

## Referee's report on the prolongation of the COMPASS-II project for 2021-2022

The COMPASS is one of the leading accelerator experiments in the field of studying the spin structure of nucleons and obtaining new data on hadron spectroscopy. The experimental setup built within this experiment was and still remains unique. The data taking of experimental data in the experiment has been started with the most active participation of JINR physicists almost 20 years ago - in 2002. Modernization of its configuration and its individual detectors made it possible to collect data on both a muon beam and a pion beam with energies from 160 to 210 GeV with various polarized and non-polarized nuclear targets.

Since 2010, the second phase of the experiment has been started, this is the COMPASS-II experiment, with a physical program aimed at four main tasks: the study of Drell-Yan processes, the measurement of exclusive meson production reactions (GPD and HEMP), the study of semi-inclusive reactions (SIDIS), and the study of Primakoff reactions. During this stage, new important results were obtained and more than 50 scientific papers have been published. The contribution of JINR engineers and physicists to obtaining these results is significant: development of a physical program and analysis of data from Drell-Yan processes and Primakoff reactions, as well as obtaining results on a new subject of the experiment — measurement of exotic resonances ( $X(3872)$  and  $X^-(3872)$ ). In the framework of the SIDIS research, the JINR group has obtained results on azimuthal asymmetries in reactions with the production of charged hadrons and on the multiplicity of kaons and pions.

One has to be noted that the JINR group is responsible for three detectors: the hadron calorimeter (HCAL1), the muon coordinate system (MW1), and the new electromagnetic calorimeter ECAL0, which was proposed, developed and built mainly by a group of JINR team.

The most important point in the experiment's work plans for 2021 - 2022 is the completion of the COMPASS-II experimental data taking program. This data taking consists of an additional measurement of semi-inclusive lepton reactions with a nuclear deuterium transversely polarized target. The main objectives of the analysis of this statistic are to obtain new data on the Collins and Sievers asymmetries, the parton distribution  $h_1$  (transversity), the deuteron tensor charge, the structure function  $g_2$ , asymmetries in processes with the two hadrons production, and the exclusive vector mesons production.

The participation of a group of JINR at this final stage of the experiment in 2021 is very important and almost crucial for a successful data taking. It includes the preparation and maintenance of a polarized target, a DAQ system, two detectors (ECAL0 will not be used), and the engineering structures of the experimental hall. According to preliminary plans, the COMPASS-II project will be closed after 2022, and work on the analysis of collected data from the COMPASS and COMPASS-II experiments is expected to be continued within the framework of one of the Laboratory's theme. Therefore, work in 2022 on the submitted project will consist of utilization or transferring the detectors to another experiment, as well as continuing to process and data analysis from both stages of the experiment.

The requested resources for the project, including the FTE for the project, correspond to the JINR program and obligations for the final stage of the COMPASS-II experiment.

I would like to recommend that PAC approve JINR's participation in the COMPASS-II experiment for 2021-2022 with the first priority.



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