



**Egle Tomasi-
Gustafsson**

Director of Research

CEA Saclay
DRF/IRFU

e-mail: Egle.Tomasi@cea.fr

Tel. : 0033(0) 1 6908 61 94

Dissertation Council

**For the Defense of Tatiana Lazareva's
PhD**

St. Petersburg State University
St. Petersburg
Russian Federation

Report on the PhD Dissertation

"Study of the yields of hadrons containing heavy quarks in ultrarelativistic collisions in ALICE experiment at Large Hadron Collider"

Submitted by **Mrs Tatiana Valerievna LAZAREVA**

in partial fulfillment of the Degree of Candidate of Sciences in Specialization 01.03.15 —
Physics of Atomic Nuclei and elementary particles, High Energy Physics

The work reported in the thesis has been conducted in frame of the CERN-ALICE collaboration.

The thesis in general is clearly written showing that the candidate understands the motivations of the work and the underlying physics.

The work is focused on the characterization of the properties of the quark gluon plasma, a specific state of quarks and gluons that could exist in hadron matter when submitted to extreme conditions of temperature and pressure. This is the main goal of the ALICE experiment.

The thesis contains a phenomenological part on the physics of heavy flavors and an experimental part on the development of new pixel detectors for the modernized inner target system of the ALICE experiment at LHC. Both parts contain an original contribution valuable to the whole physics community.

The phenomenology concerning the physics of heavy flavors includes the study of jets, in particular of the radial distance between the jet axis and the hadron. The radial dependencies may carry information on the jet formation. Similar analysis have been previously carried on in other LHC experiment, but it is first implemented in ALICE for D^0 -meson and Λ_C -baryon.

Moreover possible $D0$ pair correlations were searched for. A full analysis was performed, developing the method to identify such pairs. If an enhancement of events is evident in the azimuthal angle distribution, it is then diluted in the invariant mass spectrum preventing any quantitative conclusion.

Both analyses are difficult and are limited by the statistics, requiring strict conditions on the data selection. They have been officially endorsed by the ALICE collaboration, constituting a good motivation for further studies, that, if successful, could bring essential information on the heavy flavor production mechanism and stringent test of models and simulations.

The experimental part concerns a complete campaign of tests of the outer and middle layers of the inner tracker system following all necessary steps. Individual modules were tested including voltage response and data reading. After assembling, calibration and synchronization of the modules, the study of radiation damage and of temperature effects were performed. This work, highly valued by the ALICE Collaboration, allowed to characterize the performances of the pixel detectors and validate that the required properties were fulfilled.

The manuscript contains some misprints and a summary of the used acronyms would have been useful. The role played by the candidate and her involvement might have been stressed more in order to gain visibility on her personal contribution, that is, however, witnessed by a number of contributions in conferences and publications where she played a large role.

The ALICE collaboration is formed by more than 2000 participants in 40 countries and 172 institutions 11 of which are Russian Institutes. Russian physicists strongly contributed to the experiment in terms of the hardware and analysis effort. The visibility of the Russian contribution is also given by the quality and number of PhD defenses. Therefore, it is valuable that the education of young people is supported and put forward as a priority.

In conclusion, I am in favor of the attribution to Tatiana Valerievna Lazareva of the Degree of Candidate of Physical and Mathematical Sciences, specialization 1.3.15, Physics of Atomic Nuclei and Elementary Particles, High Energy Physics.

Saclay, February 28, 2023

A handwritten signature in cursive script, reading 'Egle Tomasi-Gustafsson'.

Dr. Egle Tomasi-Gustafsson
Director of Research