# STATEMENT

on a competition for the academic position of Associate Professor in scientific field 4. Physical sciences, scientific specialty "Physics of wave processes" at the Institute of Optical Materials and Technologies "Acad. J. Malinovski"- BAS, announced in State Gazette No 79/04.10.2022.

Candidate. Dr. Eng. Prof. Branimir Lyudmilov Ivanov

Reviewer. Prof. Tamara Petkova

The only candidate who submitted documents for the competition for the academic position of Associate Professor announced by IOMT-BAS in the State Gazette, issue 79/04.10.2022 is Assoc. Dr. Branimir Ivanov.

The candidate graduated from Sofia University "St. Ohridski"., Department of Physics. He graduated with a first specialty: Master of engineering-physics in quantum electronics and laser technology and a second specialty: Master of engineering-physics in medical physics. In the same year, he joined IOMT as a physicist, and the following year he started a full-time PhD at the institute. The dissertation on "Multicolour Holographic Recording and Holographic Optical Elements" supervised by prof. D. Nazarova the candidate defended in 2013. Since the same year he has been working as a senior assistant in the Laboratory of Holography, Optical Metrology and Holography Department at the Institute.

The review of the attached documents showed that the candidate meets the requirements for the competition for the academic position of Associate Professor, according to Article 1. and in conjunction with Article 2. 1., 2. and 3. and Art. 17. of the Regulations for the Acquisition of Scientific Degrees and Academic Positions at IOMT - BAS.

The data in Annex 3 and 4 show that the scientific publications of Dr. Ivanov in scientific issues that are refereed and indexed in world-known databases (Web of Science and Scopus), with which the candidate participated in the competition in Group B are 9, of which the candidate has collected 104 points, with the required 100. In group D of the reference: scientific publications in journals that have been refereed and indexed in world-renowned databases of scientific information (Web of Science and Scopus), there are 15 publications submitted outside the habilitation thesis, giving 239 points. Dr. Ivanov's publications are in highly specialized scientific journals such as Proc. of SPIE, but also in optics-specific reputable journals in the high quartiles Physica Scripta, Applied Optics, Optics Letters, Optics and Lasers in Engineering, Optics Communications. In the world literature, 32 citations on Dr. Ivanov's scientific works have been noted, providing him with 64 points in the reference, group D.

From the total of 24 papers submitted to the competition, priority research directions can be identified related to the development of: various optical methods for determining the spectral characteristics of optical sources and for visualization and control of samples; numerical methods for analysis of data from dynamic speckle measurements and profilometric methods for remote visualization of objects.

The main scientific contributions of the candidate can be summarized as the gaining of new scientific data and the development of new scientific hypotheses and methodologies in the following areas:

- Interferometric methods for the determination of spectral characteristics of optical sources with noise correction. A three-channel correlation Fourier spectrometer with simultaneous recording of interferograms for the reference source, for the working source and for the light of the sample under study was developed. A feedback system is proposed to perform ongoing autocorrelation correction of the working light source after changes in the reference source to improve accuracy. The accuracy of single-peak absorption recovery in Fourier transform spectrometer measurements is evaluated for the cases of additive noise in signal detection and noise that adds a fluctuating component to the carrier frequency in the source and measurement channel of the interferometer. An improved method for precise measurement of the optical characteristics of various light sources using a Fourier spectrometer based on a classical Maikelson moving mirror interferometer has been developed;

- Holographic and interferometric methods for object imaging and control - Established the generation of 3D digital input data for two types of holographic printers that can be used to print analog reflectance holograms. An accelerated method is proposed to compute the input data and for high quality printing. A combined phase-shift holographic polaryscope system with a coherent light source is developed to conduct photo-elastic coating measurements for the purpose of determining mechanical stresses. The ability of the dynamic speckle technique to detect changes in process rates due to changes in the physical environment is demonstrated;

- Numerical methods for the analysis of data from dynamic speckle measurements. The possibility of data compression in dynamic speckle analysis by coarser quantization of raw speckle images is demonstrated. A reduction in the number of quantization levels prior to statistical processing is proposed. The effectiveness of such speckle image compression is investigated by analyzing the output data obtained for a synthetic digital object under ideal conditions of uniform illumination and uniform reflectance and for a test object when the ideal conditions are not met. A streaming processing of the dynamic speckle images is proposed by computing a correlation-based estimator that is related to the activity at each point in the sample by providing high spatial resolution. A method is proposed to improve the quality of the determined bivariate velocity distribution (activity map) of processes in diffusely reflecting objects from changing speckle maps by filtering this distribution. A phase spatial light modulator is implemented as an optical simulator of speckle pictures with controllable spatiotemporally varying evolution to test algorithms in dynamic speckle metrology of physical or biological activity;

- Profilometric methods for remote shape determination and three-dimensional imaging of objects. Designed a sinusoidal phase grating for projection profilometry with sinusoidal stripes. Distortions in the designed stripes due to phase quantization are

analyzed when the phase grating is generated by an 8-bit phase modulator. It is shown that speckle noise decreases in the stripes designed with a sinusoidal phase grating set to a spatial light modulator when using a low coherence point light source.

## CONCLUSION

I believe that the main results of the study are based on the results of the study carried out by the author. Ivanov has presented the results of his scientific research and scientific-applied activities, which fully meets the requirements for the position of Associate Professor in the professional field of the competition announced for the needs of IOMT - BAS. The analysis of the attached materials characterizes the candidate as a scientist with good research capabilities in the field of Physics of Wave Processes. I am fully convinced that the election of the candidate to the AD "Associate Professor" will contribute to the strengthening and development of the division of "Optical Metrology and Holography" at the Institute.

On the basis of all the above, I recommend the Scientific Jury to propose to the SC of IOMT - BAS to elect Dr. Branimir Lyudmilov Ivanov to the academic position of "Associate Professor" in the professional field 4.1. Physical sciences, scientific specialty "Physics of wave processes".

Sofia, 17.01.2023

Member of the Scientific Jury:

(Prof. Tamara Petkova)