Report on the proposal "Participation of JINR in the Physics Research Programme at the BEPCII/BESIII"

The BES-III experiment at BEPC-II electron-positron collider, the only existing tau-charm factory in the world, is the world leading experiment in the domains of tau- and charm-related physics and low energy QCD. The BES-III experiment has already collected the world largest data samples at the J/ψ, ψ(2S), ψ(3770) and large data sample in the wide energy range up to almost 5 GeV in center of mass. There are plans of BEPC-II upgrade with the goals of luminosity gain and extension of accessible energy range, which will allow BES-III experiment to keep its leading position for another decade.

JINR physicists propose to continue their participation in the BES-III. The JINR team has already participated in data taking, data analysis and software development and obtained a number of interesting results. At the next stage of collaboration the JINR team propose to focus on the following topics.

1. Study of radiative J/ψ decays and search for the scalar and tensor glueballs. The lattice QCD calculations predict the light glueball states with masses around 2 GeV. Previously, the JINR team showed evidence for such scalar state based on analysis of BES-III data. The further study of now available large data sample of radiative J/ψ and ψ(2S) decays would be very important in confirming the possible scalar glueball observation and searching for the predicted tensor glueball.

2. Measurement of the cross section of the process $e^+e^- \to \pi^+\pi^-\eta$ in the energy range up to 3 GeV. The JINR group has already performed an analysis of this final state in the energy range from 2 to 3 GeV using energy scan technique. The analysis of now available high energy data using ISR technique will allow to do an independent measurement of this cross-section in the wider energy range, staring from the threshold. It will also be interesting to compare the results with measurements at VEPP-2000 collider at Novosibirsk, where the same cross section is being measured near the threshold using energy scan technique.

3. Study of inclusive charmonia production. The BES-III has collected unique large data sample at energies up to 4.95 GeV, which allows to measure the inclusive cross section and polarization of J/ψ and ψ(2S) production. The results are very interesting for the development of models of charmonia hadronization, as well as the search for exotic charmonium-like states. The results will also provide an important input for the data analysis at heavy-ion and fixed target experiments.

4. Study of c-quark fragmentation function, which will practically be the first measurement in the energy range of BEPC-II.

5. Continue on the development of the software for the data analysis, with particular focus on the development of tracking algorithms based on deep neural networks.

The proposed research program is quite diverse and it will allow JINR team to be one of the leading teams in the collaboration. There is synergy of the proposed research programs with other directions of research, in particular, with NICA project at JINR and Super charm-tau factory at Sarov/Novosibirsk.

I'd like to strongly support this proposal.

Ivan Logashenko
Deputy Director, Budker Institute of Nuclear Physics SB RAS

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