STATEMENT

By Assoc. Prof. Dr. Deyan Dimov,

Member of the Jury (Order No. RD-15-728 of 07.12.2022 of the Director of IOMT)

Institute of Optical Materials and Technologies

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In a competition for the academic position of "Associate Professor", announced by IOMT-BAS, in the State Gazette No. 79 of 04.10.2022, in the field of "Optical Metrology and Holography" in the professional field 4.1. Physical Sciences, scientific specialty "Physics of Wave Processes"

Only one candidate, Dr. Branimir Lyudmilov Ivanov, is presented in the announced competition.

The participant in the competition, Dr Branimir Lyudmilov Ivanov, is currently working as a senior assist. prof. at IOMT-BAS. Since joining in 2000, he has been involved in holography, interferometry, optical information processing, quantum electronics. In 2013, he covered the research and education degree PhD. His work over the years has been reported in 37 papers, 32 of them in impact-factor and impact-rank journals. All these publications, according to Scopus, have been cited 119 times to date and his h-factor is 6.

The scientific articles with which he is participating in the current competition for the academic position of Associate Professor total 24, all of which are in journals with an impact factor and an impact rank. Nine of these scientific publications are equivalent to habilitation thesis. He has participated in ten projects since 2000. In group "B" - 9 works and in group "G" - 15 works are presented and the number of points he collected are 104 and 239, with 100 and 230 points required. The analysis shows that the candidate Dr. Branimir Lyudmilov Ivanov has collected more than the required minimum points for the academic position of "Associate Professor", as stipulated in the Rules of IOMT-BAS.

The contributions presented by the candidate are summarized in 5 topics:

I. Interferometric methods for determination of spectral characteristics of optical sources with noise correction [A1-A3].

A three-channel correlation Fourier spectrometer with simultaneous recording of interferograms for the reference light source, for the working source and for the light of the sample under study was developed, implemented according to the Twyman-Green scheme. The noise sources in the spectrometer were identified and analyzed using Monte-Carlo modeling. A feedback system is proposed to perform ongoing autocorrelation correction of the working light source after changes in the reference source to improve accuracy [A1].

The fluctuations are modeled as colored noise with a Gaussian correlation function, resulting in an improvement, and recovery of the resulting spectra within a few seconds [A3].

II. Holographic and interferometric methods for pattern imaging and control [A4-A9].

An accelerated method for calculating the input data is described and the print quality is demonstrated with color holograms of complex cultural artifacts printed using holographic printers[A4].

A combined phase-shifting holographic polaryscope system with a coherent light source is proposed and developed for conducting photo-elastic coating measurements to determine mechanical stresses. The capability of isochromatic and isoclinic phase maps to accurately measure the locations of points of constant difference and direction of the principal stresses and principal strains, respectively, has been demonstrated by simulation and experimentally confirmed [A5].

The ability of the dynamic speckle technique to detect changes in process rates following changes in humidity and chemical effects on plant leaves, on cooling and aging bread, and on drying paint is demonstrated. The activity on the sample surface was also determined.

III. Numerical methods for the analysis of data from dynamic speckle measurements [B1-B8].

The possibility of data compression in dynamic speckle analysis by coarser quantization of raw speckle images is proposed and demonstrated.

Non-uniform quantization by logarithmic transformation of the captured images has been introduced, resulting in activity map quality comparable to that for low contrast images.

IV. Profilometric methods for remote shape determination and visualization of three-dimensional objects [B12-C13].

Stream processing of dynamic speckle maps by computing a correlation-based estimate that is related to the activity at each point in the sample and thus provides high spatial resolution is proposed [B3, B4].

It has been shown, through simulation and experiment, that the polar correlation function computed from binary data effectively indicates regions of different activity under both uniform and non-uniform intensity distributions in the illumination laser beam without normalization [B5, B6, B7].

Bilateral filters with Gaussian kernels have been applied to the activity maps in diffuse reflecting objects to improve their contrast and resolution [B8].

It has been shown that streaming algorithms, in which normalization is performed at each instant using one or two intensity values, are more efficient [B11].

V. Monitoring and control of drying processes by dynamic speckle analysis [B14-B15].

The dynamic speckle technique was applied to monitor the drying process of azo polymer solutions. Time changes in droplets of such solutions of different sizes are demonstrated by constructing bivariate maps of a given statistical estimate. The timescales of the drying process have been determined by tracking the time variation of the radius of correlation of intensity fluctuations within the speckle formed on the surface of the object [B14, B15].

All of this work speaks to a deep and diverse knowledge in both wave optics and wave process simulation. Branimir Lyudmilov Ivanov has established himself as a precise and thorough scientist. The personal contribution of the candidate in the research of interferometric systems, diffraction optics, digital holography and optical metrology is clearly visible.

In conclusion, the materials presented by Dr. Branimir Lyudmilov Ivanov and the examined contributions and the scientific-metric indicators fully meet the requirements of the Law on Research and Development and the Regulations of IOMT-BAS for holding the academic position of Associate Professor. From the above, I support and propose to the members of the Scientific Jury to recommend to the Scientific Council of IOMT-BAS to elect Dr. Branimir Lyudmilov Ivanov to hold the academic position of "Associate Professor" in the professional field 4.1. Physical sciences, scientific specialty "Physics of wave processes".

27.01.2023 г. Signed: .....

/Doc. Dr. Deyan Dimov/