

Reference on prolonging project NA61/SHINE in 2018-2020 years (JINR participation)

The offered project is a continuation of successful participation of the JINR group of employees from the Laboratory of High Energy Physics named after V.I.Veksler and A.M.Baldin and from the Laboratory of Nuclear Problems named after B.P.Dzelepov of JINR in the experiment NA61/SHINE at CERN at the super proton accelerator (SPS).

This document gives a review of the physics research programme on relativistic nuclei interactions and describes unique experimental results obtained during the previous three years with active participation of the JINR employees in project NA61. There are also the plans of the joint work in the framework of the experiment for a period of 2018-20120 years.

First of all, now it is necessary to carry out analysis of a huge number the accommodated data, perform modernization of the set-up and provide the performance of the runs in 2018.

The experiment carries out a comprehensive and consequent study of hadron interactions starting from elementary nucleon-nucleon processes till collisions of heavy ions with different atomic numbers and beam energies (20AGeV-158AGeV).

The participants of the Project are co-authors of numerous publications and presentations on this topic which are widely quoted in the world literature.

Further participation in experiment NA61 will allow the physicists to continue systematic studying of nucleus-nucleus interactions starting from light nuclei till the heavy ones including the nuclei of the middle sizes. For this programme the studies at the set-up NA61 are extremely valuable and still beyond the competition due to unique parameters of the facility and availability of nuclei beams at SPS in CERN.

The physical programme of the NA61 at SPS, CERN, includes the following main items on experimental data taking and analysis:

- study of energy dependence of hadron properties in $p + p$ и $p+A$ interactions, as well as in nucleus-nucleus collisions to study characteristics of these processes and search for the proof of the critical point existence in the strongly interacting matter;
- study of hadron properties in proton-proton and proton nuclei interactions to understand better the nucleus-nucleus reactions;
- study of hadron production in hadron interactions necessary for neutrino and space experiments;

From the mentioned above it is evident that participation of the JINR group in NA61 experimental data analysis and new measurements on this set-up are considered to be fruitful and should be recommended to prolong for further 3 years.

Modest financial requests are quite justified to obtain physical results and, as expected, they will be a significant contribution to the research programme of JINR.

It is necessary to emphasize that JINR participation in the experiment NA61 is very important since the research programme in this experiment lies in the main stream of the long-range programme in the field of relativistic nuclear physics at JINR. It is complementary to the studies being carried out at the Nuclotron (JINR), RHIC (BNL) and the obtained experimental results are needed for planning the research at the acceleration complexes of NICA (JINR) and FAIR (GSI).

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A handwritten signature in blue ink, appearing to read 'V.V. Burov', is written over the printed name.