

OPINION

**of a dissertation
for the acquisition of the educational and scientific degree “Doctor” in**

**in the field of higher education – 5. Technical Sciences
the professional field – 5.3 “Communication and Computer Engineering”
doctoral program – “Communication Networks and Systems”**

Author: Eng. Michail Georgios Angelakis

Topic: “Methods and Means for the Intelligent Monitoring and Control of Radio Channels in Wireless Communication Networks”

Member of the scientific jury: Assoc. Prof. Eng. Boyan Dimitrov Karapenev, PhD

1. Topic and relevance of the dissertation work

The rapid growth, rapid development and great expansion of wireless communications on a global scale and the advent of new generation technologies such as Wi-Fi 7, 5G and the future 6G put the need to move from conventional management to systems for intelligent monitoring and real-time control of radio channels in wireless communication networks and systems.

Modern digital infrastructure is unthinkable without wireless communications. With the advent of standards such as Wi-Fi 7 (802.11be), 5G and 6G generation of mobile networks, as well as the large-scale architectures of the Internet of Things (IoT and Industrial IoT), the radio channel becomes a critical and vulnerable component of the communication environment. Wireless communication networks are one of the most important modern technologies, fully related to the current daily life. Therefore, wireless infrastructures, consumer devices and networks are among the largest and most important industries in the world.

Unlike cable transmission media, the radio communication channel is very dynamic and shared with respect to the transmitted information. This necessitates the development and implementation of modern methods and means for constant monitoring of radio channels to guarantee sustainability, security and the required quality of service (QoS - Quality of Service). As the demand for wireless services continues to grow, so do the demands on network bandwidth, latency, security, and connection reliability. The design, implementation, and operation of such systems face unprecedented challenges posed by the exponential growth in the number of connected devices, the heterogeneous nature of traffic, and critical technical requirements.

The topic is modern and relevant as it includes several key factors defining the development of communication technologies in recent years - compaction of the frequency spectrum, which leads to significant interference between devices; heterogeneity of networks; strict latency, throughput and reliability requirements; dynamics of the environment – obstacles, multipath propagation of signals, attenuation, Doppler effect, etc. at mobile sites constantly change the characteristics of radio channels in real time.

This requires an in-depth consideration of both the fundamentals related to the transmission of signals in wireless networks and systems, as well as the mechanisms for monitoring and controlling the state of radio channels, which will positively affect their effective operation and QoS.

The dissertation analyzes the main methods and proposes a synthesis of models, application of intelligent mechanisms and practically oriented means and approaches for monitoring, control and solving optimization tasks in the management of radio channels and the provision of QoS in wireless communication networks.

2. Research methodology

The purpose of the research is to create methodologies related to correct approaches in modeling, selection and implementation of architecture, necessary equipment and correct configuration and application of intelligent monitoring, control and evaluation of signal parameters in wireless communication channels, which ensures improvement of reliability, efficiency and quality of services in wireless communication networks.

The subject of the researches are the different processes at the physical level related to the processing of the signals in the wireless communication channels, as well as the dependencies related to the parameters determining the performance and efficiency of information transmission under different complex initial conditions. The object of the dissertation is the passive and active methods and means for monitoring and managing the dynamics of the wireless environment for transmission, determining and optimizing the energy and quality indicators of the wireless communication signals and ensuring the quality of the channel and services by applying hardware and software-informational approaches for intelligent monitoring and control of the state of radio channels in wireless communication networks and systems.

Research methods include analytical, simulation and practical research and analysis of individual models and setups.

The research methodology includes simulation modeling, experimental studies and practical implementation of a model of a universal system for monitoring and control of radio communication networks. The MATLAB/Simulink programming environment was used for the simulation modeling and research. The development of an experimental model of an innovative universal system for monitoring and control of wireless communication networks is also presented, as well as an experimental study of the wireless radio coverage of a wireless communication network.

3. Contributions of the dissertation work

In the dissertation, 3 scientific-applied and 3 applied contributions are presented and well-organized, which I accept as clear, precise and concrete without the need for reformulation. I appreciate the author's contributions with the necessary scientific-applied and applied value and significance, and it can be noted that they expand knowledge in the field of methods and means for intelligent monitoring and control of radio channels in wireless communication networks.

4. Publications and citations of publications on the dissertation work

In connection with the dissertation, 8 published reports were presented at the scientific conferences UNITECH' 2022 and 2025, TechCo' 2024 (2 issues) and 2025 (2 issues) and the Student Scientific Session 2024 (2 issues), 2 of which are independent. No information provided on availability of citations.

5. Authorship of the obtained results

The dissertation work, the abstract and the published publications show undoubtedly that their author, Eng. Mihail Georgios Angelakis, has acquired knowledge and skills to carry out literary, theoretical, simulation and experimental research and analysis in the field of

methods and means for intelligent monitoring and control of radio channels in wireless communication networks. This characterizes the dissertation student as a well-established specialist in this field.

The abstract has a volume of 40 pages and clearly, accurately and concretely presents the content of the overall development in the dissertation work.

6. Comments, recommendations and remarks on the dissertation work

The topic in the dissertation work is considered and presented in the necessary depth of the research and summarizes and offers specialized work and development in the field of methods and means for intelligent monitoring and control of radio channels in wireless communication networks, and I recommend the dissertation student to continue and deepen his work on it.

The well-summarized, defined and presented analyzes and conclusions to the individual chapters, as well as the conclusion with the significance of the achieved scientific-applied and applied contributions, make an impression.

I would also make the following general recommendations regarding the future work and activity of the dissertation student: to continue and deepen his scientific and research work in PN 5.3; to actively participate in the learning process of learners; to join and work in collectives of international, national and university research and educational projects and the like and to seek to publish the results reached in reputable and refereed journals with Scopus/WoS databases.

7. Conclusion

I consider that the presented dissertation **meets** the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria.

The achieved results give me reason **to propose** that the educational and scientific degree "Doctor" be acquired by Eng. Michail Georgios Angelakis in the field of higher education - 5. Technical Sciences, professional field - 5.3 Communication and Computer Engineering, doctoral program – “Communication Networks and Systems”.

05.08.2026

Member of the scientific jury:

/Assoc. Prof. Boyan Karapenev, PhD/