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News from Moscow Meson Factory

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Moscow Meson Factory consists of linac accelerator, storage ring and experimental area with a complex of neutron sources (neutron source, beam stop, lead slowing-down neutron spectrometer). The defined progress in development of neutron source was made for past 2.5 years.

Accelerator

- The stability operation of the accelerator on a current 60 – 65 μA is reached at energy of protons 450 MeV. In separate sessions the current reached 70μA
- Maximum energy of protons is 502 MeV.
- Now accelerator mainly works on the isotope program (50μA,160 MeV). It is connected to an incompleteness of works in an experimental area, commercial obligations of INR and payment of the electric power.
- The preparation for operation of the accelerator on a current 120 μA is carried on. These parameters are planned to receive to an extremity of a current year after completion of debugging on RFQ – system.
- Project parameters of the accelerator - 600 MeV, 500μA.

PSR/MMF - Status of Construction

- The construction work in the building of PSR has been finished.
- Practically all necessary equipment for PSR has been produced.
- The assembly of PSR and tuning of equipment may have been finished during the next two years.
- Tuning of PSR after completing this work.
- Project pulse duration of a storage ring is 0.3 μs (600 MeV, 100Hz)

At the first stage, before the storage ring will be in operation, it is supposed to use the linac's proton beam with pulse duration 0.2-1 μs for nuclear physics studies and 30-50 μs for solid state physics studies. Pulse shaping is performed with the chopper in the linac injector.

The Experimental Area

- Mounting of the vacuum system and the beam line from an input of an experimental area up to the beam stop is completed.

- The first neutrons on the beam stop were received during a test short-term session.
- Mounting of shield around beam lines of beam stop and neutron source is completed.
- The mounting of accompanying systems (systems of cooling, power supply, etc.) is completed.

Neutron Source, Beam Stop and Lead Slowing-Down Neutron Spectrometer

The INR RAS Neutron Complex consist of the Pulsed Neutron Source, Beam Stop with the irradiation channel and the Lead Slowing-Down Neutron Spectrometer (LSNS).

Neutron source and beam stop with internal irradiation channel are executed under the uniform scheme, where basic elements are the tungsten plates covered with a titanium and cooled by water /1,2/. The cartridge with plates is in body made from an aluminum alloy. The density of tungsten plates is about 18.9 g/cm^3, the thickness – 5 and 10 mm. Tungsten elements with different coating have been tested in the core of the light-water research reactor. The zirconium and titanium coating have given the best results. Ti has smaller sensitivity to dissolved Oxygen in comparison with Zr, and it is also characterized by smaller irradiation growth. This is the reason that Ti was chosen as a material for the target plates coating.

State of Matters

- The beam stop and neutron source was assembled completely.
- The tests of the system of cooling were conducted.
- On the beam stop was conducted brief test beam seance and the first neutrons are received.
- The preparation of experiment on search of correlation between displacements of atoms during radiation damages and conductivity of a material at low temperatures carries out at present time.
- R&D of irradiation studies of structural materials for neutron sources at the proton beam-stop of Moscow meson factory is carried out /3,4/.
- The attempt was undertaken to direct a beam to a neutron source during the last seance of the accelerator. The beam was lead up to the last bending magnet. Debugging of a beam line was not possible because of a shortage of time and diagnostics completely. We hope that the following attempt will be successful.
- The technical actions for taking of a beam on a neutron source during an autumn seance of the accelerator are making now.
- The new tungsten and uranium neutron targets with beryllium reflector is under construction.
- At present, the experiments are conducted on the small-scale prototype lead slowing-down spectrometer (volume is about 1m^3 and weight 15 tons). The spectrometer places in the end of the linac's tunnel in a temporary experimental zone. Proton pulses with the duration 0.2 μs and average current up to 1μA is shaped by a chopper in the linac's injector. The LSNS carries the

research of neutron reactions with the microquantitative samples (for example, radioactive nuclei including isomers).

- The new generation of accelerator-driven LSNS, which is planned to place inside the experimental area of meson factory, will contain about 100 tons of lead /1/.

Instruments

Now, the Multi-purpose time of flight neutron spectrometer is created by joint group of Lebedev Physical Institute and INR /5/.

The Spectrometer consist of:

1. evacuated neutron guide tube (60 ×110 cm^2)
2. group of replaceable collimators and diaphragms
3. sample changer
4. high resolution powder diffractometer
5. high intensity diffractometer
6. quasi elastic spectrometer
7. high resolution inelastic and quasi elastic spectrometer
8. small-angle-neutron-scattering diffractometer
9. single crystal diffractometer
10. inelastic neutron scattering spectrometer (Be-filters)

The multi-purpose neutron spectrometer aimed for simultaneously study of structure and dynamics of condensed matters in the real time scale.
It is natural, that the allowing of a flexible unit is lower than at specialized spectrometers.
The three other channels is equip by spectrometers intended for physics of a condensed state and nuclear physics too.

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