

Reference on project NA61/SHINE (JINR participation)

St-up NA61 operates with heavy ion beams of the Super Proton Synchrotron (SPS) at the energy of 160 GeV per nucleon and uses more light secondary nuclei.

A group of physicists from JINR has been actively participating in this experiment for quite a long period of time. At present the experiment is planned to be continued at this set-up for the coming 3 years.

In the due time the group from the Laboratory of High Energies (LHE) made a 900 channel time-of-flight detector (TOF) which became one of the key detectors to identify charged particles and provide additional information along with measuring the time-of-flight by the time projection chamber (TPC).

The research programme performed the search for phase transition of hadron matter to quark-gluon plasma and deconfinement in the hot dense matter in the collisions of relativistic heavy ions. It is necessary to emphasize that the results of the experiment pushed up some theoretical studies, especially those which refer to the proof of the beginning of deconfinement on SPS at the reduced energy. These studies are planned to be continued further.

Besides, they have stimulated measurements at low energies in experiments STAR and PHENIX at RHIC set-up at the Brookhaven National Laboratory (USA) and realization of priority projects on the programme NICA/MPD at JINR and CBM at GSI.

Project NA61 presents a wide research programme:

- searching for the critical point in strongly interacting nuclear matter; studies of the deconfinement phenomenon;

- Physics at high transversal momenta;

- Analysis of hadron spectra for neutrino experiments and experiments with cosmic particles. In the framework of the ion programme the NA61 plans to carry out a wide range of two-dimension scanning in dependence on the size of the system and collision energy to search for the critical point. A complex study of the phase diagram of strong interaction of matter to search for the proof of the critical point is an extremely important task.

There is no doubt that the JINR contribution is important for operation of the developed time-of-flight system and creation of a new time-of-flight system based on RPC detectors.

The JINR employees have contributed significantly to the measurements and analysis of the processes with light nuclei production. This part of the experiment was totally a responsibility of the LHEP group from data taking, data analysis, and publication of the physical results.

The collaboration in the framework of NA61 is very efficient and simultaneously fruitful for both CERN and JINR.

Continuation of this collaboration will provide a deeper understanding of the nuclear matter properties at relativistic energies.

The JINR participation in experiment NA61 is also very important for training of young scientists at JINR for the future ambitious project NICA, whose physics programme contains complementary tasks being solved in the framework of

project NA61. The experience of work of the JINR team with different detectors on SPS ion beams at CERN can be hardly overestimated as well as their participation in data processing and analysis.

From the mentioned above it follows that participation of the JINR group in experiment NA61 is fruitful. It is worth recommending the JINR group participation to be prolonged in project NA61 for the coming 3 years (2018-2020). The relatively modest financial requests are fully justified by good physical results which, no doubt, would promote the growth of the scientific reputation of the Institute. Besides, the expected results are sure to be recognized a significant contribution to the development of the long-term research programmes in the field of heavy ion relativistic physics at JINR in Dubna.



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