

# Monte Carlo Simulation of Directional Extraction System for Low Energy Neutrons Using a Diamond Nanoparticle Powder Reflector

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Neutron reflectors are important in neutron physics and the nuclear industry. They reduce neutron losses and redirect fluxes of neutrons with different energies. The active cores of nuclear reactors are usually surrounded by reflectors of fast or thermal neutrons.

Until recently, efficient reflectors for neutrons with velocities of 40–500 m/s had not been known. The promising solution to the issue of VCN reflectors is Detonation Nanodiamonds (DND). In a series of previous works, it was experimentally shown that DND powders can be used as an effective diffuse reflector of VCN, providing even the possibility to store the VCN in a closed trap. This property of DND was used for experimental studies of the enhanced directional extraction of VCN using a DND reflector [1].

In this report, we present the first results of a Monte Carlo simulation of the probabilities of a directional extraction system for VCN using a DND reflector.

1. S.M. Chernyavsky, M. Dubois, E. Korobkina, E.V. Lychagin, A.Yu. Muzychka, G.V. Nekhaev, V.V. Nesvizhevsky, A.Yu. Nezvanov, A.V. Strelkov, K.N. Zhernenkov, "Enhanced directional extraction of very cold neutrons using a diamond nanoparticle powder reflector", Rev. Sci. Instrum. 93, 123302 (2022). DOI: 10.1063/5.0124833.