

Compact neutron velocity selector for experiment on measuring reflection coefficient of very cold neutron VCN

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In neutron physics experiments, it is very important to have a knowledge and determination of the velocity of the useful neutrons for carrying out a full-fledged experiment. To have a certain speed of slow neutrons, an experimental instrument is needed called a neutron velocity selector.

In the up-going experiments of the JINR FLNP group on the measuring of the reflection coefficient of very cold neutrons, the most important part is the neutron velocity selector [1]. Thus, for the purpose of this experiment, the goal is to create a new neutron velocity selector with high transmission and with good resolution, which is optimal for its use in experiments.

A neutron velocity selector is a rotating cylinder made of absorbing material with angular velocity and with an infinitely narrow helical slot cut along its surface so as to progress an angle in the cylinder length.

This work presents a theoretical calculation of a neutron velocity selector for a very cold neutron beam in the wavelength range of 30–160 Å, as well as a geometry optimization procedure. The output wavelength and speed resolution are calculated. The effects of the divergence of the incoming beam are also estimated.

1. E.V. Lychagin, A.Yu. Muzychka, V.V. Nesvizhevsky, G. Pignol, K.V. Protasov, A.V. Strelkov. Storage of very cold neutrons in a trap with nano-structured walls // *Physics Letters B* 679 (2009) 186–190

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