

## STATEMENT

on the competition for the academic position of "associate professor" in Professional field 4. 1. Physical sciences, (Physics of wave processes), announced in the State Gazette no. 96 of 17.11. 2023

Member of the scientific jury: Prof. DSc Nikolay Nedyalkov Nedyalkov, Institute of Electronics, BAS

The only candidate for the present competition is Dr. Aneliya Mincheva Dakova-Mollova, assistant professor in the Department of Physics at the Faculty of Physics and Technology of Plovdiv University "Paisii Hilendarski". In 2016, she successfully completed her doctoral studies on "Linear and nonlinear optics of femtosecond and attosecond laser pulses" at the Institute of Electronics of the BAS. Since 2010, she has been teaching as a part-time teacher at Plovdiv University "Paisii Hilendarski", holding the positions of assistant and assistant professor in the period 2011 - 2015. From 2016 to 2022, Dr. Dakova-Mollova also holds the position physicist at the Institute of Electronics, BAS, and from 2022 she is assistant professor. The main directions of her professional activity are related to scientific developments in the field of studying the propagation processes of ultrashort laser pulses in various media. She leads lectures and exercises in the "Physics" department at the Faculty of Physics and Technology of Plovdiv University "Paisii Hilendarski".

The submitted documents for the competition and their content provide an opportunity for a clear assessment and analysis of the scientific, scientific-applied and teaching activities of Assistant Professor Dr. Dakova-Mollova. 25 scientific publications were submitted for participation in the competition, of which 15 were published in journals with an impact factor and 10 in publications with an impact rank. All the publications presented were published after obtaining the scientific and educational degree "doctor" and are from the last 5 years, which is a clear indication of active work at the current stage of her career. She is the lead author of 8 of the presented publications, 6 of which are from indicator C, on which the habilitation is based. For participation in the competition, 80 citations of works in which Dr. Dakova-Mollova is a co-author are presented. They are from the last 5 years, which demonstrates scientific production at a high level and on current topics. Assistant Professor Dakova-Mollova has participated or is participating in 5 projects under national and international programs, and was also the head of two projects at the Bulgarian Science Fund for organization of scientific events. Hirsch index according to SCOPUS is 8. The teaching activity of Assistant Professor Dakova-Mollova is associated with conducting lectures and practical exercises in bachelor's and master's programs at Plovdiv University "Paisii Hilendarski", in the areas of Fiber Optics and Optical Communications, Optical Communication Systems, Optics, Physics. In recent years, her teaching employment has met the requirements. She has developed 9 bachelor's and master's programs (one of which is an electronic course). She was the academic supervisor of 18 graduates who successfully defended their diplomas. Dr. Dakova-Mollova has participated in 13 conferences, presenting 6 reports, which proves her skills in presenting scientific results and leading discussions. With her scientometric data, the candidate

exceeds the minimum requirements set by ADASRB and adopted at Plovdiv University "Paisii Hilendarski". Scientific publications are presented in journals that are referenced and indexed in world-renowned databases of scientific information, which are equivalent to habilitation work (indicator C). The total number of points under this indicator is 130, with a minimum of 100. According to indicator D, publications are presented that are equivalent to 257 points out of the required 200. According to the indicator E, related to citations of works in which Dr. Dakova-Mollova is a co-author, also the specified points exceed the required ones. The teaching activity also corresponds to the necessary workload, determined by the Regulations for the development of the academic staff of PU "Paisii Hilendarski".

The scientific activity of Assistant Professor Aneliya Dakova-Mollova is focused on the field of description of the propagation of ultrashort laser pulses in various media, with the emphasis being: formation and description of optical solitons during the propagation of optical pulses in non-linear dispersion media; parametric four-photon mixing processes in nonlinear dispersion media; and formation and evolution of optical vortexes in isotropic media with nonlinear dispersion. These topics are the subject of increased scientific interest, which is largely based not only on the unexplained processes in the propagation of ultrashort pulses, but also on the potential effective applications in areas such as optical communications, quantum computing, material processing, controllable fusion. A basic approach used to analyze these processes is analytical and numerical solution of the nonlinear amplitude equation. The effectiveness of this approach in a specific case compared to the "classical" nonlinear Schrödinger equation is demonstrated and analyzed. Methods for solving systems of equations for complex wave amplitude functions, which describe four-photon parametric processes, have also been developed. The main scientific and scientific-applied contributions from the activities of Assistant Professor Aneliya Dakova-Mollova, can relate to obtaining new knowledge and enriching existing understanding in the field of propagation of ultrashort pulses in different media, interaction between optical fields and generation of beams with different parameter modulations. The results for finding conditions for the generation of light and dark solitons in fibers and in air can be reported here, which is key knowledge for practical applications in optical communications; a description of the effects of changing the polarization of optical pulses and a comprehensive description of the four-photon mixing process while accounting for all third-order nonlinear processes.

The personal contribution of Dr. Dakova-Mollova, as described in the presented documents, is beyond doubt. It is essential for obtaining and interpreting the main results of the presented works. My personal impression of the candidate also confirms this. In the main publications for participation in the competition (indicator C), she is the lead author in 6 of them, which is evidence of a major contribution. In the others, there is a major involvement in the development and application of analytical and numerical approaches. The candidate's submitted papers and publications clearly demonstrate a deep knowledge of the current state of research, unsolved questions and methods for their analysis. She has solid training in mathematical methods and their applications for solving physical problems.

I have no critical comments on the content, as well as on the technical presentation of the documents.

Conclusion:

My analysis of the results of the research and teaching activities of Assistant Professor Aneliya Dakova-Mollova gives me reason to believe that she is an established scientist with a significant contribution in the field of photonics, in particular in the research of the propagation of ultrashort laser pulses in various media, with the skills and ability to determine and guide research at high level. Her teaching activity, which, apart from being a necessity for her position, determines opportunities for attracting young scientists and forming research groups.

Quantitative indicators of her scientific activity correspond to the criteria set by ADASRB, necessary for occupying the academic position of "Associate Professor". My personal opinion is that Dr. Dakova-Mollova is a responsible scientist with deep knowledge in the field in which she works, highly motivated, open to working together with other groups.

On the basis of the above, I positively evaluate the presented materials and express my convinced support for the candidacy of Assistant Professor Dr. Aneliya Dakova-Mollova, recommending to the Scientific Jury to support and propose to the Faculty Council of the Faculty of Physics and Technology of Plovdiv University "Paisii Hilendarski" that she be elected to the academic position of "Associate Professor" under Professional Field 4.1. Physical sciences.

27.03.2024

Prof. DSc Nikolay Nedyalkov