

Workshop on Neutron Science

October, 16-18 2013

Workshop venue **PNPI NRC "Kurchatov Institute" Gatchina**

Chairmen: *Mikhail V. Kovalchuk and Sebastian M. Schmidt*

CONCLUSIONS

Under the chairmanship of Mikhail Kovalchuk, representing the Kurchatov Institut and Sebastian Schmidt, representing the Forschungszentrum Jülich an exploratory workshop was conducted, in order to identify routes of cooperation between the Russian PNPI NRC center in Gatchina and German Neutron Centers (GNC). Representatives of the following institutions participated: PNPI NRC, JINR, FZJ, ILL, HZG, TUM, KFN. The meeting reaffirmed the strengths of all parties and the mutual benefits of much closer co-operation with the ultimate aim of developing the PIK Reactor in Gatchina to be a world-class center for neutron science. The very open and fruitful workshop that discussed on the one hand the scope of German neutron activities and on the other hand presented the Russian plans for the exploitation of the new research reactor PIK in Gatchina came to the following conclusions:

- Excellence in materials science is needed to ensure a country's economic competitiveness and to enable innovation. For Europe and in particular Russia to have important capabilities in materials research, it must have world-leading neutron science facilities. Neutrons are a key scientific tool, especially for studying hydrogenous materials such as polymers, engineering materials, complex fluids and biomaterials, magnetism and magnetic nano-materials that are e.g. essential in information technology and very generally dynamic processes that govern materials behavior and functioning.
- All participants agreed about the high potential of PIK for such research. This concerns all fields of materials science from hard to soft materials from the subtleties of nano materials to biomedical and pharmaceutical molecules. For that purpose PIK provides high flux beams of cold as well as thermal neutrons. A proper optimization of beam extraction, neutron guide systems and instrumentation will make PIK a world leading neutron source that will add essential capabilities to the Russian capacity in materials science and will be an important part in the European network of neutron facilities.
- To reach this goal, a general exploitation concept of PIK needs to be developed and important investments in human resources and instrumentation will be indispensable. In particular the buildup of a critical mass of well-educated scientists and engineers will be of foremost importance, a task that may be accomplished by intense cooperation of PIK with German and international neutron facilities. The design and construction of world-class instruments will strongly benefit from that workforce and could initially be supported by conceptual and engineering support through collaborating facilities.

With that a number of cooperation areas are identified:

- i. Education and training of (young) Russian scientists and engineers in neutron instrumentation and operation at the different German neutron facilities, also in cooperation with Russian and German universities
- ii. Development of a general optimized concept for the scientific exploitation of PIK involving senior experts from PIK and German facilities
- iii. Development of neutron delivery systems for the reactor PIK as well as research and development of modern methods of neutron detection
- iv. Development and construction of neutron polarization and neutron polarization analysis devices
- v. Design and construction of new and advanced neutron scattering instrumentation.
- vi. Modernization of existing instrumentation
- vii. Development of a user access program and proposal system.

Further specific cooperation projects could be envisaged:

- modern methods of neutron data treatment, including visualization, graphic user interfaces, common data format and data treatment software
- access to existing and future PhD-programs, including Russian universities affiliated with NRC "Kurchatov Institute" (St. Petersburg State University, Moscow State University, etc.)
- access to MLZ at the FRM II reactor in Garching for methods and instrumentation development

In order to achieve the above goals the following steps need to be implemented:

1. The creation of an advisory committee (and later on topical subcommittees) to discuss in greater detail the scientific program to be developed for the PIK reactor to establish a world-class suite. Such discussions should commence within the next year, and be organized around specific scientific research direction or technology bringing together scientists and engineers in specific fields.
2. The collaboration in determining the characteristics of the instruments and infrastructure to be built and manufacturing of the instruments and infrastructure for neutron researches at the PIK reactor.
3. The PNPI NRC KI would discuss with GNC the detailed design and construction of such instruments, components and infrastructure and make decisions thereafter. In each case the instruments will be designed and built with an important contribution from Russian scientists and engineers, who will be seconded to the respective GNC.

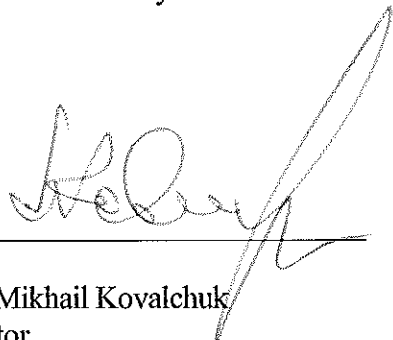
4. The commissioning of the instruments built or modernized by GNC will take place by joint effort between PNPI NRC KI and the respective GNC

5. GNC in cooperation with German universities will host Russian PhD students for training in neutron science or technology each year; their travel and living expenses will be paid by the Russian partner. In particular Russian postdocs will be seconded typically for 2 years to GNC in order to participate in instrument operation, upgrades and user service.

6. An efficient exchange program for experts from administration should be setup additionally.

7. NRC KI will develop a roadmap that outlines how it proposes to be developed over the next 15 years so that there is a clear vision of how its technical capability and capacity will evolve. This is key to understanding how it will contribute to an evolving landscape for neutron research centers in Europe and Russia over this period.

8. Scientists from GNC will participate in the education process of young Russian scientist concerning with the instrument construction, particularly via the chair for neutron and synchrotron scattering at the St. Petersburg State University.



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Date: 6/12/13

Dir. Kovalchuk

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