

# **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. Emmanouil Themistoklis Kypraios**

**Topic: Methods and Algorithms for Research on Multiplexed Signals in Passive Optical Communication Networks**

**Member of the scientific jury: Assoc. Prof. Tereza Angelova Stefanova, PhD**

## **1. Topic and relevance of the dissertation work**

Optical WDM-PON networks provide significant opportunities for the evolution of next-generation broadband infrastructures, offering an effective basis for high-capacity, secure and future-oriented communication services. By allocating a dedicated wavelength to each user or service, WDM-PON eliminates the bandwidth sharing limitations found in traditional optical systems, allowing for symmetrical high throughput and Quality of service. This architectural advantage opens the door to a wide range of modern applications, but also raises a number of challenges related to the choice of coding and modulation in optical transmission channels from the point of view of ensuring maximum transmission distance, high Q-factor, respectively BER, good spectral characteristics and energy budget of the system, taking into account the main limiting factors (transient characteristics, limitations from dispersion and attenuation along the fiber, nonlinear effects and number of optical spans, etc.). This gives me reason to believe that the topic is undoubtedly relevant, useful from a scientific-applied and applied nature and extremely challenging for development.

Based on the analysis performed, the specific objectives and tasks of the dissertation work have been adequately formulated, which gives me reason to believe that the doctoral student has gone into depth and knows the state of the problem well.

## **2. Research methodology**

The dissertation has a total volume of 126 pages. Its content includes a list of abbreviations used, an introduction, four chapters with conclusions drawn after each chapter, a conclusion, contributions of the dissertation work, a list of publications on the dissertation work and a bibliography of the literary sources used. 79 literary sources are cited.

The doctoral student has defined as the objective of the dissertation work and an approach to solving the problem to develop correct imitation models and experimental setups for a comprehensive study of the processes of multiplexing signals with spectral division by wavelength and to present methods and algorithms to improve the reliability and efficiency of communication and the Quality of services in multi-channel passive optical networks.

The achievement of this objective is ensured by solving several main tasks: synthesis of a generalized methodology and creation, research and analysis in a software environment

of simulation models for studying the processes of multiplexing and signal transmission in multi-channel passive optical networks; research of the main processes of coding, modulation and processing of optical signals and assessment of the degree of their influence on the performance, reliability and Quality of services in multi-channel passive optical networks; creation of an experimental setup for experimental research and testing of the developed methodologies and models.

Based on the analysis presented above, I believe that the doctoral student has adequately approached the choice of a systematic framework, tools and means that he has applied to solve the research problem by using appropriate and feasible methods for conducting the research in accordance with the objective and tasks of the dissertation.

### **3. Contributions of the dissertation work**

I accept the contributions presented in the dissertation work of Eng. Emmanouil Kypraios and assess them as scientific and applied (4 in number) and applied (3 in number). The contributions are of significance and usefulness through: development and application of a methodology and algorithm for optimal planning, sizing, modeling and research of passive optical networks with spectral multiplexing of signals; development and research of imitation models for analysis, performance assessment and solving optimization problems in high-speed multi-channel optical networks using different formats for optical signal modulation and various complex configuration parameters; development and research of a practical model of a passive optical network with wavelength multiplexing of signals, intended for a wide variety of practical research in the field.

### **4. Publications and citations of publications on the dissertation work**

The publicity of the results of the dissertation work is ensured and proven by 6 publications of papers from scientific conferences, indexed in the national reference list of NACID.

Two of the submitted publications are single-authored, and the rest are co-authored with the doctoral student's scientific supervisor and other authors. There is no evidence submitted with the dissertation for known citations of the publications.

From the reference attached to the documentation, it is evident that the submitted publications cover the minimum national requirements and scientometric indicators and the minimum requirements of TU-Gabrovo for acquiring the educational and scientific degree "doctor".

### **5. Authorship of the obtained results**

No evidence of plagiarism has been found in the materials provided for the dissertation.

The content of the attached publications and the presence of two single-authored ones, as well as the text of the dissertation, give me reason to believe that the main part of the research conducted and the analyses of the results are entirely the personal contribution of the doctoral student.

### **6. Comments, recommendations and remarks on the dissertation work**

I have no significant critical remarks on the content of the presented materials, but I can note the following recommendations:

- some refinement of the terminology used is necessary;
- some corrections to the layout are necessary, as well as some grammatical and stylistic editing of the text in the dissertation work and in the author’s abstract.

The recommendations made do not diminish the merits of the developed dissertation work and the contributions achieved with it.

In addition, I recommend that the doctoral student continue working on this issue, widely sharing his acquired experience and useful practices by taking steps to create practical guides, researching new technologies in the relevant field, and through publications in specialized international journals, refereed and indexed in global 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. Emmanouil Themistoklis Kypraios in the field of higher education - 5. Technical Sciences, professional field – 5.3. Communication and Computer Engineering, doctoral program – “Communication Networks and Systems”.

18.02.2026

**Member of the scientific jury:**     /signature/

/Assoc. Prof. Tereza Stefanova, PhD/