

REVIEW

in a competition for an academic position of “Reader” (“Associate Professor”)

in professional field 5.3. Communication and Computer Equipment (Microwave engineering and communications)

for the needs of “St. Kliment Ohridski“ Sofia University (SU),

Faculty of Physics, announced in State Gazette (SG) issue 25/26.03.2021.

The review was prepared by: professor eng. Marin Simeonov Marinov, Ph.D., Faculty of Aviation of the "Georgi Benkovski" Air Force Academy, Dolna Mitropolia, in his capacity as a member of the scientific jury for the competition, according to Order № ПД-38-198 / 27.04.2022 of the Rector of Sofia University.

Only one candidate has submitted documents for participation in the announced competition: chief assistant eng. Hristomir Hristov Yordanov, Ph.D., Technical University – Sofia (TU), Faculty of Telecommunications.

I. General description of the presented materials

1. Details of the candidacy

The documents submitted for the competition by the candidate meet the requirements of of the Act on the development of the academic staff in the Republic of Bulgaria (ADASRB), the Regulations on the implementation of the Act on the development of academic staff in the Republic of Bulgaria (RIADASRB) and art. 107, para 1 of the Regulations on the terms and conditions for obtaining scientific degrees and holding academic positions at SU "St. Kliment Ohridski" (RTCOSDHAPSU).

For participation in the competition, the candidate Hristomir Hristov Yordanov has submitted a list and copies of a total of 22 titles, including 6 articles and 14 reports publicized in Bulgarian and foreign journals and proceedings of scientific forums, 1 chapter of a book and 1 book based on the dissertation of the candidate.

Fifteen publications are in journals and proceedings, indexed in Web of Science and Scopus, 6 publications are in non-indexed editions with scientific review, and one is a book based on the dissertation of the candidate. A list of 6 publications in which one article of the candidate has been cited is presented. All citations are in publications indexed in Web of Science and Scopus.

Four reports on classroom employment of the candidate in the last 4 years are applied. According to the Register of academic staff and dissertations, maintained by NACID, the candidate

was appointed to the academic position of Chief assistant at the Technical University - Sofia in 2017 with an act of appointment № 1-391/28.02.2017.

2. Candidate data

The candidate obtained a Bachelor's degree in radio communications from the Technical University - Sofia in 2002 with bachelor thesis on the topic "Microwave Ku band subharmonic mixer". He obtained a Master's degree in microwave engineering at the Technical University of Munich, Germany with the master thesis on the topic "Implementation of Genetic Algorithm for Design of an Ultra-Wideband Blaun". In 2011 he defended his doctoral dissertation at the Technical University of Munich on the topic "Wired and Wireless Inter-Chip and Intra-Chip Communications", supervised by professor Peter Russer, Ph.D. The recognition of acquired educational and scientific degree "doctor" in professional field 5.3. Communication and Computer Equipment was done by Technical University – Sofia with Protocol № 11/14.06.2016 whereby the candidate meets the requirements of art. 24, para 1, point 1 of the ADASRB, art. 53, para 1, point 1 of the RI-ADASRB and art. 105, para 1, point 1 of RTCOSDHAPSU.

The candidate was a Fellowship holder by EU Marie Curie program in the period 2011-2015, during which he participated as a researcher in a scientific project. In the period 2019-2020 he is a guest researcher under the Fulbright program at UC Berkeley, Berkeley Wireless Research Center.

During the period 2014-2016, the candidate occupied a position of Assistant in Faculty of Telecommunications at TU – Sofia and since 2017 he has occupied a position of Chief assistant at the same faculty. Since 2017 he has been appointed to Vice dean for research of Faculty of German Engineering Education and Industrial Management at TU-Sofia.

Presented documents and public source of information confirms that the candidate possess more than 7 years' experience in academic positions and consequently he exceeds the requirements of art. 24, para 1, point 2, letter a) of the ADASRB, art. 53, para 1, point 2 letter a) of the RI-ADASRB and art. 105, para 1, point 2, letter a) of RTCOSDHAPSU.

3. General characteristics of the scientific works and achievements of the candidate

The publications submitted in the competition show that the main scientific interests and results obtained by the candidate are in the fields of:

- modeling of electromagnetic fields;
- research and modeling of integrated antennas in the microwave band;
- research and optimization of the inter and intra-chip communications.

In the last few years, the candidate has supplemented these areas of research interest by developing models and methods for adjustment and calibrating measuring instruments and antennas, as well as using artificial intelligence elements in the processing of radar signals.

As there are no additional requirements for candidates for academic positions at the Faculty of Physics of "St. Kliment Ohridski" Sofia University in the professional field 5.3. Communication and computer equipment, in the review I assess the compliance of the candidacy with the requirements of ADASRB, RIADASRB and RTCOSDHAPSU.

The candidate has presented scientific publications that have equal standing as monograph, thus fulfilling the requirements of art. 24, para 1, point. 3 of the ADASRB, art. 53, para 1, point 3 of the RIADASRB and art. 105, para 1, point 3 of the RTCOSDHAPSU. The presented 10 publications are indexed in the scientific databases Web of Science and Scopus, which fulfills the requirements of indicator 4 of group of indicators C for professional field 5.3. Communication and computer equipment from Annex to Art. 1a, para 1 of the RIADASRB. All publications are in English language. Two of the publications have 3 authors and the others have 4 or more authors. In 5 of the publications the candidate is mentioned first, in one he is mentioned second, and in the others he is mentioned after second place. This gives me reason to conclude that the candidate has made a significant contribution to these publications. Considering that no separation protocols have been applied, I recognize a total of **135.57** points per group of indicators C, which exceeds the minimum requirements.

The candidate has presented 12 publications to fulfill the group of indicators D. One of the publications is in German language and the other 11 are in English language. Three of the publications are in proceedings of international conferences in Bulgaria and the rest are in journals and proceedings of conferences abroad. One of the publications is a book based on defended dissertation for awarding educational and scientific degree "doctor" and are on indicator 6 of the group. Five of the publications are in editions referenced and indexed in world renowned databases with scientific information and are on indicator 7 of the group. The rest 6 publications are in not referred journals with scientific reviewing and are on indicator 7 of the group. I recognize a total of **215.71** points per group of indicators D, which exceeds the minimum requirements.

The candidate has submitted a list of 6 publications on group of indicators E in which the following publication is cited, in which he is a co-author:

- Yordanov, H., Poulkov, V., Russer, P. On-Chip Monolithic Integrated Antennas Using CMOS Ground Supply Planes, IEEE Transactions on Components, Packaging and Manufacturing Technology, 2016, Vol. Issue 6, Print ISSN: 2156-3950, Electronic ISSN: 2156-3985 ISSN, pp. 1268-1275.

All 6 publications in which this candidate's publication is cited are indexed in Web of Science and Scopus and fall into indicator 12 of the group. I recognize a total of **60** points per group of indicators E, which exceeds the minimum requirements.

The fulfillment of the minimum requirements of ADASRB, RIADASRB and RTCOSDHAPSU for professional field 5.3. Communication and computer equipment are summarized in Table 1.

Таблица 1. *Compliance with the min. requirements ADASRB, RIADASRB and RTCOSDHAPSU.*

Group of indicators	Indicator	Candidate's points	Minimum required points
A	1. Dissertation paper for awarding educational and scientific degree "doctor".	50	50
C	4. Habilitation work – science publications (not less than 10) in editions referenced and indexed in world renowned databases with scientific information.	10 publications (60/n) 135.57	100
D	6. Published book based on defended dissertation paper for awarding educational and scientific degree "doctor" or for awarding scientific degree "Doctor of science". 7. Science publication in editions referenced and indexed in world renowned databases with scientific information. 8. Science publication in not referred journals with scientific reviewing or in edited collective volumes. All for group of indicators D:	1 publication (30) 30 5 publications (40/n) 105.71 6 publications (20/n) 80 215.71	200
E	12. Citations or reviews in science editions, referenced and indexed in world renowned databases with scientific information or in monographs and collective volumes.	6 publications (10) 60	50

The presented scientific papers do not repeat those of previous procedures for acquiring a scientific titles and academic positions.

I am not aware of the existence of proven plagiarism in the submitted scientific papers.

4. Characteristics and evaluation of the teaching activity of the candidate

he candidate has submitted reports for 2581.08 equivalent practical hours during the last 4 academic years. This makes an average of 645.27 equivalent practical hours per year, which is a high work-load. The submitted reports do not contain detailed information about the disciplines in which the candidate has taught. In the publicly available information on the Internet, I found that

the candidate has lectured and led seminars and laboratory exercises in the disciplines "Computer Networks", "Analog Electronics", "Communication Systems", "Embedded Communication Networks" in the bachelor's and master's curricula of the Faculty of German Engineering Education and Industrial Management at TU-Sofia.

In my opinion, the candidate has the necessary teaching experience to hold the academic position of "Reader" ("Associate Professor").

5. Content analysis of the scientific and applied scientific achievements of the candidate contained in the materials presented for the competition

I appreciate that the most significant contributions of the candidate's publications are in the theory and application of integrated antennas.

In [B3] the problems associated with the continuing miniaturization of electronic devices and the increasing use of on chip integration of antennas are analyzed. The peculiarities of nanoantennas integrating, both on substrates currently used in integrated circuits and on possible other substrates in the future are considered. It is justified that nanoelectronic technologies are an acceptable trade-off between the requirements of antenna integration into the chip architecture and those of those of circuit integration.

Publications [B7-B9, Г2, Г4-Г8] are devoted to the methods for making monolithic integrated antenna, as well as the evaluations and measurements of their parameters. The use of two methods for designing efficient on-chip antennas are proposed, namely using high-impedance substrate with standard thickness, or using very thin substrate. The advantages and disadvantages of each of the two methods for increasing the efficiency of the antennas are analyzed. Some of these publications present antennas designed and manufactured by the authors on an ultra-thin substrate with a thickness of 17.5 μm , using Chip-FilmTM technology. Results of simulations and measurements of the manufactured prototypes are presented, which prove the efficiency of the antennas, designed by these methods. The problems of increasing the bandwidth of inter-chip communication channels by making efficient antennas on the silicon chip are considered.

For this purpose, a solution based on sharing of metallization structures between the antenna and the CMOS circuitry is justified. The influence of the chip substrate on the antenna parameters is studied. Wireless communication channels between chips are evaluated and an overview of various techniques to increase data throughput is done. A method for experimental adjusting is proposed to measure interference and to assess the possible deterioration of wireless communication between integrated on chip antennas.

I assess **the scientific contributions** in this group of publications as enriching the existing theory of antennas and in particular the theory of on-chip antennas.

I evaluate **the applied contributions** in this group of publications as the development of methodologies for analysis, simulation and measurement of integrated antennas.

I assess **the practical contributions** as the application of scientific achievements in practice, namely the prototyping of integrated antennas and measuring their characteristics.

I appreciate that the second most important contributions of the publications are in the development of equivalent electrical circuits of the communications in and between integrated circuits.

Publications [B2, B4-B6, Γ 3] suggest models of distributed microwave circuits and wireless communication circuits by presenting them as equivalent electrical circuits. A method for determining the parameters of the equivalent electrical circuits by means of system identification is presented. The obtained results are compared with the results obtained by numerical full-wave analysis of the circuit. A method to reduce the number of elements of the equivalent circuit by including delay lines in addition to the standard passive elements is proposed. A systematic procedure for generating combined models of equivalent circuits, based on numerical data, is also discussed. Models of wireless inter-chip communications using integrated antennas, including modeling of the antennas in the near field, are studied.

I assess **the scientific contributions** in this group of publications as enriching the existing theory of distributed circuits.

I assess **the applied contributions** in this group of publications as the development of methodologies and procedures for obtaining equivalent electrical circuits of distributed microwave circuits.

I assess **the practical contributions** in this group of publications, such as obtaining equivalent electrical circuits of specific distributed microwave circuits, including wireless inter-chip communication.

The rest of the publications contain independent applied and practical contributions.

In publications [Γ 9, Γ 10] models of signals obtained during the surveillance of objects in the shape of a cube and a sphere with radar are developed. Some neural networks are developed to recognize the shape of the object based on the radar signal and a comparison of the efficiency of the neural networks depending on their structure and as on the parameters of the radar signal is made. I assess the contributions in these publications as **applied contributions**.

In publications [Г11, Г12] algorithm for tuning of polarization purity of a phased antenna array with linear polarization is developed. A precise method for alignment of an antenna under test and the sampling near field probe is presented. I assess the contributions in these publications as applied and practical with possible application in the design of antenna arrays and equipment of laboratories for antenna parameters measuring.

In publication [B1] a theoretical study is done, which shows that the use of isotropic antennas in the theoretical study of antenna arrays is legitimate. The contributions of this publication are **applied** and have the character of confirmation of known knowledge.

In publication [Г1] the standalone, freely available software package YATPAC, developed by the Institute for High-Frequency Engineering at Technische Universität München is presented. The package is based on the Transmission Line Matrix method. The various elements of the package and the simulation procedure are described. The results are compared with other full-wave electromagnetic simulators. I assess the contributions of this publication as **practical**.

In publication [B10] procedures for calibrating a microwave moisture meter are developed. Studies of the proposed procedures using a real experimental moisture meter are conducted. Conclusions and recommendations for the use of the proposed procedures are presented. I assess the contributions of this publication as **practical**.

All presented citations of the candidate's publication are in editions referenced and indexed in world-renowned databases with scientific information (Web of Science и Scopus). Apart from these citations, I have found citations of other publications of the candidate, including an additional citation of the mentioned above article, which shows that other scientists use the results of the candidate's research.

6. Critical remarks and recommendations

I have no remarks on the content and structures of the reviewed publications.

I have a remark on the selection of publications that have equal standing as monograph. I think that instead of the publication B10 it is better to include publication Г6 or Г7 in this list. This replacement does not change the distribution of the candidate's points, but then all publications in the group of indicators B would address the problems of analysis and design of integrated antennas.

I have remarks on the reference summary on original scientific contributions of the candidate. First, the publication B6 is not mention, second in the point 4, letter a) instead of publication number B9 it should be B10 and last in the point 3 letter b) instead of publication number Д1 it should be B9.

7. Personal impressions of the candidate

I do not know the candidate personally and I have no impressions of him.

8. Conclusion on the candidacy

Having thoroughly reviewed all the presented scientific publications and additional materials for the competition, and having in mind the analysis of their importance and scientific and applied contributions, I **confirm** that the scientific achievements of the candidate fulfill the requirements of ADASRB, RIADASRB and RTCOSDHAPSU for taking the academic position “Reader” ("Associate Professor") in the scientific area and the professional field of the competition. The candidate, in particular, meets the minimum national requirements in the professional field and I am not aware of the existence of proven plagiarism in the publications submitted for the competition.

I give a **positive** assessment of the candidacy.

II. OVERALL CONCLUSION

Based on the above, I recommend to the scientific jury to propose to the Faculty Council of the Faculty of Physics of Sofia University "St. Kliment Ohridski" to elect **eng. Hristomir Hristov Yordanov, Ph.D.** to the academic position of “Reader” ("Associate Professor") in the professional field 5.3. Communication and Computer Equipment (Microwave engineering and communications)

23.06.2022

Reviewer:

(prof. eng. Marin Marinov, Ph.D.)