

Referee report on the prolongation of the project  
“PANDA experiment at FAIR”  
(JINR participation)

The FAIR laboratory, now being constructed at Darmstadt, promises very large variety of studies in the field of hadron and nuclear physics. The PANDA experiment will use the unique antiproton beam of High Energy Storage Ring (HESR) with high luminosity and energy homogeneity. The experiment makes emphasis on research of possible exotic states (hybrids, glue-balls, etc.) and structure of nucleons. It is important to point out that PANDA will complement information about nuclear matter features from analyses of heavy ion collisions, which will be obtained in collider experiments MPD and SPD at NICA/JINR, as well as in the fixed target experiment CBM, also at FAIR.

The JINR group is developing several interesting tasks suggested by our scientists for the PANDA physics program: measurement of proton structure functions (quark and gluon distributions) in a new kinematical region, measurement of elastic and deep inelastic antiproton-nuclei processes (tensor glue-balls and effects of nucleon polarized strangeness and others.) It is also worth mentioning the development of Monte-Carlo generators being used in simulation with PANDARoot (improved FTF and DPM models of Geant4 toolkit).

The hardware contribution of JINR group to the PANDA experiment went through serious changes: from participation in R&D works on several technologies to concentration on two very important items (the solenoidal superconducting magnet and the muon system), and finally, the full responsibility for the muon system. Now the JINR group defines totally the design and production of the PANDA muon system. Keeping in mind that the system is based on Mini-Drift Tubes technology developed in JINR and the previous experience of the group in constructing the big muon systems (D0/FNAL and COMPASS/CERN), one may be sure that JINR group will successfully realize the PANDA muon system project.

The R&D results obtained by the group demonstrate high degree of project readiness. The following achievements should be mentioned: direct calibration of the muon system prototype response to muons and hadrons in full PANDA energy range, observation of antiproton and neutron signals, successful test of FPGA-based digital front-end electronics (for data acquisition system).

Very important feature of this project is high degree of synergy between muon systems of PANDA and SPD/NICA. Most of results obtained by the JINR group during execution of PANDA project are fully applicable to the design of SPD.

The requested resources needed to construct the muon system look adequate to the task. I fully support this project and recommend approving its extension with high priority for the next period.

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