

Institute of Quantum Physics and Engineering Technology

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Annex

Nº	Project Name	Head of Project	Project start and end years	Volume (Amount)	Status Finished/Current	Grant Code
1	A search for new physics through jets registered in the frontal area at the CMS experiment and a study of the radiation stability of silicon photomultipliers of the CMS experiment	Alexi Mestvirishvili	2022 -2024	240000 GEL	Ongoing-	FR-22-985

Abstract:

1. The project is dedicated to the research works related to the modernization of the calorimetric detectors of the ongoing CMS experiment at the CERN Large Hadron Collider and the search for new physics in cases containing jets.

The Standard Model of Elementary Particles, developed in the 1970s, is the most complete theory describing the fundamental interactions in the universe. The completeness of the theory was also confirmed in 2012 with the discovery of the Higgs boson by the CMS and ATLAS experiments. However, at the collider experiment, there are processes that cannot be predicted by the standard model. Such processes are the so-called Soft, i.e. low p_t (transverse momentum) processes characterized by jets in the front region (pseudo velocity 2.2 - 5). The mentioned processes have a significant contribution to the final configuration and their experimental study is important. Also, such processes can shed light on physics beyond the standard model, that is, processes if they exist, that cannot be described by the standard model. By 2023, it is planned to increase the intensity of the collider's proton flows and move to the higher luminosity mode (HL-LHC) phase-2. This will allow the CMS experiment to study the properties of the Higgs boson in detail, increase sensitivity to rare decays, and try to detect possible manifestations of physics outside the Standard Model. The transition of the LHC experiment to Phase-2 requires the appropriate modernization of the experiment, caused by the significantly increased particle flow and radiation background, especially in the front area of the CMS detector, so called high pseudo-rapidity region. In that region, the

existing disk-shaped electromagnetic and hadron calorimeters are planned to be replaced by the so-called high-granularity calorimeter.

- 1.-Specific result-
- 2.- Recommendations