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Concept of the Bragg Monochromator for Very Cold Neutrons

A new high-brilliance ultracold neutron source at the IBR-2 pulsed reactor is currently being developed at the FLNP JINR. Work on the project of a new type of UCN source requires conducting of a series of methodical experiments with very cold neutrons, which are currently not feasible at JINR. Therefore, at the first stage of work on the project, it is planned to create a test VCN channel. It is assumed that one of the main components of this VCN facility will be a monochromator, which allows to produce a monochromatic neutron beam with a velocity of $v = 20 \pm 1$ m/s.

In this work, an optical Bragg monochromator for very cold neutrons is considered. The monochromator consists of two multilayer titanium-nickel mirrors arranged to preserve the initial beam direction. The necessary requirements for such a monochromator were analyzed and compared with a mechanical velocity selector. It has been shown that the Bragg monochromator allows for higher transmissivity with a better degree of monochromatization.

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