

Dear members of the Scientific Jury,

Regarding the defence by the student Elton Shumka of his PhD thesis in Experimental Particle Physics at the University of Sofia “St. Kliment Ohridski”, we would like to inform the Scientific Jury that Elton Shumka is an active participant in CMS RPC activities, including maintenance, operation, and R&D.

Elton Shumka joined the CMS RPC group during his Master’s studies in 2019, and has thus far contributed to a variety of projects. His main contributions as a PhD student, are listed below:

- The development of a Machine Learning based tool for the monitoring of CMS RPC currents quality via anomaly detection. The tool was implemented by utilizing Generalized Linear Models and Autoencoders to model the behavior of RPC currents. Its decision-making logic produces notifications which starting with the ongoing Run-III are helping the operators to anticipate any chamber misbehavior before it leads to operational failure. The work was presented by Elton Shumka at RPC2022 conference at CERN and ACAT2022 in Bari (Italy).
- The integration of the ML monitoring tool in the larger context of the Java-based CMS RPC automation framework. Furthermore, he was involved in the augmentation of this framework by developing various task-processing units, called automata, which broadened the range of studies that can be performed using its output.

Elton’s activities resulted in two publications:

- “Machine Learning based tool for CMS RPC currents monitoring”, published in Nuclear Instrumentation and Methods A journal, DOI: <https://doi.org/10.1016/j.nima.2023.168449>

- “CMS RPC Non-Physics Event Data Automation Ideology”, submitted for publication in the Nuclear Instrumentation and Methods A journal journal.

Elton is the leading author of the first publication and in the main group of authors in the second, and his contributions are significant both in the software development, carrying out the research and preparing the publications.

Sincerely,

Salvatore Buontempo
CMS RPC Project manager

