

**I. Preamble**

1. The members of the Programme Advisory Committee for Nuclear Physics honoured the memory of Professor Tsvetan Vyllov who, as Vice-Director of JINR, was the coordinator of the PAC for Nuclear Physics and the PAC for Condensed Matter Physics for many years. He has made outstanding contributions to the development of JINR and of its cooperation with research centres of the Member States and other countries.

The members of the Programme Advisory Committee for Nuclear Physics paid special honour to Professor Yuri Gaponov who was extremely successfully working in this PAC for a long period of time. He is missed very much. His original and kind personality will always be fondly remembered.

Both colleagues were commemorated with a minute of silent appreciation.

2. The Chairperson of the PAC, W. Greiner, welcomed the PAC members, the ex-officio members from JINR and the invited experts, and presented the implementation of the recommendations taken at the previous meeting.

JINR Vice-Director M. Itkis informed the PAC about the Resolution of the 106th session of the Scientific Council (September 2009) and the decisions of the Committee of Plenipotentiaries (November 2009).

The PAC is pleased to note the decision of the Committee of Plenipotentiaries (CP) to increase the JINR budget by 20.7% in 2010. The CP also emphasized the importance of the annual increase of the budget in 2010–2016, planned according to the budget forecast approved by the CP, for achieving the milestones of the development strategy for the next seven-year period.

The PAC notes that the CP accepted the concept of the Seven-Year Plan for the Development of JINR 2010–2016, based on concentration of resources for updating the accelerator and reactor base of the Institute, and approved this plan taking into account the recommendations of the PACs and the Scientific Council.

**II. Results of the implementation of the “Programme of the Scientific Research and Development of JINR (2003–2009)” and the JINR Programme of Nuclear Physics Research for 2010–2012**

The PAC congratulates the Directorate and the international staff of JINR on the complete and successful realization of the previous seven-year scientific programme and highly appreciates the valuable contributions to the advancement of science and

technology at the world level that have been achieved as part of this programme. The major milestones achieved in implementing this programme provide a solid basis for further scientific and technological development of JINR.

The PAC takes note of the report presented by JINR Chief Scientific Secretary N. Russakovich and endorses the proposed main lines of the JINR Programme of Nuclear Physics Research for the period 2010–2012 in accordance with the new seven-year JINR development plan.

### **III. First experiments at IREN-1**

The PAC heard with interest the report on the first test measurements performed at the improved IREN-1 neutron source. The achieved energy resolution of the facility is good and permits reaching the new higher level of neutron resonance identification.

Recommendation. The PAC recommends the acceleration of the upgrade of IREN-1 to rapidly reach the higher intensity of the source and to make it really comparable with powerful neutron sources in Europe. It also recommends that additional funding be provided for supplying the necessary equipment for the next phase of IREN and its full completion as well as for modernization of the experimental instruments.

### **IV. Experiments on the synthesis of element 117**

The PAC heard with great interest the report on the results of the experiment dedicated to the synthesis of element 117 in the  $^{48}\text{Ca}+^{249}\text{Bk}$  reaction. The PAC congratulates the staff of the Flerov Laboratory on the discovery of element 117 and new isotopes of elements 115, 113, 111, 109, 107, and 105. The discovery of chains of two neighboring isotopes emphasizes the importance of the odd-even and odd-odd effect for such heavy nuclei. It is in fact especially interesting that the odd-odd chain (3n channel) neighboring to the odd-even chain (4n channel) is twice longer (6  $\alpha$  particles).

Recommendation. The PAC suggests considering, during the modernization phase of the U400 cyclotron complex, the possibility to develop a uranium beam of large intensity ( $\sim 10^{12}$  p/s). This will allow the exploration, in further perspective, of alternative pathways to extend the nuclear chart towards even heavier and longer living nuclei.

The PAC looks forward to further discussions of the status of the operating basic facilities and of projects of new experimental physics instruments of FLNR at its future meetings.

## **V. Status report on the MASHA set-up**

The PAC discussed in detail the current status and prospects of the MASHA spectrometer presented at this meeting. The PAC recognized with interest the plans for developing a gas ion-catcher in addition to the existing ISOL type ion source.

Recommendation. The PAC strongly supports the intention of the FLNR Directorate to start experiments with the MASHA mass spectrometer in 2010. The PAC recommends the installation of a gas ion-catcher and optimization of its properties for use at the MASHA set-up.

## **VI. Status report on the GABRIELA set-up**

The PAC heard with great interest the current status and prospects of the VASSILISSA separator and the GABRIELA set-up (7 Ge detectors and a large number of Si strip detectors), based on the joint JINR–IN2P3 (France) collaboration programme dedicated to the study of nuclear structure and nuclear reaction mechanism of heavy nuclei and superheavy elements. The scientific programme started in 2004, and 5 full-scale experimental campaigns (1 month of beam time per year) were completed with high-intensity beams of  $^{48}\text{Ca}$ ,  $^{22}\text{Ne}$ , and  $^{40}\text{Ar}$ .

The ongoing programme will highly benefit from the upgrade of the VASSILISSA separator started in 2008, from modified Ge detectors with higher multiplicity as well as from the use of actinide targets in asymmetric systems.

The PAC highly appreciates both the number of publications and the considerable progress achieved in the course of modernization of the VASSILISSA separator being performed in close collaboration with IN2P3.

Recommendation. The PAC strongly supports the approval of the proposed upgrade of the GABRIELA and VASSILISSA complex with high priority.

## **VII. Visit to FLNR**

The PAC members are grateful to the Directorate of the Flerov Laboratory of Nuclear Reactions for the organization of a visit to the laboratory to see the experimental equipment, in particular the accelerator complexes. Great changes in the appearance were noted in many sections of this laboratory. The good status of the equipment and the good organization of the research at FLNR helped very much the members of the PAC to understand the excellent results produced in the laboratory, demonstrated very recently by the synthesis of the new element 117.

### **VIII. New project “Detector of reactor antineutrinos based on solid-state plastic scintillators” (DANSS)**

The PAC heard with interest the proposal on the project DANSS whose goal is to develop and build a solid scintillator-based antineutrino detector. This detector can be used for real time monitoring of reactor parameters as well as for fundamental investigations of neutrino properties (neutrino magnetic moment, oscillations, etc.). Furthermore, the PAC recognizes a great potential for the application of this technique in non-proliferation issues. The PAC was pleased with the comprehensive presentation and the quality of the proposal description provided well in advance.

Recommendation. The PAC strongly recommends the approval of the DANSS project with high priority to be implemented under the theme “Non-accelerator Neutrino Physics and Astrophysics”.

### **IX. Scientific report “Study of the nuclear fusion reactions in a $pt_\mu$ system with the muon catalyzed fusion method”**

The PAC heard with interest a status report on the theory of muon catalyzed  $pt_\mu$  fusion. This process was studied extensively at PSI in the 1980s, but the  $e^+e^-$  channel was missed which would clarify the strength of the E0 transition and would shed light on the reaction mechanism of four-body systems.

Recommendation. The PAC recommends the development of an experimental project to study  $pt_\mu$  fusion by the Mu-CATALYSIS collaboration (Dubna, VNIIEF Sarov, Delft University, INP Cracow, ITEP Moscow).

### **X. Poster session**

The PAC was pleased with the presentations of new interesting results in intermediate energy physics obtained in the ANKE and EDELWEISS experiments and in the theoretical investigations of alpha-cluster and dinuclear models. The PAC congratulates the young physicists for their results, the demonstrated ability to work in top-teams of nuclear physics, and encourages them to continue their activities.

### **XI. Next meeting of the PAC**

The next meeting of the PAC for Nuclear Physics will be held on 17–19 June 2010. Its tentative agenda will include:

- Reports and recommendations on themes and projects to be completed in 2010
- Consideration of new projects and themes

- Poster presentations of new results and proposals by young scientists in the field of nuclear physics research
- Reports dedicated to the 70th anniversary of the discovery of spontaneous fission
- Scientific reports.

A handwritten signature in black ink, reading "Walter Greiner". The signature is written in a cursive style with a horizontal line above the "er" in "Greiner".

Walter Greiner

Chairperson of the PAC