

STATEMENT OF ACADEMIC OPINION

regarding the materials submitted for participation in a competition for the academic position of "associate professor" in professional field 5.2. Electrical Engineering, Electronics and Automation, specialty "Biomedical Equipment and Technologies", at the Department of "Medical Equipment, Electronic and Information Technologies in Healthcare"

announced in the State Gazette: issue 15 of 21.02.2025

with candidate: Ch. Assist. Prof. Eng. Nikolay Tinkov Dukov, PhD

Member of the scientific jury: Prof. Eng. Rumen Kostadinov Popov, PhD

1. General characteristic on the research and applied science activity on the candidate

The scientific production of chief assistant professor Eng. Nikolay Tinkov Dukov, PhD is in the area "Technical Sciences". The results from the research and applied science activity of the candidate are published in total of 48 scientific publications and are cited 160 times, according to information from the Scopus database. From these works, in the current procedure are included 11 publications equivalent to a monography (indicator B4 – 108.48 points) and 18 publications (indicator G7 – 204.37 points) as each of them is referred in the scientific data bases Web of Science and/or Scopus. The candidate has also submitted 4 publications beyond the minimum scientometric requirements, 3 of which are in the scientific data bases Web of Science and/or Scopus and 1 in unreferenced edition with scientific review. The citations for the competition are 5 in total (indicator D12 – 50 points), all are in scientific publications, referenced and indexed in world-renowned scientific databases. The candidate also presents 2 citations beyond the minimum scientometric requirements, referenced and indexed in world-renowned databases of scientific information. Beyond the minimum national requirements for the position of "associate professor", the candidate has also presented a list with 15 significant scientific research projects. I believe, that the presented materials exceed the minimum national requirements for the academic position of associate professor and are at a high scientific, technical and professional level.

2. Assessment of the candidate's pedagogical training and activities

Chief Asst. Prof. Eng. Nikolay Dukov, PhD has over 11 years of work experience as a lecturer, including as a part-time lecturer in the Department of "Electronics and Microelectronics" and an assistant professor in the Department of "Computer Science and Technology" at the Technical University - Varna, as well as an assistant professor and chief assistant professor in the Department of "Medical Equipment, Electronic and Information Technologies in Healthcare" at the Medical University "Prof. Dr. Paraskev Stoyanov" - Varna. The submitted documents show significant teaching activity, which speaks of the candidate's professional preparation for conducting an educational process.

3. Major scientific and applied scientific contributions

The candidate has defined scientific, applied science and applied contributions in four thematic areas, which I accept and can be summarized as follows:

In thematic area 1, contributions focus on computer modeling and fabrication of breast phantoms and innovative techniques for simulations and anatomical realism using patient data for virtual examinations. The fabrication of physical phantoms through 3D printing with materials such as PLA and ABS is covered, and various methods for X-ray applications are tested. A focus is also placed on bone phantoms, introducing new hydrogels and composites for accurate replication of bone density. The use of phantoms for training and quality control is emphasized, thereby improving educational and diagnostic outcomes. Technologies for phantom realization are synthesized, providing guidance for future innovations in X-ray diagnostics.

In thematic area 2, contributions focus on the development of algorithms for segmentation of lesions from tomosynthesis and MRI, improving the accuracy of 3D models for phantoms. Mathematically generated lesion models are introduced, allowing the simulation of complex tumor structures without patient data. Lesion models in phantoms are validated and integrated, confirming their accuracy and applicability in diagnostics.

In thematic area 3, contributions focus on the characterization of 3D printing materials such as PLA, ABS and photopolymer resins, establishing their radiological suitability for phantoms by measuring Hounsfield units and X-ray absorption. New tissue-equivalent materials have been developed, such as nanosilicate-polysaccharide hydrogel and various dental silicones have been investigated. Contrast agents developed to improve visibility in X-ray examinations have been validated. The application of PLA-terracotta composites and silicones for the manufacture of phantoms has been investigated, confirming their effectiveness in imaging diagnostics through radiological suitability tests.

In thematic area 4, contributions focus on improving phase-contrast imaging and simulating phantoms for better tissue contrast, especially in dense mammary glands. Contrast-enhanced diagnostics has been optimized by using 3D-printed phantoms for CEM and radiography, achieving maximum tumor contrast. An optical system with a CMOS camera has been developed for the validation of X-ray algorithms without ionizing radiation, facilitating safe prototyping. Statistical and computational methods for validating simulations have been established, ensuring the reliability of software for radiological applications. Web-based platforms for the evaluation of X-ray images and health data have been created, increasing the accessibility and efficiency of research. 3D-printed models have been integrated into student training.

4. Significance of contributions to science and practice

Achieved contributions are significant for the science and the practice. The results have been published in refereed and indexed journals and international scientific conferences becoming known to the scientific public. A large part of the publications are with impact factor and high quantile (Q1 and Q2), which I note as positive. The citations show, that the candidate is known and the results achieved are useful for theory and practice.

5. Critical notes and recommendations

To the presented for review works I don't have remarks from editorial, scientific and technical point. Obvious is that the candidate has encompassed several important scientific areas.

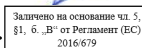
My recommendation to the candidate is that the results achieved from the scientific works be implemented in teaching activities in the form of teaching aids.

CONCLUSION

The presented in the competition scientific works contain essential results, for which I give positive assessment. There are sufficient scientific, scientifically applied and applied contributions. The minimum requirements are achieved, the scientometric indicators are fulfilled and on the basis of this I find for reasonable to **propose** Ch. Assist. Prof. Eng. Nikolay Tinkov Dukov, PhD to hold the academic position **"ASSOCIATE PROFESSOR"** in professional field 5.2. "Electrical engineering, electronics and automation", scientific specialty: "Biomedical engineering and technologies", in the department "Medical equipment, electronic and information technologies in healthcare", Faculty of Public Health at the Medical University - Varna.

Date: 11.06.2025

JURY MEMBER:



Prof. Eng. Rumen Popov, PhD