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Possibility to increase efficiency of the energy transfer to neutrons due to diffraction by a moving grating.

Recently, multiwave dynamical theory of neutron diffraction by a moving grating was developed [1].
A phase grating moving across the neutron beam can act as a quantum modulator of neutron wave transforming the spectrum of transmitted neutrons. As a result, the spectrum is characterized by a discrete set of energies. The efficiency of the neutron energy transfer is directly defined by amplitudes of diffraction orders. Theory predicts that at a certain height of the grating profile a significant suppression of the zero-order diffraction may occur. At the same time the intensity of the lines of orders increases.
Experiment was performed at the PF2 source of ILL.
The resulting spectra if diffracted UCNs were measured ucing time-of-flight Fourier diffractometer [2]. Two diffraction gratings with different depth of the grating profile were used. The results of the experiment were compared with the results of numerical simulation. Finaly the experimental results were found in a good agreement with theoretical predictions.

[1] Bushuev V. A., Frank A.I., Kulin G.V., Jetp 122 (1) (2016) 32.
[2] G.V. Kulin, A.I. Frank, S.V. Goryunov, et al. 2016 Nucl. Instr. and Meth. A 819 67.

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