МИНИСТЕРСТВО НА ОТБРАНАТА
ИНСТИТУТ ПО ОТБРАНА „ПРОФЕСОР ЦВЕТАН ЛАЗАРОВ”
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OPINION

by Associate Professor Dr. **Alexander Asenov Kolev**,
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on a competition for the academic position of "**associate professor**" for a military serviceman in the field of higher education "Technical Sciences", professional field 5.3. "Communication and Computer Engineering", scientific specialty "Radio Transmission and Radio Reception Equipment", announced in the "State Gazette", no. 29 of 04.04.2025 and in accordance with Order No. 320/02.06.2025 of the Director of the Defense Institute

with the candidate:
Colonel Doctor Eng. **Ivan Penchev Ivanov**,
Director of the Directorate "Development of C4I Systems"
at the "Professor Tsvetan Lazarov" Defense Institute

1. General characteristics of the candidate's scientific-research, scientific-applied and pedagogical activities

In the current competition for the academic position of "associate professor" for a military serviceman, announced in the State Gazette, ", issue 29 of 04.04.2025 and in accordance with Order No. 320/02.06.2025 of the Director of the Defense Institute, Col. Dr. Eng. Ivan Penchev Ivanov participated as the only candidate.

Col. Dr. Eng. Ivan Ivanov has submitted an author's report with a total volume of 40 scientific works in the specialty (articles, scientific reports and monograph) in national and international publications. In the total volume of scientific works in Bulgarian there are 34 pcs., in English there are 6 pcs., of which 16 are independent. 25 scientific works have been submitted for review by the scientific jury under this competition, of which one is an independent monograph with a volume of 214 pages. The scientific works submitted for review have been presented and published in the period from 2008 to 2025, according to the annex "List of scientific works and developments". The distribution of the titles submitted for review is: 3 in English, 22 in Bulgarian.

The presented works, as scientific achievements in practice and enrichment of existing knowledge, are mainly related to research in the field of communication and information technologies for the needs of defense, with a focus on the design and construction of radio communication systems for maintaining the command and control process and the exchange of information in weapons control systems.

In the works of recent years, the candidate's research activity is aimed at multifunctional radio engineering systems, based on software-defined radio platforms, with the possibility of use for communication, radar, navigation and electronic warfare. The results obtained support the processes of modernization of the communication and information environment for work in the Bulgarian Army.

Col. Dr. Eng. Ivan Ivanov is a researcher and implementer in the professional field of the announced competition. He participated in working groups of the international projects Innovative & Integrated Security System on Board Covering the Life Cycle of a Passenger Ships Voyage (ISOLA), EU Horizon 2020 Project, grant agreement № 883302 and Covert and Advanced multi-modal Sensor Systems for tArget acquisiTion and reconnaissance (CASSATA), EDF Project, Grant Agreement - GAP-101121447 and in the National Scientific Program "Security and Defense".

The scientific and applied activity of the candidate includes over 20 developments (communication systems, information subsystems, methodologies and programs, etc.), most of which have been implemented for the needs of defense. A large part of the published theoretical research has been implemented in the mentioned developments.

2. Evaluation of the candidate's special training and activity

Col. Dr. Eng. Ivan Ivanov holds a master's degree, acquired at the Military Academy "G. S. Rakovski" - Sofia, specialty "Organization and Management of CIS in OTF" in 2007. The candidate acquired the educational and scientific degree "Doctor" after successful doctoral studies and defense of a doctoral dissertation in 2004 in the professional field 5.3 "Communication and Computer Engineering, scientific specialty "Radio Transmitting and Receiving Equipment". Throughout the entire period of scientific development, he has worked in his scientific field. According to the attached documents, the candidate's scientific and practical achievements are traceable after 2000.

He has completed educational and qualification courses in the country and abroad, including: a course on "Server Settings and Administration 2003" in 2005, a course on "Information Operations at the National Level with the Participation of the Armed Forces and C4I Architecture", a course on "Communication and Information Systems" - USA, with a certificate for outstanding academic achievements, a strategic course, an officer for the

strategic and operational units for the management of the Armed Forces. He holds a certificate of English proficiency (STANAG 6001) level 3-3-3-3.

The scientific research and experimental design activity of Col. Dr. Eng. Ivan Ivanov is entirely focused on the development of communication systems and technologies for the needs of defense. He has provided scientific support in the management of the life cycle of products and systems - radio relay station "Hemus", data transmission equipment for ASUOADN "Vulkan-S", data transmission equipment for ASU "Obkhvat", radio station for aviation "Brushlyan", chemical situation information exchange system "Kamchia", etc. Participant in program teams for the implementation of projects for the modernization of the Air Force - "PIKIS of the 61st Marine Corps", "Automated network for communication with mobile objects according to the TETRA standard", "Field hardware KSA and TA", etc. In the period 2012 - 2023 he is a national representative in the panel "System Concepts and Integration" of the NATO Science and Technology Organization.

The candidate has successively held the positions of 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.

I believe that Col. Dr. Eng. Ivan Ivanov possesses the necessary professional, research, implementation, popularization and personal qualities that are necessary to occupy the academic position of "associate professor" under the announced competition.

3. Main scientific results and contributions

I accept the claim for the contributions proposed by Col. Dr. Eng. Ivan Ivanov as their essence and application according to the submitted documents.

The grouping of the candidate's scientific and applied research and declared results is within the scope of:

- Architectures, models, design and prototyping of software-defined, cognitive radio stations and radio engineering systems;
- Perspectives, architectures, prototypes in improving communication and information systems and technologies;
- Perspectives, architectures and improvement of software-defined active and passive radar systems.

1) Architectures, models, design and prototyping of software-defined, cognitive radio stations and radio engineering systems

The paradigms for software-defined radio stations (SDR) and cognitive radio stations have been analyzed and the concepts of their essence and content have been enriched [II.1.1, II.2.2]. Improved architectures for their implementation have been proposed, using cognitive machines [II.2.2], cloud technologies [II.2.11, II.2.17, II.2.19], polyphase filtration/synthesis [II.2.18] and a controllable communication environment [II.2.21]. The creation of a multifunctional radio engineering system for communication and electronic warfare based on SDR has been proposed and experimented with [II.2.23].

The proposed improved architectures have been tested through modeling, design and prototyping [II.1.1, II.2.4, II.2.18, II.2.21, II.2.23, II.2.31]. The practical results of their use to provide new functionalities in communication and information systems have been reported [II.2.2, II.2.4, II.2.23]. Experimental data on the quality of the radio channel, expressed in terms of bit error rate (BER), have been obtained and compared with the theoretical ones [II.2.31].

In the monograph [II.1.1], based on a functional block diagram of a radio communication system, each of the blocks was initially described, modeled and simulated independently using the SDR concept. A complete model of a software-defined radio communication system with QPSK modulation was synthesized in the GNU Radio environment. Computer simulation allows dynamically, in the process of work, to introduce changes in the characteristics

of the radio channel, deviations in the main parameters of the receiver, etc. and to observe their influence on the behavior of the system. Through numerous implementations of basic communication protocols using SDR, the advantages of the technology in a quick transition from model to prototype have been practically established.

2) Perspectives, architectures, prototypes in improving communication and information systems and technologies

An analysis of promising technologies for communication and information systems and their practical application for security and defense purposes has been made [II.2.3, II.2.6, II.2.8]. Hybrid architectural solutions of cloud technologies applicable for military purposes have been proposed [II.2.10, II.2.12, II.2.14]. Results from the specific use of modern military technological solutions for building a departmental cellular system according to the TETRA standard have been presented and a proposal for future development has been made [II.2.1].

Based on the analysis performed, specific private proposals for improving security and defense systems have been synthesized. The use of "augmented reality" technology in building an information environment for visualization of cellular network coverage has been proposed and prototyped [II.2.5]. An information and digital model of data structures with a role for objective control has been proposed, as well as an algorithm for generating an information frame from data when registering flight information of aircraft [II.2.13]. An analysis of current cyber risks at sea has been developed [II.2.15], with a specific focus on cruise ships. Several data synthesis algorithms have been described and discussed, and further needs for more secure cyber environments have been discussed.

3) Prospects, architectures and improvement of software-defined active and passive radar systems

An analysis of promising technologies for building radar systems has been

made [II.2.15]. The role of software-defined radio platforms in the development of future promising radars has been revealed [II.2.9]. Architectures of passive single-band and dual-band radars using DVB-T and LTE signals have been proposed. Key radar indicators for a specific application in the area of interest have been assessed. The possibilities for monitoring and security of the dual-band architecture using the software-defined USRP platform have been studied [II.2.16, II.2.20].

Out of a total of 25 scientific papers submitted to the scientific jury for review, of which one was a monograph, the candidate is the sole author of 11 of them, and in 3 of the publications in co-authorship he is in first place. Thus, his personal contribution has been confirmed.

I am not aware of any reports of plagiarism in the works of the candidate in the competition.

4. Evaluation of the significance of the contributions for science and practice

Col. Dr. Eng. Ivan Ivanov demonstrated his high scientific training, knowledge, skills and scientific achievements in 2 scientific projects with international participation, 1 national scientific program, as well as in 8 technical projects and developments for the benefit of the Bulgarian Army. The candidate has presented a list of 38 citations, of which 12 are in scientific publications, referenced and indexed in world-renowned databases and 26 are in collective volumes with scientific review. The citations faithfully reflect the results traceable in the works submitted for review.

5. Critical notes on peer-reviewed works

A careful review of the scientific papers submitted by the candidate for review shows a very good level of content and layout. I cannot make any significant critical remarks.

The author should seek more opportunities for publication with inclusion in recognized international databases of scientific production.

6. Conclusion

The works submitted for review cover the minimum scientometric indicators specified in the Regulations for the Implementation of the Law on the Development of Academic Staff in the Republic of Bulgaria for the professional field 5.3. "Communication and Computer Engineering".

Everything presented so far allows me to give a positive assessment of the materials for participation in the competition. The attached materials and documentation fully comply with the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the Regulations for the terms and conditions for holding academic positions at the Institute of Defense "Professor Tsvetan Lazarov".

7. Evaluation of candidates

Having carefully analyzed the presented scientific production in terms of the significance and content of scientific and applied contributions, I give a **positive** assessment of the scientific activity of the only candidate in the competition, **Col. Dr. Eng. Ivan Penchev Ivanov**.

I recommend to the esteemed members of the present scientific jury to vote for the award of the academic position of "**Associate Professor**" in the field of higher education 5 "Technical Sciences", professional direction 5.3 "Communication and Computer Engineering", scientific specialty "Radio Transmission and Radio Reception Equipment", to **Col. Dr. Eng. Ivan Penchev Ivanov**.

Date: 18.06.2025 г. Jury member:

/Assoc. Prof. Dr. Alexander Kolev /