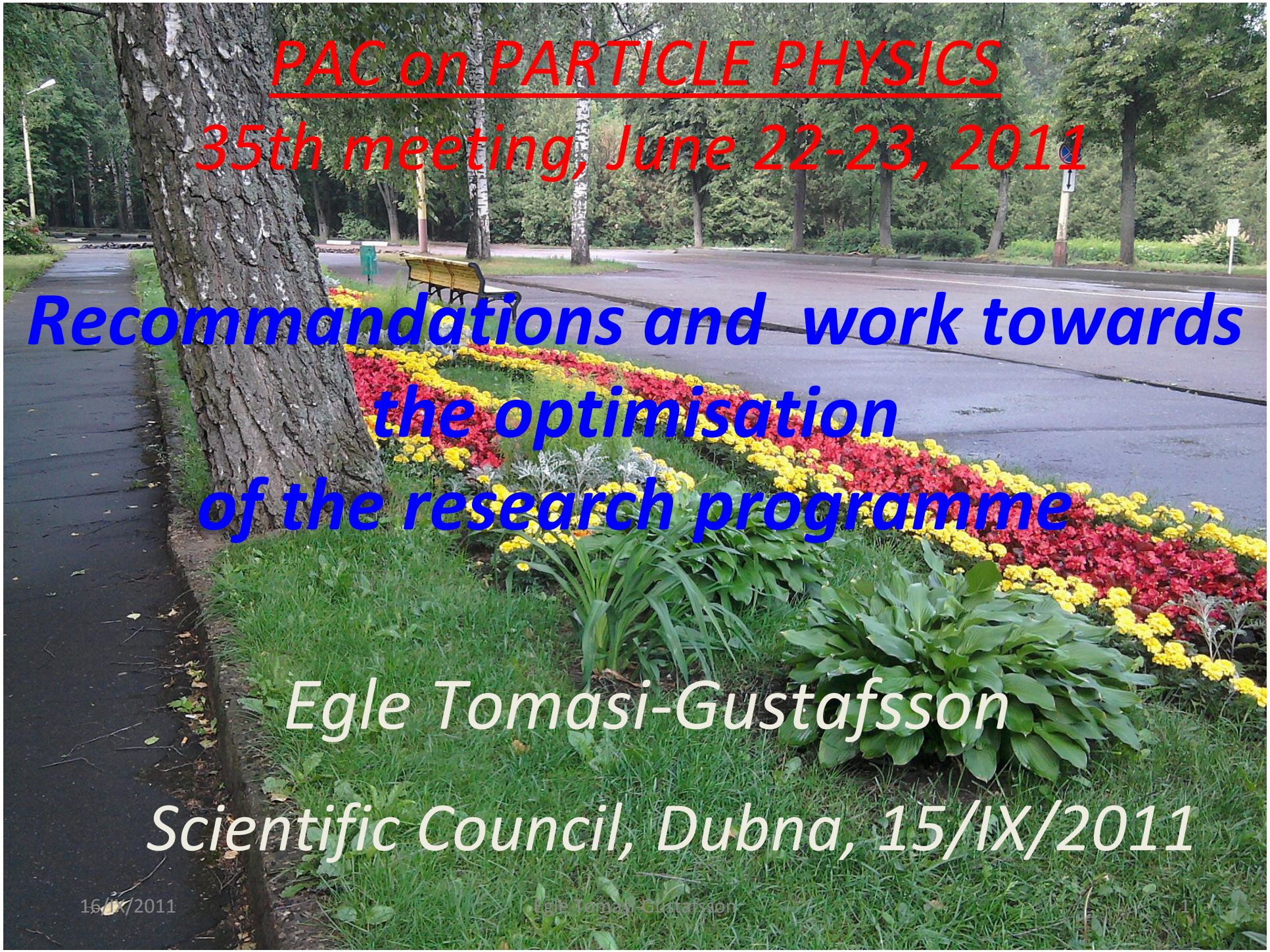

PAC on PARTICLE PHYSICS

35th meeting, June 22-23, 2011

Recommandations and work towards the optimisation of the research programme

Egle Tomasi-Gustafsson

Scientific Council, Dubna, 15/IX/2011

Recommendations on the Nuclotron-NICA projects

G. Trubnikov

- The PAC appreciates the active progress in designing and developing elements and prototypes of the NICA complex, …. superconducting magnet prototypes, …the ion and polarized particle sources ….designing the collider lattice.
- The PAC welcomes the productive cooperation with IHEP (Protvino) and the State Nuclear Centre (Sarov) on Heavy-Ion Linac, with the Budker INP (Novosibirsk) on RF, cooling and magnetic systems, with the State Specialized Design Institute (Moscow) on the TDR, with CERN, GSI, IKP FZJ.
- The PAC concurs with the recommendations of the NICA Machine Advisory Committee taken at its meeting on 7 June 2011.

…international call for experiments at the Nuclotron-M

Recommendations on the progress towards the NICA White Paper (I)

A. Sorin

The PAC appreciates the significant progress of this work

- *New editorial section* summarizing the main physical phenomena and the main parameters of the NICA facility including Nuclotron-NICA extracted beams.
- *broad international involvement* in the preparation of this document,
- The PAC recommends *continuation of this work* including the traditional *round-table discussions* of the future research programmes at NICA/MPD and Nuclotron-NICA.

Recommendations on the MPD project

V. Kolesnikov

The PAC appreciates the significant progress achieved in designing the MPD detector, in developing new technologies for its elements, and in simulation and feasibility studies. The beginning of prototyping of the MPD subsystems is also noted.

Recommendations on future scientific activities and proposal of experiments at Nuclotron-NICA

V. Kekelidze

Research programme …using the Nuclotron extracted beams

The PAC endorses this programme and considers its realization in the announced terms to be extremely important. Taking into account the *intensive schedule* for the commissioning of the experimental set-ups on the Nuclotron extracted beams, the PAC *recommends that the project to study the hot dense baryonic matter be presented at the next PAC meeting.*

Recommendations for new projects (I)

NA61/NA49 (G. Melkumov) : heavy-ion, neutrino and cosmology

In view of the important results which are foreseen in the future, the PAC reccommends

1)unification of the two JINR groups

2) should be reinforced by young scientists and PhD students.

…. the PAC looks forward to the implementation of this recommendation and to the presentation of this project at its next meeting *before final approval*.

Recommendations on the projects proposed for continuation (II)

- D0 (G. Alexeev)

- CDF (V. Glagolev).

extension until the end of 2014, with first priority.

Recommendations on the projects proposed for continuation (III)

- The PAC takes note of the report on the TUS project presented by L. Tkachev and recommends extension of JINR's participation in this project until the end of 2014, with first priority.

Recommendations on the projects proposed for continuation (IV)

- Daya Bay (D. Naumov)

…..recommends extension of JINR's participation in this project until the end of 2014, with first priority.

V. Recommendations on the JINR contributions to LHC experiments

- Scientific results of the CMS, ATLAS, and ALICE experiments presented by S. Shmatov, A. Cheplakov, and M. Vala.
- Emphasizes the scientific significance of the results being obtained with the active participation of JINR physicists
- Encourages the groups to strengthen their efforts in the data analysis and in the presentation of the results at international conferences.

V. Recommendations on the JINR contributions to LHC experiments

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- Future reports *should focus on specific contributions and responsibilities* of the JINR groups and include :
  - a list of talks given at international conferences,
  - a list of analysis notes submitted to the collaboration,
  - a list of PhD students,
  - a list of management duties and conveners of data calibration and analysis groups.

VII. Scientific reports

- The PAC notes with interest the report "Muon g-2: current status " presented by *A. Dorokhov* and thanks the speaker.

- The PAC notes the report "Experimental study of strange matter production in heavy-ion collisions at the Nuclotron" by *V. Ladygin*, and invites him to present a proposal at the next meeting.

Recommendations on activities approved for completion in 2011 (I)

•THERMALIZATION *(E. Kokoulina- SVD-2 Collaboration).:* multiple particle production by the in *pp* interactions with high multiplicity

…continuation of this activity within the SVD-2 Collaboration under theme 02-1-1086.

•NA49 *(G. Melkumov)*

….closure of this project (→NA61/NA49).

•BECQUEREL (P. Zarubin) peripheral fragmentation of light nuclei in nuclear emulsions**:**

….continuation of this activity under theme 02-1-1087.

Recommendations on activities approved for completion in 2011 (II)

Theme: "Physics and Engineering of Feedback Systems in Synchrotron" *(V. Zhabitsky) :*

…all the systems for the LHC Damper were designed and constructed

….developed jointly by CERN and JINR, built by JINR and by Russian Industry, …

The LHC Damper is used routinely during injection, ramp, and collisions.

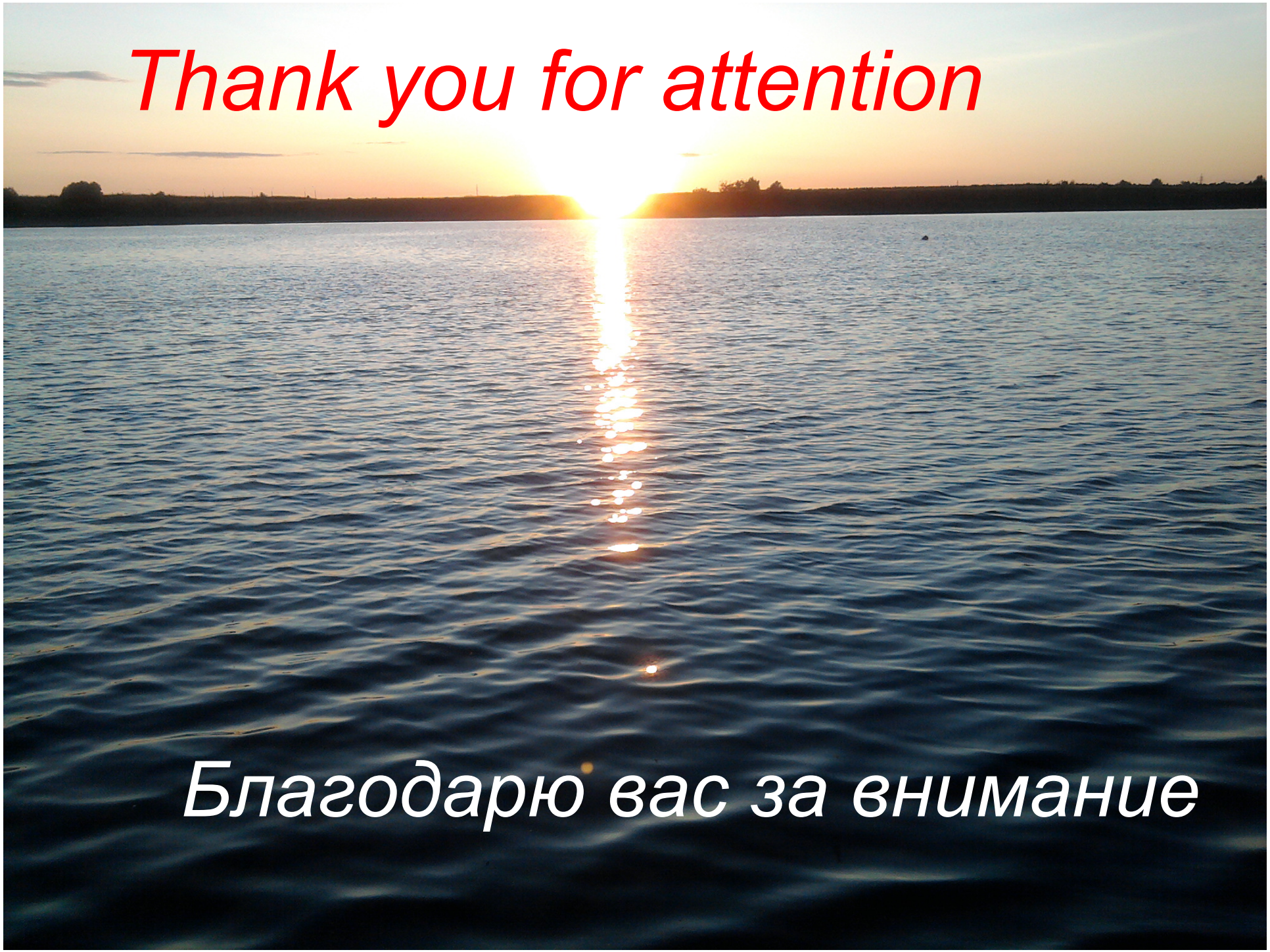
The PAC highly appreciates the results of this successful activity, which received the JINR First Prize in 2010, and recommends its closure due to the achievement of the goals of this project.

VIII. Poster presentations by young scientists in the field of particle physics research

The PAC notes with interest the poster presentations in particle physics presented by young scientists from VBLHEP and LIT. It selected the poster "Design of the Nuclotron booster in the NICA project" presented by *A. Tuzikov* (VBLHEP) to be reported at the Scientific Council session.

IX. Agenda (next meeting jan 23-24)

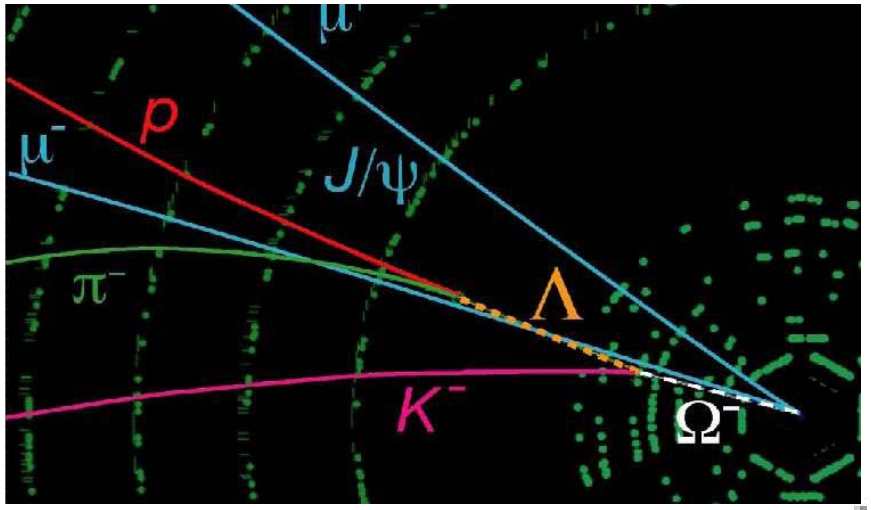
- Consideration of new projects (including NA61/NA49) and themes
- Reports and recommendations on the projects to be completed in 2011
- Report on progress towards the NICA White Paper
- Status report on the Nuclotron-NICA and MPD projects as well as SPD proposal
- Report on plans for future scientific activity and proposals of experiments at the Nuclotron-NICA complex
- Reports on the scientific results obtained by the JINR groups in the LHC experiments and plans for their future upgrades.


Thank you for attention
Благодарю вас за внимание

D0

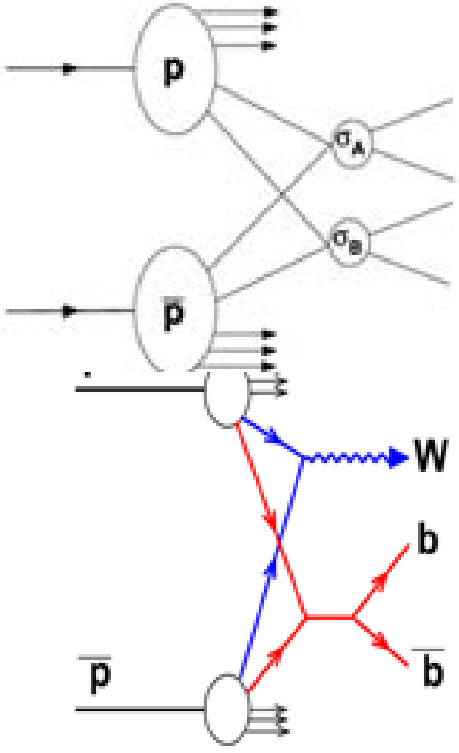
- Achievements:
  - First observation of cascade double strange baryon Ω_b
  - multiple parton interactions in extended kinematical region =>Estimation of the double parton background to Higgs production at Tevatron.
  - The instrumentation technique (MDT detectors and corresponding electronics) developed for the D0 project => applied for the muon system proposed for the SPD detector at NICA.
- Request
  - 40 kE/year on 3 year (25 KE travel+15 kE material)
- Programme
  - Finalize studies in B-physics and QCD
  - New physics (through multiple parton interactions)
  - Parton distribution functions in a new kinematical region

D0

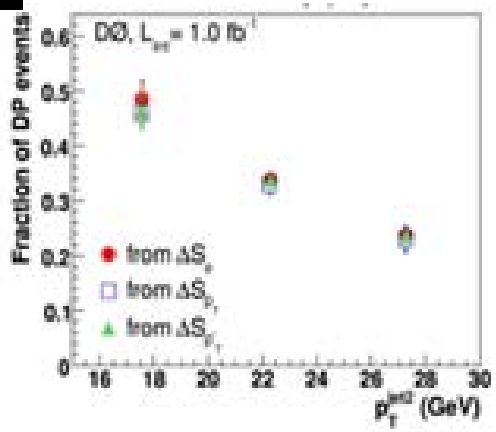


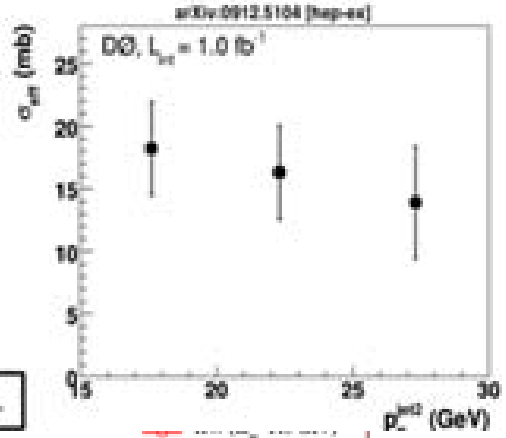
Run 203929, Event 22881065,
M(J/Psi+Ω) = 6.158 GeV/c2

PRL 101, 232002 (2008)

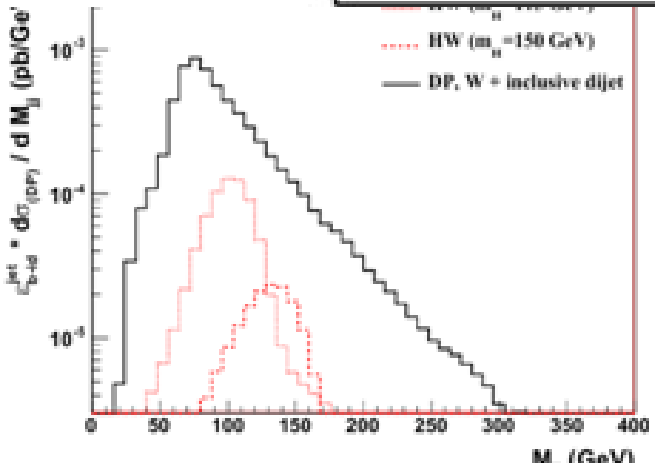


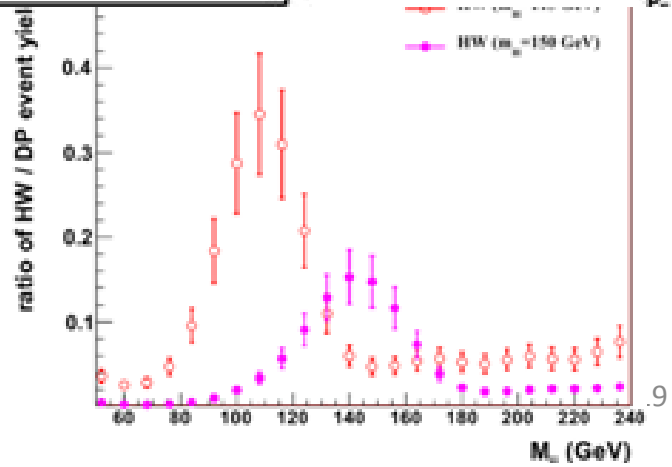
$$\sigma_{DP} = \frac{\sigma_A \sigma_B}{\sigma_{eff}}$$





Fraction of DP events decreases as expected.





CDF

- Results:
  - Top Mass measurement
  - Very High multiplicity processes(thermalization phenomena)
- Contribution:
  - Large Scintillator Counters of the CDF muon trigger 1 for heavy quark physics.
  - Si-strip complex for secondary vertex trigger recognition 2 leading JINR responsabilities
  - Data collection and analysis
- Request (40 KE/year on 3 years)

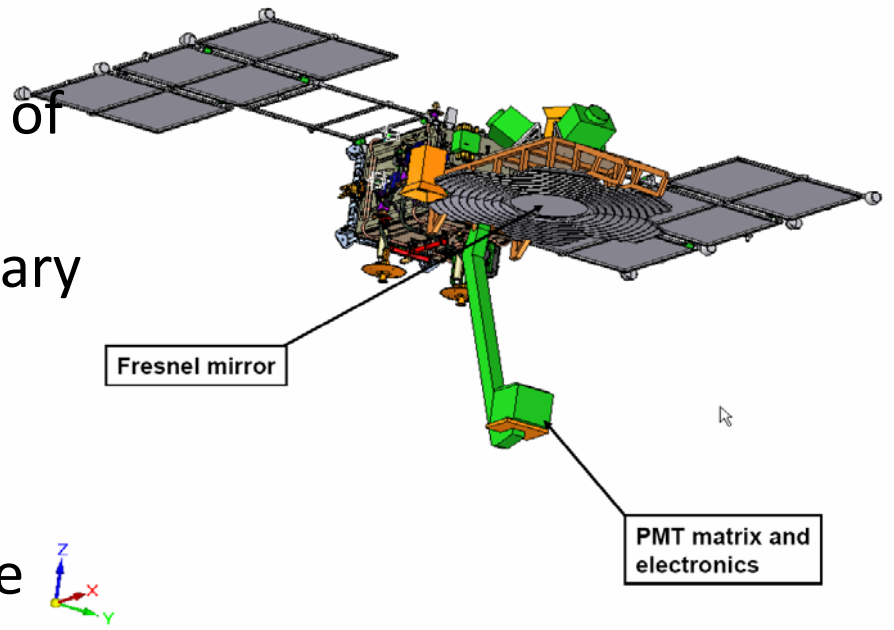
Daya Bay

- Contributed to:
  - Gd-loaded scintillators, conception, creation and optimization, production technology;
  - new method of PPO (LS fluorene) synthesis, production and commissioning (300 kEuro);
  - investigation of comsogenic background
  - design of anti-muon active veto system,
  - in MC of complex processes associated with cosmic muons.
- Plans :
  - determination antineutrino detector energy response;
  - determination of number of proton targets in LS,
  - study of backgrounds;

=> First measurement of the parameter θ13

TUS

- UHECR study by the measurement of EAS fluorescent radiation: observation of the full sky for primary particle arrival directions.
- Astronomy and astrophysics with particle with energies 10^{20} eV, extending, the measurement of the energy spectrum of the cosmic radiation beyond the (GZK) cut-off.
- High energy neutrino astronomy. Phenomena intrinsic to the Earth‘s atmosphere



TUS

- TUS R&D completed in 2010.
- Flight TUS apparatus production is in preparation: TUS mission is planned at the end of 2011 for 3 years of data taking.
- The main JINR activity from now is to produce a set of the program packages including the event simulation with expected optical parameters, programs for on-board data processing and off-line physical analysis.
- Full scale technological prototype of the Fresnel mirror was produced and tested in 2010 according to space qualification requirements - successfully tested at temperature $\pm 80^{o}$C and pressure 0.02 – 1.0 atm
- Next step: measurements of the Fresnel mirror system and evaluation of systematic uncertainties.