

R E V I E W

**Authored by Prof. Mihail Petkov Iliev, D.Sc. –
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Concerning scientific papers and works submitted for participation in
competition for the academic position of “Associate Professor”
in the field of higher education 5. Technical Sciences,
professional field 5.3. “Communication and Computer Engineering”,
scientific specialty “Communication Networks and Systems”,
 (“Wireless Communications and Broadcasting”, “Security equipment”)**

Ch. Assist. Prof. Krasen Kirov Angelov, PhD – Technical University of Gabrovo participates as a candidate in the competition for “Associate Professor”, announced in the State Gazette, issue 68/31.07.2020 and on the website of TU – Gabrovo for the needs of the Department of “Communication Equipment and Technologies” at the Faculty of Electrical Engineering and Electronics.

1. Brief biographical data

Krasen Kirov Angelov was born on October 6, 1980. He graduated with a Bachelor's and Master's degree from the Technical University of Gabrovo, with a qualification of “Engineer - Master in Communications”. Since 2008, he has been an assistant in the Department of “Communication Equipment and Technologies” at the Technical University of Gabrovo, and since 2016, after acquiring the PhD degree, he has been a chief assistant in the same department.

2. General description of submitted materials

The candidate participates in the competition with 45 scientific publications, categorized as follows:

- 10 publications in editions referenced and indexed by internationally acclaimed scientific databases, equivalent to habilitation work;
- 3 publications in editions referenced and indexed by internationally acclaimed scientific databases;
- 29 publications in unreferenced journals requiring review of scientific production or in edited volumes;

- 3 textbooks and study guides.

The publications submitted for participation in the competition by number of authors, language and place of publication are categorized as follows:

- 4 single-authored publications;
- 38 collaborative publications;
- 25 publications in English;
- 17 publications in Bulgarian.

3. Reflection of candidate's scientific publications among the scientific community (known citations)

4 of the presented publications are in journals with Impact Factor or SJR value. As of the date of writing the review, it is evident that the candidate has a Hirsh index of 2 ($h = 2$) according to the Scopus database. The author's citation report submitted with the materials for the competition includes 10 citation counts of the candidate's work in national and international publications, of which:

- 3 citations in national publications;
- 7 citations in editions referenced and indexed by internationally acclaimed scientific databases, incl. 6 in Scopus and 1 in Web of Science

It can be concluded that the scientific community in the field of the subject matter of the present competition is familiar with the scientific work of Ch. Assist. Prof. Krasen Angelov, PhD.

4. Overview of the content and results of the submitted scientific work

The scientific work submitted for review can be categorized in the following thematic areas:

4.1. Wireless communications and broadcasting

Broadband data transmission (related to the delivery of multimedia services in wireless computer networks and mobile cellular networks) and narrowband communications for sensor data transmission and telemetry (related to Internet of Things applications) are studied.

Solutions based on LoRaWAN technology are presented in [B.4.1, B.4.4, Г.7.1] – a platform is developed for providing access and testing applications, evaluation of the efficiency of the technology and the quality of the radio coverage in urban environment; demonstration models (of a communication gateway and a platform for application in

intelligent management systems) are developed for educational and research purposes, using systems with software-defined radio [Г.8.3].

In the area of wireless communications, approaches for optimal planning of radio coverage in radio networks with different technologies are proposed, analyzed and presented, both for narrowband communications [B.4.1] and for broadband mobile cellular [Г.8.14, Г.8.29] and computer networks. [B.4.5].

4.1. Optical communication networks

Models of single-channel [B.4.2, B.4.7, B.4.9, Г.8.13] and multi-channel [Г.8.4] optical communication lines for high-speed signal transmission are developed. The focus is on optical signal modulation processes [B.4.2, Г.8.2] and dispersion compensation methods [B.4.2, Г.8.6] for long distance optical lines. Solutions for optimal design of passive optical networks [B.4.8, Г.8.7] and for networks with optical amplifiers and regenerative sections are proposed [B.4.9, Г.8.15]. The efficiency of the used transceiver optical equipment is analyzed [Г.8.1]. Optimization problems related to the selection of interdependent operating parameters in single-channel [B.4.7, Г.8.6] and multi-channel operating mode [Г.8.4, Г.8.5] have been solved. The efficiency of the optical network and the quality of the transmitted optical signals over long distances using different modulation formats (RZ, NRZ, CSRZ, MDRZ, DM) are analyzed [B.4.2, B.4.7, Г.8.4]. Models are developed to study the influence of the applied dispersion compensation scheme [B.4.2, Г.8.6]. A comparative analysis is performed and optimal solutions are proposed according to the criteria of transmitted optical power, route length, modulation format used, etc. A model of PON network with possibilities for transmission of television and IP services and network monitoring is practically implemented [B.4.8, Г.8.7].

4.3. Systems and services in satellite and cable television networks

Experimental studies of the parameters and characteristics of the satellite channel for transmission of digital television programs according to DVB-S/S2 standard are performed. Simulation and experimental laboratory models with the necessary measuring instruments and software are synthesized. The parameters of the received signal from different transponders of the Hot Bird 13 satellite are measured [Г.8.8, Г.8.9, Г.8.19].

Experimental setups are developed for research and analysis of systems for terrestrial, cable and satellite digital television with capabilities for streaming, real-time monitoring and study of the processes of coding and modulation of digital signals [B.4.3, Г.8.27, Г.8.28]. A comparative analysis of different methods for delivery of television content to the end users is presented. The impact of the second and third order nonlinear distortions on the spectrum of the channels is considered and studied [Г.8.18]. The impact of pure Gaussian noise in the systems, as well as the errors due to it, is studied by measuring the parameter of the carrier-to-noise ratio (CNR) [Г.7.3, Г.8.22, Г.8.28]. The factors improving the quality of the service and the network utilization are analyzed [Г.8.16, Г.8.20, Г.8.26]. Various approaches are proposed and analyzed for the upgrade to an optical transmission medium [Г.8.16, Г.8.17], as well as for the introduction of modern interactive IP-based services and broadband high-speed access in cable television systems [Г.8.10, Г.8.21, Г.8.23, Г.8.24,].

4.4. Reliability and fault tolerance of communication networks

The reliability of the communication services equipment is modeled based on the Markov chain tools [B.4.6]. An example for estimating the probability of failure in a multichannel optical network is considered. A comparative analysis of several routing algorithms is presented and recommendations for their use according to the state and size of the network are proposed [Г.8.11].

5. General description of the candidate's activity

5.1. Educational and pedagogical activity (work with students and postgraduate students)

At the Technical University of Gabrovo Ch. Assist. Prof. Krasen Angelov, PhD is a lecturer in “Wireless communications and broadcasting”, “Security equipment”, “Audio and video equipment”, “Cellular communications” and “Information technologies in communications” for students in the Bachelor's and Master's degree in “Communication Equipment and Technology”. He has delivered practical learning content and laboratory exercises in the following disciplines: “Television Equipment”, “Satellite and terrestrial television”, “Signals and systems”, “Analog Circuitry”, “Digital signal processing”, “Broadband mobile networks”, “Cable television networks” and “Satellite communication systems” for students in the same specialty. At the college of the University in Lovech, he is lecturer in “Security equipment” for students in a Master's degree, a preparatory course of study. For the last 5 years, he has supervised 52 graduates in the preparation and defense of their research/theses, 6 of which in the Bachelor's degree and 16 in the Master's

degree. He has examined 59 diploma theses for Bachelor's and Master's degrees during the same period. The candidate had participated in 18 State Examination Boards for awarding Bachelor's and Master's degrees to students majoring in “Mobile and Satellite Communications” and “Communication Equipment and Technologies”. In his educational and pedagogical activity Ch. Assist. Prof. Krasen Angelov, PhD uses various specialized software products for simulation modeling, software development and documentation: MATLAB, OptiSystem, WinProp Atom IDE, Eclipse IDE, Android Studio & SDK Tools, Cisco Packet Tracer, Sphinx Python Documentation Generator, etc.

5.2. Scientific and scientific-applied activity

Ch. Assist. Prof. Krasen Angelov, PhD, has participated in the research teams of 10 successfully completed projects, incl. 5 under operational programs, 1 under a national program and 4 under university programs. He is the head of a university project.

He has executed 8 verified reviews of publications in renowned scientific journals. The candidate has participated in 2 noteworthy science forums. He works actively with students, leads student teams at national student scientific and technical competitions and events. He has supervised 8 students for the preparation of papers and participation in Student Scientific Session of TU – Gabrovo. He is a member of the Union of Scientists in Bulgaria.

5.3. Implementation activity

The candidate has participated in the teams and managed 4 university projects, which led to the development and implementation of modules and technologies to improve the quality of phone services at TU - Gabrovo.

Ch. Assist. Prof. Krasen Angelov, PhD has developed laboratory setups and software applications for research and analysis of communication networks and systems and has implemented those in the teaching process of the department of “Communication equipment and technologies”.

6. Contributions (scientific, scientific-applied, applied)

Upon an analysis of the materials submitted for participation in the competition I categorize the candidate's contributions as follows:

1. A LoRaWAN platform is designed providing access for creating and testing applications for intelligent communication in IoT with functionality for assessing the efficiency of technology and quality of the provided radio coverage in urban environments.

2. Demonstration models are developed of a multi-channel LoRaWAN communication gateway and of a LoRa-based communication platform for application in intelligent control systems and for educational and research purposes, using software-defined radio systems.
3. Radio coverage of the LoRa / LoRaWAN network on the territory of the town of Gabrovo is studied as part of a platform for communication and testing of applications based on the developed complete LoRaWAN architecture.
4. A module is developed for receiving and retransmitting digital satellite (DVB-S / S2) signals over an IP network and for real-time monitoring of the parameters of the retransmitted satellite signals.
5. Parameters and characteristics of a satellite channel for transmission of digital television signals in standard DVB-S/S2 are studied. An experimental laboratory model with the necessary measuring instruments and software is synthesized.
6. Models of a wireless MIMO channel for indoor communication is synthesized and studied, taking into account the characteristics and spatial-temporal properties of the channel, the electromagnetic propagation of the signals and the parameters of the used antennas.
7. A model of passive optical network for delivery of interactive services is developed, providing: easy staff training, opportunity for research, introduction of new services, management and communication functionalities.
8. Models for research, analysis and evaluation of the performance of high-speed single-channel optical networks are developed using different formats for optical signal modulation (NRZ, RZ, CSRZ, DM, and MDRZ), different schemes for dispersion compensation and solving optimization problems.
9. Simulation models of multi-channel high-speed optical communication networks are developed and studied. The models enable solving optimization tasks by criteria of achieving minimum BER value or maximum Q-factor and ensuring maximum network performance and efficiency at different signal input parameters.
10. Methodologies based on the iterative approach for optimal planning and dimensioning of the length and number of amplifying sections in coaxial and optical transmission networks are developed.

11. Models for modeling, research and implementation of predictive analysis of the reliability and fault tolerance of communication networks, systems and service devices are synthesized.

I evaluate the candidate's contributions as:

- Enhancing knowledge and systems through formulation of innovative approaches in existing scientific fields.
- Creation of modified algorithms and methods for obtaining supporting facts.

7. Assessment of the candidate's personal contribution

4 out of the 45 scientific publications submitted for review (42 articles and 3 textbooks) are single-authored, and Ch. Assist. Prof. Krasen Angelov, PhD is the lead author in 18 publications. No appendix has been presented for assignment of authorship in the remaining collaborative publications and I have therefore assumed equal authorship for all contributors listed. In consideration of the above, having analyzed the scientific publications submitted for review, I have no doubt for the authorship of the contributions of Ch. Assist. Prof. Krasen Angelov, PhD outlined in point 6 of the present review.

8. Critical remarks and recommendations

Based on the analysis of the work submitted for review within the present competition, I would make the following remarks and recommendations for the prospective work of Ch. Assist. Prof. Krasen Angelov, PhD:

- To narrow down his research areas;
- To continue his active work with students, postgraduates and young scientists, in order to build a team with the capacity to obtain more meaningful results and to participate in national and international research projects and programs.

9. Personal impressions

I have known Ch. Assist. Prof. Krasen Angelov, PhD, the candidate participating in the competition, for more than 15 years. I have worked with him on joint projects. I am familiar with his scientific work. I was a reviewer of his dissertation for acquiring of PhD degree. I have worked with his colleagues who have given positive feedback about him, his teaching and research work. I would therefore reasonably conclude that I have formed an adequate and objective opinion about the candidate and his overall work.

In my opinion the amount and quality of scientific work and the professional realization of Ch. Assist. Prof. Krasen Angelov, PhD, comply with the requirements of the

Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its application and the requirements of the Technical University of Gabrovo for holding the academic position "Associate Professor".

10. Conclusion

All materials submitted for review within the competition are sufficient in terms of length and content. In terms of quantity, the submitted materials considerably exceed the minimum scientometric requirements for awarding the academic position of "Associate Professor". The analysis of the scientific materials for participation in the competition shows that Ch. Assist. Prof. Krasen Kirov Angelov, PhD has performed sufficient and significant teaching, scientific and research work. He has published articles, papers and study guides. The scientific work of the candidate has the necessary applied research and practical contributions.

Upon a comprehensive assessment of the results of the candidate's activities, I am confident that they meet the requirements for awarding the academic position of "Associate Professor".

I view of the above I would propose that Ch. Assist. Prof. Krasen Angelov, PhD be selected the academic position of "Associate Professor" in the field of higher education 5. Technical Sciences, professional field 5.3. Communication and Computer Engineering, scientific specialty "Communication Networks and Systems" ("Wireless Communications and Broadcasting", "Security equipment") at Technical University of Gabrovo.

16.10.2020 г.

Reviewer: /signature/

/Prof. Mihail Petkov Iliev, D.Sc./