

Restart of IBR-2 reactor after modernization and first experiments at its neutron beams

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IBR-2 reactor is the main basic facility at JINR dedicated to condensed matter research. The IBR-2 operates as a fast pulsed reactor. Its main distinctive property, which makes it differ from other nuclear reactors, is the mechanical modulation of the reactivity by means of a movable reflector. Producing a record neutron flux of 10^{16} n/cm²/s in the pulse, the IBR-2 reactor is also an economical and relatively inexpensive facility. Activation of the equipment and the burn up of the active core are slow due to the low mean power. The IBR-2 reactor is mainly used for investigations in the fields of condensed matter physics (solids and liquids), biology, chemistry, Earth and materials science. Operating experience has shown that it is a very effective neutron source; in most areas of application it compares well with the best neutron sources based on proton accelerators. At present, this experience is of special importance in connection with the increasing interest in long-pulsed neutron sources.

IBR-2 operated successfully from 1984 until 2006. On December 18, 2006 reactor was shut down for modernization. Main directions of reactor modernization include:

1. A compact reactor core.
2. Lower speed of rotation of the main movable reflector, counter rotation of rotors, use of a nickel alloy as a reflector material.
3. Use fuel pellets configuration that will allow increasing the depth of fuel burn up to 9%.
4. New design of safety system which improves its parameters.
5. Creation of easily replaceable moderators, their optimization for each neutron beam. Development of the cryogenic moderators with palletized moderator material.

Dismantling of the old reactor parts and installation of the new equipment was completed in 2010. Brief history of the work will be outlined in the report.

In February 2011 loading of fresh fuel to the reactor core was completed and physical start-up has began. After successful realization of this stage in June, the power start-up program was fulfilled resulting in increase of the mean reactor power to the design value of 2 MW (peak power of the reactor reached 1850 MW). During the power start-up several instruments around the reactor started to operate in a test mode. Beam intensities at different beam ports have been measured and some real experiments were realized, including structure studies of advanced materials, engineering diagnostics of industrial components, neutron activation analysis, characterization of biological membranes, study of nanostructured materials, etc. Some examples of these researches will be presented in the report.

In November 2011 first call for proposals was launched with the deadline 11 January 2012. The call resulted in 106 applications from 17 countries

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(including 3 from Argentina!). Successful proposals will be realized by the end of 2012 when the operating license will be obtained and regular IBR-2 operation will start.