*REFEREE’s REPORT on the PROJECT*

**“PANDA experiment at FAIR (JINR participation)”**

JINR’s participation in PANDA is unique for two reasons. One is that PANDA’s research program covers most of the hot problems in high-energy physics, the second is in the complementarity of the FAIR and NICA’s physical programs.

The Facility for Antiproton and Ion Research (FAIR) in Darmstadt is based on the experience and technological developments of the existing GSI laboratory. The future fixed-target experiment PANDA at FAIR, featuring a modern multipurpose detector, offers a broad physics program with emphasis on various aspects of hadron physics. The antiproton beams of High Energy Storage Ring (HESR) with momenta ranging from 1.5 to 15 GeV/c will make possible the use of a wide variety of physics channels.

The most important part of JINR’s team in PANDA is related to the construction of the detector in the Muon System. PANDA’s Physics program includes, in particular: 1) studies of the nucleon structure; 2) strangeness and charm physics physics, glueballs, hybrids and multiquarks; 4) hadrons in nuclei; 5) developing Monte-Carlo generators.

The JINR group is developing several tasks suggested by JINR scientists for the PANDA, namely: measurement of proton structure functions (quark and gluon distributions) in a new kinematical region, measurement of elastic and deep inelastic antiproton-nuclei processes (tensor glueballs etc.).

The hardware contribution of JINR group to the PANDA experiment has undergone significant changes: from participation in the R&D technologies to the solenoidal superconducting magnet and the muon system.

Among the R&D the following results are worth mentioning: 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. An important feature of this project is the high degree of synergy between muon systems of PANDA and SPD/NICA. Most of the results obtained by the the JINR group are applicable to the design of SPD.

The JINR team is involved in the design and production of the PANDA muon system. The system, based on Mini-Drift Tubes technology developed in JINR and the previous experience of the group will realize the PANDA muon system project. The following issues are worth to mention: direct calibration of the muon system prototype response to muons and hadrons in the whole PANDA energy range; observation of antiproton and neutron signals; successful test of digital front-end electronics (for the data acquisition system).

The presentation of the Project is not free from some technical flaws, raising the following questions and remarks:

1. Overlap/complementarity in the scientific programs and potentials of FAIR and NICA

should be better highlighted;

1. Production of glueballs is among PANDA’s priorities. The advantage of PANDA (if any)

compared to central diffractive production at the LHC is worth to estimate and comment;

1. The main theoretical tool is referred to as the “modified FTC MC”. It should have been better

explained what does “modified” mean as well as compare it with alternative theoretical approaches;

1. Small technical flaws: a) the first appearance of abbreviations should be explained/expanded;

b) units of money (probably EU) miss from Table (“Cost estimate”) on p. 5.

All this does not affect my appreciation of the Project. I fully support it and recommend its extension with high priority for the next period. The requested resources are adequate to the task.



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