

# REVIEW

***Authored by Prof. Raycho Todorov Ilarionov, D.Sc.  
Technical University of Gabrovo,  
concerning scientific papers and works submitted for participation  
in competition for awarding the academic position of "Professor" in the  
field of higher education 5. Technical Sciences; professional field 5.3.  
"Communication and Computer Engineering", scientific specialty  
"Communication Networks and Systems",  
("Signals and Systems", "Radio communication equipment")***

***The competition was announced in State Gazette, issue 50 from  
15.06.2021, and on the website of Technical University of Gabrovo (TU-  
Gabrovo) for the needs of the Department of "Communication  
Equipment and Technologies" at the Faculty of Electrical Engineering  
and Electronics; with applicant  
Assoc. Prof. Stanimir Mihaylov Sadinov, PhD – Technical University of  
Gabrovo.***

## **1. Brief biographical data**

Assoc. Prof. Stanimir Mihaylov Sadinov, PhD graduated with a degree in Electronic Engineering and Microelectronics, majoring in Communication Engineering at the Technical University of Gabrovo in 1994. In the period 1997 - 2000 he was a full-time doctoral student in the scientific specialty "Communication Networks and Systems". In 2000 he started working at the Technical University of Gabrovo as an assistant in the Department of Communication Engineering and Technology. In 2006 he successfully defended his dissertation on "Study of the possibilities for improving the quality of signals in cable coaxial television networks". He has been an associate professor since 2009 in the specialty "Communication Networks and Systems" (Radiocommunication Equipment). From 2016 until now, Assoc. Prof. Sadinov is Head of the Department of Communication Engineering and Technology at TU-Gabrovo. In the period 2012 - 2016 he was Deputy Dean for Research and Personnel Policy at the Faculty of Electrical Engineering and Electronics.

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

The submitted works for participation in the competition include:

- 14 scientific publications that are referenced and indexed in world-famous databases of scientific information (B.4);
- 13 scientific publications that are referenced and indexed in world-famous databases with scientific information (Г.7);
- 10 scientific publications in non-refereed peer-reviewed journals with review or in edited collective volumes (Г.8);
- two textbooks (E.23);
- two teaching aids (E.24).

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

In the list of citations for participation in the competition are presented 20 issues in scientific journals, referenced and indexed in world-famous databases (Д.12) and 4 in non-refereed peer-reviewed journals (Д. 14).

### **4. Overview of the content and results in the presented works**

The publications presented by the candidate in the competition for the academic position "Professor" are divided into three thematic areas of communication networks and systems directly related to the competition.

*The first group* "Signals and Systems" presents scientific results related to processing, simulation, practical research and analysis of signals, data teletraffic and systems in telecommunications networks. Simulation models related to the processing and analysis of signals in various transmission communication environments have been developed in order to improve efficiency in the utilization of the frequency spectrum and optimization of network resources.

In [B.4.3] a simulation scenario was created for the study of signals and QoS systems in the latest generation of mobile cellular networks, and a performance assessment was performed. [B.4.7] presents a simulation model in Matlab / Simulink environment for bit error rate analysis (BER) with BPSK modulation scheme in a channel with added white Gaussian noise (AWGN) and presentation of a choice for an optimal set of functions for study and evaluation of more complex variants of digital phase modulation of signals. An innovative approach for identification of Markov teletraffic circuits [B.4.8, D.8.5] by means of multilayer neural networks with error back propagation and decision tree structure has been developed. A simulation model was created in Matlab / Simulink environment using BERTool to study the effect of phase noise on 64-QAM and 256-QAM signal modulation [B.4.10], taking into account the influence of the change in input signal power. In a similar way in [B.4.14] the use of different types of modulation schemes in the reverse channel of cable television networks is analyzed, as the noise resistance of the signals when changing a number of input-output parameters is studied.

[Г.7.2] discusses reverse distributions and hybrid algorithms based on artificial intelligence (AI) and adaptive neuro-fuzzy interface system (ANFIS) in signal processing. An approach to the application of QoS procedures is presented [Г.7.3]. Using artificial neural structures, they were created to identify square waveforms with the superposition of uniform Gaussian noise and periodic random noise. Simulation models [Г.7.7, Г.7.11] have been developed to identify noise signals of different shapes using LabVIEW. An algorithm [Г.7.12] has been developed for simulation modeling of a teletraffic model of voice services on / off + h / m / 1 / k, as well as predicted mathematical models based on regression analysis with respect to the average residence time in the system have been derived. and the probability of loss.

The publications in *the second thematic area* " Radio Communication Equipment and Radio Broadcasting" are related to two areas - broadband data transmission and narrowband communications for sensor data transmission and telemetry. Solutions [Г.7.1, Г.7.4, Г.7.8] based on LoRaWAN technology are presented - a platform has been developed for providing experimental access and testing of applications, evaluation of the efficiency of the technology and the quality of provided radio coverage in urban environments [Г. 7.10]. Demonstration models have been developed for educational and research purposes, using systems with software-defined radio [Г.7.6].

With regard to wireless communication, approaches for optimal planning of radio coverage in wireless communication networks for different communication technologies have been proposed, analyzed and presented [Г.7.4], [B.4.5].

Experimental studies of the parameters and characteristics of the satellite channel for transmission of digital television programs DVB-S / S2 have been performed [Г.8.6, Г.8.7, Г.8.9]. Experimental formulations for research and analysis of terrestrial, cable and satellite digital television systems with possibilities for streaming, real-time monitoring and research of the processes of coding and modulation of digital signals have been developed [B.4.6, Г.7.13]. A comparative analysis of different methods for transmission of television radio signals to end users has been made.

*The third thematic area* "Optical and cable communication networks" deals with a number of computer models of single-channel [B.4.4, B.4.9, B.4.11, Г.7.5, Г.8.10] and multi-channel [B.4.1, B.4.2, Г.8.2, Г.8.4] optical communication lines for high-speed signal transmission. The processes of modulation of the optical signals [B.4.1, B.4.4] and the methods for compensation of the dispersion [B.4.4, Г.8.3] for large lengths of the optical lines are mainly considered. Solutions are proposed for optimal construction of passive optical networks [B.4.2, B.4.12], as well as for networks with optical amplifiers and regenerative sections [B.4.11, Г.8.1, Г.8.10]. Last but not least, attention is paid to the analysis of the efficiency of the used transceiver optical equipment [Г.8.2, Г.8.10].

## **5. General description of candidate's activity**

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

Assoc. Prof. Stanimir Sadinov participated in the development of the curricula and gave lectures on the disciplines "Signals and systems", "Radio communication equipment", "Television equipment", "Broadband mobile networks", "Cable television networks", "Satellite communication systems", included in the curricula of specialties at the Faculty of EE - full-time and part-time education for educational qualification degree "bachelor" and "master".

To ensure the learning process with the participation of the candidate, textbooks on Signals and Systems, Radiocommunication Equipment, Design of interactive cable television networks and a guide for laboratory exercises on Signals and Systems and Communication Circuits have been issued.

He is the academic advisor of over 170 graduates in the bachelor's and master's degrees and four postgraduate students who defended the "doctor" degree in the doctoral program "Communication Networks and Systems".

### **5.2. Scientific and scientific-applied activity**

To participate in the competition, the candidate has submitted 37 scientific publications (articles in journals and conference papers), of which 27 are in refereed and indexed publications, 3 of which have an "impact factor" and 27 are in the SCOPUS database. Of the 37 publications, 5 are independent, 32 co-authored (2 with two authors, 10 with three authors and 20 with more than three authors). In the remaining 13 the candidate is the first author. There are 6 papers in scientific conferences in Bulgarian and 31 in English. He is a co-author of 2 textbooks and 2 teaching aids. The publications do not repeat the articles, reports, textbooks and teaching aids attached to the competition documentation for the "Doctor" degree and the academic position "Associate Professor".

The candidate has participated in a large number of national and international scientific and educational projects. In the materials for the competition, he has indicated 9 national projects (of which in 4 he is a leader and in 5 he is a participant) and 4 international projects (in 2 of them he is a coordinator, in 1 he is an expert and in 1 he is a participant). The projects

are under axis 1 of the Operational Program Science and Education for Smart Growth, Interreg and Horizon 2020.

The documentation for the competition presents evidence of compliance with the minimum national requirements and the requirements of TU - Gabrovo for holding the academic position of "professor":

Group of indicators	Contents	Minimum required points by indicator groups for holding an academic position "Professor"	Declared points by groups of indicators for holding the academic position "Professor"
A	Indicator 1	50	50
Б	Indicator 2	-	-
В	Indicator 3 or 4	100	219
Г	Sum of indicators from 5 to 11	200	223,67
Д	Sum of indicators from 12 to 15	100	208
Е	Sum of indicators from 16 to the end	150	325

Contents	Minimum requirements for TU - Gabrovo to the candidates for the academic position "Professor"	Declared indicators by the applicant for taking academic position "Professor"
Total number of publications (articles and reports)	30, of which at least 5 standalone and 3 with IF (WoS)	37, of which 5 standalone and 3 with IF (WoS)
Number of known citations made by other authors	20	24
Published textbooks / books	2	2
Published teaching aids	-	2
Number of students who have defended Ph.D thesis	1	4
Managing projects and contracts	3	4

### **5.3. Implementation activity**

There are no officially submitted company documents for implementation. The candidate has participated in the construction of laboratories and bench equipment for laboratory and practical training of students in the disciplines Signals and Systems, Radio Communication Equipment, Television Equipment, Satellite and Cable Communication Networks and Cellular Communications. He also works actively as an expert in various projects with business and the Municipality of Gabrovo, related to the implementation of innovative technologies in the field of telecommunications services.

### **6. Contributions** (scientific and related to applied research and application).

I accept the scientific contributions presented by the author as follows:

#### ***Scientific contributions:***

- ❖ An innovative approach has been developed for the identification of Markov teletraffic circuits by means of multilayer neural networks with backpropagation of the error and the structure of the decision tree;
- ❖ Inverse propagations and hybrid algorithms based on artificial intelligence (AI) and adaptive neuro-fuzzy interface system (ANFIS) in signal processing have been synthesized;
- ❖ An algorithm for simulation modeling of a teletraffic model of voice services on / off + h / m / 1 / k has been developed and predictive mathematical models based on regression analysis with respect to the average residence time in the system and the probability of losses have been derived;

#### ***Applied research contributions:***

- ❖ An approach for application of QoS procedures for analysis and study of the impact of different types of noise in communications is presented - uniform white noise (UWN), Gaussian white noise (GWN), Bernoulli noise (BN) and Poisson noise (PN);
- ❖ Simulation models have been created for the study of signals and systems in telecommunication networks such as state-of-the-art mobile cellular networks, digital television networks, digital modulations and the communication channel connected to them by applying Markov chains;
- ❖ Models have been created for research, analysis and evaluation of the performance of high-speed (from 10 to 40 Gbps) single-channel optical networks using different formats for optical signal modulation (NRZ, RZ, CSRZ, DM, MDRZ), different schemes for compensation of dispersion (symmetric compensation, pre- and post-compensation) and solving optimization problems;
- ❖ Simulation models for signal research in multi-channel (4 and 8-channel) high-speed (10 to 40 Gbps) optical communication networks have been developed and studied to solve optimization problems to achieve a minimum value of BER (min. BER) or maximum Q factor and ensuring maximum performance and efficiency of the network at different input parameters of the signals and taking into account the influence of nonlinear effects in assessing the performance of the system.

### ***Applied contributions:***

- ❖ Demonstration models of a radio communication multichannel LoRaWAN gateway and of a LoRa-based communication platform for application in the systems for intelligent management of parking lots and garages, as well as for educational and research purposes, with application of systems with software-defined radio have been developed;
- ❖ A radio communication module has been 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 broadcast satellite signals;
- ❖ An experimental system for testing and research of the radio coverage for the VHF and UHF radio frequency band for the territory of the town of Gabrovo has been implemented, through software-defined radio (SDR);
- ❖ A practical model of passive optical network (PON) has been developed for the delivery of interactive services for implementation, which allows convenient and easy training of staff and the possibility for wider practical research (traffic processing, introduction of new services and modules for management and communication, etc.) in the field of passive optical networks.

### **7. Assessment of the candidate's personal contribution**

One of the indicators of the candidate's merits is his personal participation in the mentioned above contributions. Of the 37 publications - 5 are independent, 32 co-authored (2 with two authors, 10 with three authors and 20 with more than three authors), in 13 of which the candidate is the first author. The rich teaching and research activities are proof of a high level of professional competence. The content in the materials of the competition speaks of a highly prepared specialist and leaves no doubt that the scientific and applied contributions of the candidate are an individual work or a team, but with his significant creative participation.

### **8. Critical remarks and recommendations**

The following formal remarks can be made on the submitted documents:

I recommend more publications in foreign journals and conferences that are referenced, which will lead to more citations. To try to prepare more significant projects, which will unlock the results of the implementations. The candidate should not stretch over too many study subjects.

### **9. Personal impressions**

I have known the candidate personally for more than 20 years, and I have immediate impressions of his scientific, pedagogical and organizational activities. My impressions can be summarized as follows:

Knows the scientific sources, the professional and company literature and the current state of the competition field;

He also has broader interests that go beyond the competitive scientific field, which is an advantage in the competition for a professor;

Along with his creative activity he has built laboratories, created a wide network of business contacts, which he widely uses for the needs of TU-Gabrovo;

He has good experience as a research supervisor;

Good organizer for development and management of scientific projects;

Respected and highly valued as a responsible specialist by hi colleagues and the university management.

#### **10. Conclusion:**

Associate Professor Sadinov has made presentation of works and personal details which successfully stand in favor of his claims concerning this competition. My conclusion is grounded on the following summary point:

1. The candidate has submitted scientific works and genuine achievements of top scientific and research level which are sufficient to meet the established requirements concerning academic professorial position.
2. Demonstrates the qualities of a scientist in the field of communications.
3. He is well able to set and resolve scientific tasks which demand the level of solid research worker; is likewise in good command of relevant instruments for accomplishment of said tasks and last but not least, Mr. Sadinov is good at organizing and leading research teams.

***In view of the above, I propose Assoc. Prof. Stanimir Mihaylov Sadinov, PhD to be awarded the academic position of “Professor” in the field of higher education – 5. Technical Sciences, professional field – 5.3. Communication and Computer Engineering, specialty – “Communication Networks and Systems” (“Signals and Systems”, “Radio communication equipment”).***

15.10.2021

Reviewer:                    /signature/  
/Prof. D.Sc. Raycho Ilarionov/