THE IBR-2 PULSED REACTOR

Information on the operation of the IBR-2 research nuclear facility

The IBR-2 research nuclear facility is operated under Rostekhnadzor license № GN-03-108-2614 of 27.04.2012 and Rostekhnadzor license № GN-03-108-2871 of 30.04.2014.

Since January 2015 regular IBR-2 cycles of scientific experiments have been carried out at a power of 2 MW with the CM-202 moderator operating either in the water or cryogenic mode in accordance with the schedule of the physical start-up of the cold moderator.

Table 1 presents data on the IBR-2 operation for physics experiments.

№ cycle	Period	Reactor operation at power, hr	Reactor operation for physics experiments, hr	Moderator type
1	19.01-02.02	331	326	water
2	11.02-21.02	237	230	cryogenic
3	11.03-21.03	264	240	cryogenic
4	30.03-16.04	350	330	water
5	13.05-27.05	342	336	water
6	28.09-09.10	271	264	water
7	19.10-02.11	275	267	water
8	09.11-23.11	331	326	water
9	07.12-21.12	333	327	water
TOTAL		**2734**	**2646**	

Information on the activities under the project “Complex of cryogenic moderators of the IBR-2 reactor”

1. The cryogenic moderator CM-202 operated at power during the 2nd and 3rd cycle (February and March). In the 2nd cycle – for 9.4 days (470 MW/h), in the 3rd cycle – for 10.4 days (510 MW/h), after which the operation of CM was suspended for carrying out construction and assembly work on the preparation of the premises for installation of the cryogenic facility "Linde". The cryogenic facilities KGU-500 and KGU-600 manufactured in 1972 and 1986, respectively, and being well beyond their expected service life were dismantled.
2. In October 2014 an agreement on the installation of KGU-1200/10 "Linde" in bldg 117 of the IBR-2 reactor was concluded with GSPI. Works on the preparation of the premises for the assembly of the facility units are in progress in accordance with the GSPI project.
3. A contract was signed with NIKIET on the development of a detailed design of an inclined channel moderator CM201 (neutron beamlines 4-8). The completion of the project is scheduled for the middle of 2016, after which the moderator will be manufactured at a specialized plant (SPA "Atom" or NIKIET) until the middle of 2017.
4. On November 3, 2015 the equipment of the facility "Linde" was delivered. The assembly, installation and commissioning of the facility will be started immediately after the completion of construction works and scheduled to be completed by July 2016.
5. Upon completion of the adjustment of the facility it is planned to carry out tests: a) on the stand; b) simultaneously on the stand and with the moderator to determine the cooling capacity of the facility "Linde" and the working temperature range.
6. In the 2nd half of 2016 it is planned to continue bench testing of promising versions of cryogenic moderators, such as a moderator with triphenylmethane, moderator with replaceable substance, etc.

7. In accordance with the plans for 2016 it is projected to finalize the design of CM-203 (beamline 2).

IREN FACILITY

In 2015, the IREN facility operated for experiments for 237 hours. In April-May 2015, at the IREN facility a group of staff members of VBLHEP and FLNP together with the specialists from «Dawonsys» (Republic of Korea) carried out the final stage of assembling and adjustment of two sets of new modulators to power pulsed klystrons — SHF sources of power of the LUE-200 accelerating system, which is a driver of the pulsed source of resonance neutrons. Commissioning of the modulators capable of generating electrical load pulses with a pulse power of up to 180 MW and an average power of 180 kW will allow doubling the average energy of accelerated electrons and providing operation of the accelerating system with a cycle frequency of up to 120 Hz, which will increase the power of the accelerated beam by more than one order and correspondingly the neutron yield from the irradiated target of the IREN source.

***Fig. 1**. Assembling of modulators and klystrons; the modulator during tests.*

Experiments have been conducted to compare the neutron yield from tungsten and uranium nonmultiplying targets. The accelerator operated with one accelerating section, DAWONSYS modulator and TH2129 Thomson klystron of 17 MW. At the same operating modes of the accelerator the gain in the case of the uranium-238 target was 2.6.

At present, the second section of the accelerator has been installed; the work on its connection is in progress.

EG-5 ACCELERATOR

In 2015, the EG-5 accelerator operated for experiments for 510 hours. Experimental studies on charged particle beams using nuclear analytical methods of Rutherford backscattering (RBS) and elastic recoil detection (ERD) were conducted in cooperation with representatives of various institutes of the JINR Member States (Institute of Applied Physics of NAS, Sumy, Ukraine; Institute of Electrical Engineering of SAS, Bratislava, Slovakia; Maria Curie-Skłodowska-University, Lublin, Poland), Russian institutes (A.M.Prokhorov General Physics Institute of RAS, Moscow; B.P.Konstantinov Petersburg Nuclear Physics Institute, Gatchina; Voronezh State University), as well as of the JINR laboratories (DLNP, FLNR). Samples of different elemental composition and various preparation technologies were analyzed. The structure and properties of silicon and oxide films, the processes of accumulation and distribution of hydrogen and deuterium in the samples, the effect of proton irradiation on the characteristics of composite HTSC materials were investigated.