

# OPINION

on a competition for **associate professor**

**professional field 4.1. Physical Sciences**

**(Physics of Microcosm, High Energy and Elementary Particles Physics)**

**Candidate:** Mariana Filipova Shopova, Ph.D., head assistant professor in the Faculty of Physics and Technology, Plovdiv University “Paisii Hilendarski”

**Prepared by:** Mariyan Velichkov Bogomilov, Ph.D., associated professor in the Sofia University “St. Kliment Ohridski”

## **I. General characteristic**

The only candidate in the competition is Dr. Mariana Shopova, a head assistant professor. Mrs. Shopova received her master's degree in "Applied Nuclear Physics" from Plovdiv University "Paisii Hilendarski" in 2012 and her doctoral degree in professional field 4.1. Physical Sciences "High Energy Physics" from the Institute for Nuclear Research and Nuclear Energy (INRNE) affiliated with the Bulgarian Academy of Sciences (BAS) in 2018. From 2014 to 2019, she was an assistant professor, and since 2019, she has been a head assistant professor at the Faculty of Physics and Technology, Plovdiv University.

The candidate participates in the competition: with 7 publications that make a significant contribution, all published in journals with impact factor and SJR; with 11 non-habilitation publications in journals with an impact factor; with 80 citations citing her 5 articles. The documents submitted to the competition are comprehensive and accurately reflect both the requirements of normative documents and the scientific contributions of the candidate. The additional information provided creates a complete image of Dr. Shopova's excellent professional qualities.

## **II. Scientific and applied contributions of the candidate**

The habilitation thesis of Dr. Shopova is on a topic related to research, analysis, and support for the muon system in the CMS detector at CERN. The theme fits exactly into the formulation of the competition. The candidate's scientific contributions are described in the abstracts of materials, an expanded habilitation report, self-assessment of contributions, and a supporting letter from the leader of RPC (Resistive Plates Chambers) muon system in the experiment CMS Prof. Salvatore Buontempo, which certifies them.

The most important scientific and applied contributions of the candidate are:

- Work and stability of RPC system on CMS:

The work and stability of the RPC (Resistive Plate Chamber) system were studied using the method of extrapolated segments, which uses information from neighbouring muon detectors. The CMSSW software, part of which includes this method, was used to determine calibration, efficiency, synchronization, and other essential characteristics of RPC.

- Muon trigger and RPC trigger:

Modification of hardware and software muon and RPC triggers to reflect different working conditions in the CMS experiment, such as higher beam energy and intensity.

- Study on the longevity of RPC:

To verify and assess the durability and longevity of RPCs under increased radiation loads expected during HL-LHC, test measurements were performed using a high-activity  $Cs$  source. The results show that the chambers will work stably over the next period of operation.

- Modernization of Muon system on CMS:

In the upcoming period with high luminosity at LHC, the muon system on CMS will be modernized by expanding to cover 2.4 pseudo-rapidity and installing improved chambers with a resistive plate (iRPC) design. These new detectors were tested in the GIF++ laboratory at CERN. Additionally, additional muon detectors GEM (Gas Electron Multiplier) are being installed in the closing parts of CMS, which have also been tested.

In addition to these contributions, Dr. Shopova also holds responsible positions such as: representative of the RPC system in CMS Muon Conferences & Publications Board; coordinator of the group for conferences and publications on the RPC system, RPC Conferences & Publications Board Coordinator; coordinator of the group for detector analysis of the work of the RPC system, RPC DPG Coordinator; representative of Bulgaria to the panel of young scientists at European Committee for Future Accelerators (ECFA).

The above-mentioned contributions demonstrate a significant volume and quality of work performed by candidate Dr. Shopova. My conviction is that she has approached her tasks exceptionally responsibly. The fact that confirms this are the numerous published articles in high-citation journals. I believe that, regarding scientific production criteria for taking on the position "associate professor", these requirements have been exceeded.

### III. Teaching activity and popularization of science

Over the past five years, Dr. Shopova has been a scientific supervisor for six successfully defended bachelor's thesis projects and seven reviews that are close to the current competition theme. The candidate's teaching activity over the past few years has been extremely high. This includes conducting lectures, seminars, practical classes, and developing new courses (including online ones). This is an overload which I recommend reviewing in the future.

Mariana Shopova participates in events promoting science with students as International Masterclasses for schoolchildren on Particle Physics topics. She also participates in organizing National Scientific Conferences "Physics, Engineering, Technologies".

### IV. Comparison of the applicant's indicators with the requirements for the occupation of the academic position Associate Professor

Mariana Shopova meets the minimum national requirements (points) for taking on an academic position "associate professor", as accepted by the "Rules for the Implementation of the Law for the Development of Academic Staff in the Republic of Bulgaria".

Group A,	Indicator 1,	min. 50 points,	scored 50 pts
Group Б,	Indicators 3 or 4,	min. 100 points,	scored 150 pts (from Ind. 4)
Group Г,	Indicators 5-10,	min. 200 points,	scored 250 pts (from Ind. 7)
Group Д,	Indicator 11,	min. 50 points,	scored 160 pts

### Conclusion

In drafting this opinion, the following normative acts and documents were taken into account: the „Law on the Development of the Academic Staff in the Republic of Bulgaria” and the Regulations thereto.

In conclusion, Dr. Shopova fully meets all minimum and mandatory criteria mentioned in these documents. Based on this foundation and because of my excellent personal impressions about the professional and ethical qualities of the candidate, **I express a positive opinion for the selection of Dr. Mariana Filipova Shopova as "associate professor" in the field of "4.1. Physical Sciences (Physics of Microcosm, High Energy and Elementary Particles Physics)".**

March 5, 2025

Sofia

/assoc. prof. Mariyan Bogomilov/