecture are investigated using the USRP software-defined platform [II.2.16 and II.2.20].

5. Assessment of the significance of contributions to science and practice

The main results and achievements of the candidate in the competition fall into the field of scientific and applied scientific contributions and can be classified into the following groups:

✓ Enrichment of existing knowledge, creation of new classifications, methods and constructions, including the following:

– the description, modeling and simulation of each of the blocks of a radio communication system using the SDR concept in the monograph [II.1.1]. There, a model of a software-defined radio communication system with QPSK modulation in the GNU Radio software environment is also synthesized;

– the proposals for improved architectures for the implementation of SDR, using cognitive machines [II.2.2], cloud technologies [II.2.11, II.2.17, II.2.19] and multiphase filtration/synthesis [II.2.18].

✓ Application of scientific achievements in practice, realized effect and obtaining confirming facts, including:

– the analysis of promising technologies for communication and information systems and their practical application in security and defense [II.2.3, II.2.6, II.2.8];

– the determined monitoring and security capabilities of the dual-band architecture using the software-defined platform USRP [II.2.16 and II.2.20];

– the results obtained from the analysis and use of technological solutions for building the military departmental cellular system according to the TETRA standard;

– the analysis of promising technologies for building radar systems [II.2.15], plus determining the place and function of software-defined radio platforms in the development of promising radars [II.2.9];

Dr. Ivan Penchev Ivanov has made significant contributions to the development of solutions in the field of radio communication systems for supporting the command and control process and the exchange of information in weapons

control systems. With his developments and participation in working groups and councils, the candidate has contributed to the direct support of the processes of modernizing the communication and information environment for work at the Bulgarian Armed Forces.

6. Assessment of the extent to which the contributions are the work of the candidate

A monograph and 24 publications have been proposed for review, of which twelve are independent for the author, and the rest are co-authored. The co-authored publications submitted show the candidate's own scientific style, which is why I assume that he has a participation equal to the other authors in them.

From the analysis of the candidate's special training and activity, the achieved main scientific results and contributions and after their assessment of significance for science and practice, it undoubtedly follows that the candidate has the main merit in achieving them.

I am not aware of any plagiarism in the submitted scientific works. The analysis of the style and scientific level of the publications shows the undoubted authorship of Col. Dr. Ivan Penchev Ivanov.

7. Critical notes on peer-reviewed works

I could recommend the candidate to interact more actively with more researchers in his or her own and related scientific fields and publish his or her works in more scientific journals. The above recommendation does not affect the candidate's achieved scientific and applied scientific contributions.

I have no critical comments on the scientific works submitted to me for review.

8. Personal impressions and other issues on which the reviewer believes he should take a position

I have known Dr. Ivan P. Ivanov for more than 25 years as an excellent

professional, a serious and responsive colleague. The impressions I have of his work as a researcher and expert give me reason to assert that the candidate possesses the necessary special training and competencies of a scientist in the field of communication and information technologies. My observations of his recent works show that he continues to develop successful research and development activities in the promising areas of radio communication and multifunctional radio systems based on software-defined radio platforms.

9. Conclusion

Through the materials submitted for the competition, the candidate demonstrates excellent preparation, knowledge of scientific tools and skills for conducting in-depth scientific research. The candidate's monographic work and publications demonstrate the relevance and significance of the issues being developed.

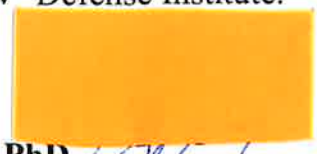
After taking into account the main scientific results and contributions achieved and their assessment of significance for science and practice, I believe that the candidate Dr. Ivan Penchev Ivanov fully meets the requirements for holding the academic position of "associate professor".

10. Candidate evaluation

The materials submitted for participation in the competition meet the requirements of the Act on the Development of Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the Regulations on the terms and procedure for acquiring scientific degrees at the "Professor Tsvetan Lazarov" Defense Institute.

The consideration of the achieved main scientific results and contributions and their assessment of significance for science and practice give me reason to recommend to the scientific jury to propose to the scientific council of the Institute to award the scientific position of "associate professor" to PhD Ivan Penchev Ivanov in the field of higher education "Technical Sciences", professional direction 5.3. "Communication and computer technology", scientific specialty "Radio transmitting

and receiving equipment" in the department "Communication networks and systems" of the "Professor Tsvetan Lazarov" Defense Institute.



Assoc. prof. PhD **Sevdalin Spassov**

19 of June 2025