

OPINION

by

Dr. Eng. Nedyalko Todorov Katrandzhiev, Professor at UHT-Plovdiv

of a dissertation for awarding the educational and scientific degree "**Doctor**"

in the field of higher education: *5. Technical sciences,*

professional field: *5.3. Communication and computer equipment*

doctoral program: *"Automation of areas of the non-material sphere
(medicine, education, science, administrative activities, etc.)".*

Author: *Phys. Eng. Svetoslav Genchev Hadzhigenchev*

Topic: *"Goelectrical resistivity telemetry system in seismogenic zones".*

Supervisor: *Assoc. Prof. Eng. Slavi Yassenov Lyubomirov - Plovdiv University "Paisii Hilendarski".*

1. General presentation of the procedure and the doctoral student

By order No. PD -21-123 dated 19.01.2024 of the Rector of Plovdiv University "Paisii Hilendarski" (PU), I have been appointed as a member of the scientific jury to ensure a procedure of a dissertation work defense on the topic "**Goelectrical resistivity telemetry system in seismogenic zones**" for the acquisition of the educational and scientific degree "doctor" in the field of higher education **5. Technical sciences**, professional field **5.3. Communication and computer equipment**, doctoral program **Automation of areas of the non-material sphere (medicine, education, science, administrative activities, etc.)**. The author of the dissertation is **Phys. Eng. Svetoslav Genchev Hadzhigenchev** – full-time doctoral student at the EKIT department of the Faculty of Physics and Technology with the supervisor Assoc. Prof. Eng. Slavi Yassenov Lyubomirov from Plovdiv University "Paisii Hilendarski".

According to the procedure requirements Phys. Eng. Svetoslav Genchev Hadzhigenchev has submitted the following documents: request to the Rector of the PU to disclose the procedure for the defense of a dissertation work; CV; protocol of preliminary discussion in the department; dissertation work; abstract in Bulgarian and English; list and copies of scientific publications on the topic of the dissertation - 5 pcs.; certificate of fulfillment of the minimum national requirements; declaration of originality and authenticity of the attached documents. All documents meet the requirements and based on this I determine the candidate's eligibility for further evaluation.

2. Relevance of the topic

The presented dissertation is dedicated to an important and still unsolved problem - the possibility of predicting earthquakes. The topic is relevant because it is directly related to the reduction of the consequences of earthquakes, namely human casualties and material damage.

3. Knowledge of the problem

In the development of the dissertation work, physics engineer Svetoslav Genchev Hadzhigenchev referred to 101 literary sources. Of these, 66 are journal articles or conference proceedings, 20 are technical documentation in electronic format, and 15 are company, product, or informational Internet sites of institutions or others. The doctoral student has 30 years of experience at the National Institute of Geophysics, Geodesy and Geography – BAS as a seismologist at the “Rozhen” seismic station, and he was the head of the accredited Central Testing Laboratory Gamakabel AD, Smolyan and chief expert – physicist at the Regional Health Inspection of Smolyan city.

The accumulated professional experience is a solid prerequisite for knowing the problem and setting an adequate goal and tasks for its achievement.

4. Research methodology

Four tasks were set to achieve the goal of the dissertation, which is “to develop a system for telemetry of geoelectrical resistivity and other harbingers of earthquakes in seismogenic zones”. They were well chosen and their solution would lead to the realization of the goal.

The dissertation presents a comprehensive development of a geoelectrical resistivity telemetry system, describing its hardware design, software management, data transmission and visualization.

5. Characterization and evaluation of the dissertation work and contributions

I assess the dissertation work as useful for the scientific community. Scientific-applied and applied contributions had been achieved. The most important of them are:

- The possible sources of noise, the ways of their reduction and the results of the observations of variations of the apparent resistance in the process of earthquake preparation are analyzed.
- The anomaly recorded by the author when measuring the apparent resistance in the area of the town of Strazhitsa, after the destructive earthquake of 07.12.1986, was shown and analyzed.
- The influence of drying on the electrodes contact resistance, and on the magnitude of the operating current and the measured geoelectrical resistance, was investigated.
- the author had observed an increase in the intensity of ultra-low-frequency electromagnetic radiation at a frequency of 5kHz, which he suggested was related to accompanying earthquakes in Romania.
- Equipment for measuring variations in geoelectrical resistance and meteorological parameters was designed and implemented in hardware. It was installed in the land of the village of Dunevo, region Smolyan.

- Modules for calibration and verification of the equipment for measuring variations of the geoelectrical resistance had been implemented.
- Data obtained from the geoelectrical resistivity register and meteorological parameters for a seven-month period were presented, together with recorded earthquakes of magnitude greater than 2.5 on the Richter scale and epicentral distances up to 100 km. An algorithm for removing outliers and smoothing the “raw” data was described.
- A possibility of registration, transmission, processing, storage and visualization of the received sensor data in a cloud platform was realized. A MATLAB program was created to process the data from the station and to visualize it in real time.

6. Assessment of the publications and personal contribution of the PhD student

The publications presented in the dissertation cover the main highlights of the subject. The doctoral student, engineer-physicist Svetoslav Genchev Hadzhigenchev, has four independent publications and is the first author of one scientific publication. The personal contribution of the doctoral student is undoubted due to the above written.

7. Dissertation abstract

The abstract was presented in Bulgarian and English and reflected the most important moments of the dissertation work.

8. Recommendations for future use of dissertation contributions and results

Notes

In the contributions presented by the author, it was indicated that data were obtained from the registration of geoelectrical resistance and meteorological parameters for an eight-month period, and in the dissertation work a graph was shown and it was written that the data were for a seven-month period (Fig. 3.15 on 109 page; pages 113 and 143).

On page 115 it was written: "Figure XX shows" - the figure number is missing.

The literature review was incomplete. To the greatest extent, this concerns the practical implementation, transmission, storage and visualization of the data.

References include publications of the dissertation author - they should not be there because the literature review should be based on the scientific achievements of other authors.

No uniform style was used for writing the literary sources - some literary sources start with the surname, others with the author's first name; the year in some was written in parentheses before the title, and in others at the end.

Recommendations

I recommend that in the future the PhD student to do more extensive literature research.

CONCLUSION

The dissertation contains scientific and applied results and applied results, which represent an original contribution to science and meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Law and the relevant Regulations of PU "Paisii Hilendarski" .

The dissertation shows that the doctoral student Phys. Eng. Svetoslav Genchev Hadzhigenchev has in-depth theoretical knowledge and professional skills for independent conducting of scientific research.

Due to the above written, I confidently give my **POSITIVE** assessment of the conducted research to prove a scientific thesis and **propose to the honorable scientific jury to award the educational and scientific degree "doctor" to Phys. Eng. Svetoslav Genchev Hadzhigenchev in the field of higher education: 5. Technical sciences, professional field 5.3. Communication and computer equipment, doctoral program "Automation of areas of the non-material sphere (medicine, education, science, administrative activities, etc.)"**.

16.02.2024

Author of the opinion:
/Prof. Dr. Eng. Nedyalko Katrandzhiev/