UNIVERSAL COLD AND ULTRACOLD NEUTRON SOURCE AT PIK REACTOR

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The special neutron source with liquid hydrogen (or deuterium) moderator is proposed to be installed into the through going horizontal channel HEC-4-4' of the reactor PIK. Two cold neutron beams will be ejected from both sides of the channel and ultracold neutrons will be guided to one side and then extracted from the cold beam.

We expect of this source to improve substantially an experimental capabilities of the PIK reactor as an instrument for fundamental physics researches. That will give us a progress in the investigations which require an extremely high intensity of neutron beam such as a search for neutron electric dipole moment, neutron lifetime and correlation constants measurements, search for P-odd effects in interactions with cold neutrons and so on [1]. The intensity expected of this source is supposed to be by 20 times more than it has been obtained from the similar cold source at the WWR-M reactor [2] and will achieve at least $4 \cdot 10^{11}$ n/s for polarized cold neutrons and $5 \cdot 10^{6}$ n/s for ultracold neutrons.

The souce existing at WWR-M reactor can be considered as a prototype of the source at the reactor PIK. All its beneficial features will be applied to the new one. The main of them is use of liquid hydrogen (deuterium) natural circulation over the locked control between the moderator chamber and outside placed heat exchanger. It provides an efficient remove of radiation heating. The calculations show that it is possible to maintain a hydrogen subcooled (1.5 K below the boiling point) at the expected total heating power 5.3 kW [3] . The cryogenic facility is specially moderni-zed and adopted to the source operation conditions.

At present we have done all the basic calculations and desigh of the main parts of the source. We hope it to run with the beginning of PIK operation.

References

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3. Altarev I.S. et al. Preprint LNPI-1704. Leningrad. 1991. 35 p.