A New Experiment on Study Non-Stationary Neutron Diffraction by Surface Acoustic Waves

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Neutron diffraction by a traveling surface acoustic wave (SAW) is a non-stationary quantum process leading to the transfer of an energy quantum to a neutron $\Delta E = n\hbar\Omega$, where n is an integer, $\hbar$ is Planck's constant, Ω is a frequency of the wave.

The first and until recently the only one experiment on the observation of neutron diffraction by SAW was carried out by Hamilton et al. [1]. In [2], we presented the results of an experimental investigation of this phenomenon and an approach to its theoretical description. In the experiment, the neutron wavelength remained fixed at a variable angle of incidence.

The report will present the results of a new experiment on the study of neutron diffraction by SAW and a comparison with theoretical predictions. In contrast to the experiments [1, 2], the new measurements were carried out at a fixed angle of incidence and in the time-of-flight mode. This made it possible to study the diffraction pattern in a wide range of wavelengths.

1. W.A. Hamilton, A.G. Klein, G.I. Opat and P.A. Timmins., Phys. Rev. Lett., **58**, 2770 (1987).
2. G.V. Kulin, A.I. Frank, V.A. Bushuev, Yu.N. Khaydukov, D.V. Roshchupkin, S. Vadilonga, A.P. Sergeev, Phys. Rev. B, **101**, 165419 (2020).