STATEMENT

From Prof. DSc. Phys. and DSc. Eng. Marin Nenchev, member of the Scientific Committee on the procedure for awarding the scientific degree "Professor" in Physical Sciences for the purposes of BAS - Laboratory of Applied Physics - Plovdiv to for Prof. DSc. Tinko Eftimov (Professor at Plovdiv University "Paisii Hilendarski")

The requested Procedure for Professor has a single candidate - Prof. Dr. Tinko Eftimov. It has a peculiarity related to the current Law on Scientific Degrees and Titles, according to which the candidate who was not selected under the old procedure with the HAC, High Atestation Comission, does not retain his title "Professor" when moving from one scientific institution to another. In this aspect, the candidate who was elected as a Professor at the University of Plovdiv "Paisii Hilindarski" now, after the change of the law and the termination of the HAC, to move to the BAS - as a "Professor" at the BAS , must be elected as such, which is a task for the judgment of the approved Scientific Competition Jury.

As a member-professor of the Scientific Jury, with the responsibility to give a written Statement - on the award of the professorship for BAS, I made the necessary familiarization with the extensive material presented on the application (I, I have from the HAC two professorship - both for BAS in Physical Sciences and for TU-Sofia in Technical Sciences and the corresponding two doctorates for DSc. Phys. and DSc. Eng., which I note for my expertise). The opinion that I have formed, and which I will set out and justify below, is that the Candidate meets the required standards for a BAS "Professor" in Physical Sciences.

I consider that to be a BAS professor, he should well meet three important points: 1) to have proven scientific/technical achievements evaluated by the average world standards and in particular working contacts with scientists of the level of leading countries; 2) to have demonstrated clarity of scientific or technical progress and 3) to have the potential for such progress proven by achievements - scientific, technical in the educational process of recent years.

In the aspect noted, I have also given an assessment of the candidate. Below, first as a sufficient quantitative characteristic:

1- For the proven scientific and technical achievements and capabilities:

The candidate has worked successfully with many groups in this country and in a developed country such as Canada. He presents a substantial body of matrials - basically 97 matrials, publications and contributions to books including at least 30 rank - with IF and IR and contributions to more than 10 books - mainly with co-authorship in writing the publications from 2 to 10 co-authors, with an average of 5, or with chapters and publications, in 10 scientific books and five patents for inventions. I consider this to be a sufficient amount of publication output.

2 - For the important assessment of the scientific level of the candidate in the international aspect:

The best possible objective evaluation (of course to the best possible degree and taking into account that there is no better) is that of the international specialized scientific agency SCOPUS with its personal h-index awarded to the scientist - by a sufficiently objective procedure. As a very significant

point, the Candidate has an h-index very close to the normal international average for a professor. His SCOPUS index is h = 13, indicating a specialist with a very good international level.

According to the data, he also covers well the Bulgarian norms for a professor as a set of points of the Ministry of Education on various activities characterizing the candidature for a professor.

2. The candidate's international scientific contacts are very good - he has worked for a long time in close collaboration with Canadian specialists, mainly in Canada - Canadian Universities - in the province of Quebec. He has many collaborative works with them, as well as with a number of Bulgarian scientists involved through him. This activity of international effective and high-level cooperation I consider to be a very good characteristic for the candidate, which he will continue to develop, with the effective and continuing involvement of young Bulgarian scientists-specialists.

Brief presentation of selected and summarized scientific achievements of the candidate:

1. Theoretical and experimental studies on fiber-optic sensor networks based on long-period gratings and interferometers

1.1. Developed theoretical description of the behavior of inhomogeneous long-periodic gratings and cascades of long-periodic gratings [16, 17, 18, 23, 24]- publications according to the attached list by the candidate.

For the first time, composite gratings consisting of two sub-gratings of different period, with non-uniform differences in the effective refractive indices or in a cascade separated by a fiber section between them, have been analyzed theoretically and studied experimentally.

Theoretically, the analysis is based on the coupled mode equations and their solutions in matrix form, by which the spectra of non-uniform long-period gratings cascades are modeled.

Different methods have been used to fabricate such gratings by excimer laser (KrF), CO2 laser and by splicer. It has been shown experimentally that such constructions are suitable for simultaneous measurement of temperature gradient and mean temperature using a single grating, which is a novelty.

Such non-uniform gratings made of photosensitive fibers are found to be much more sensitive to thermal gradient and temperature than those made of standard communication fibers.

1.2. High-sensitivity micro Mach-Zehnder cross-cavity interferometers have been improved and systems for multiplexing and processing spectra from spectrally encoded fiber-optic sensors have been tested [2, 3, 4, 5, 6, 7, 8, 9, 10, 11].

The achievements in this field are:

- Record sensitivities up to 27000 nm/RIU to the refractive index by stepwise cavity expansion;

- Fabrication of micro Mach-Zehnder interferometers optimized for the visible and near-infrared;

- the development, experimental and theoretical analysis of dual-mode broad-spectrum fiber-optic Mach-Zehnder interferometers

Si and InGaAs based photodiode line array detection and spectrum analysis systems, fiber-optic splitters and switched sensor systems with spectral and spatial multiplication have been developed and investigated.

2. Studies on luminescence of substances and their application [53, 54, 55, 56, 57, 58, 59].

2.1. Study of phosphorescence spectra of Strontium aluminates

The temporal responses of phosphorescence have been studied extensively, with normalized on-off excitation time responses defined for the first time. An expression for the on-excitation temporal response is derived.

On the basis of the analysis of the rise time (turn-on) and fall time (turn-off) responses, a criterion for estimating the relative contribution of phosphorescence to the total luminescence emission is defined.

The temperature dependence of the rise and fall times of phosphorescence is investigated and why the relative contribution of phosphorescence to fluorescence increases with increasing temperature is explained.

The quantity total phosphorescence efficiency is introduced, which is the product of the relative phosphorescence fraction and the temperature-dependent normalized phosphorescence intensity.

It is shown that the temporal responses of phosphorescence depend on the excitation wavelength, the excitation duration, and the wavelength of the phosphorescence spectrum.

Based on the results obtained, a temperature sensor was developed using the differential signal between the rise and fall time response, which is particularly suitable for fire protection systems.

Paper impregnated Mn, Eu and Dy doped strontium aluminates and their possible applications are investigated.

2.2. Glass fluorescence study:

- Samarium doped oxofluoride glasses luminescing at 564 nm, 600 nm and 645 nm.

It has been shown that under X-ray irradiation, the luminescence drops with different time constants for each of the above lines, which circumstance is the basis for a wide-range X-ray irradiation sensor.

- Neodymium oxide doped zinc borophosphate glasses, luminescent around 900 nm, 1061 nm, 1100 nm and 1300 nm

Absorption and fluorescence spectra and decay times were investigated.

- Europium and dysprosium doped yttrium aluminates and borates fluorescing around 600 nm and 710 nm.

The three-dimensional excitation-emission spectra and possible applications in document security marking systems are investigated.

In a comment, as an example of a paper with an interesting idea, I will detail the post from those given for the professorial habilitation here:

In the journal "Optical Fiber technologist" No. 28 (2016) of the prestigious international scientific publisher "Elsiver". The article is "Excitation efficiency of a side-pumped fiberized fluorescent dye microcapillary", Veselin Vladev, Tinko Eftimov, Stefan Nedev, Faculty of Physics and Engineering Technologies, Plovdiv University ‘‘Paisii Hilendarski” Photonics Laboratory, 24 Tsar Asen St., Plovdiv 4000, Bulgaria

The work proposes and develops the interesting idea of substantially increasing the output energy parameters of a dye mini-laser . In this laser, a cylindrical aperture - cuvette with the laser-active liquid and an optical fiber cut at an angle, tightly positioned next to it in its own channel, bringing the excitation radiation to the laser solution, are arranged in parallel in a tight package in a glass cylinder. From the professional study, by modeling, describing the illumination process and numerical analysis, a suitable cutting angle of the optical fiber is determined at which illumination of the laser-active solution by the excitation radiation greatly increases the excitation efficiency. The result is not evident and the professional idea is brought to high excitation efficiency by the suitable fiber cutting angle. A number of good and professionally developed ideas can be pointed out.

In **Conclusion**, from the foregoing, I propose that the Condidate be awarded the requested degree of Professor of Physical Sciences.

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For the Statement:

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