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Superconducting magnetic system for gradient spin-flipper with a strong magnetic field

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The main idea of the UCN source at a periodic pulsed reactor is effective pulsed accumulation of the UCN trap [1].The amount of neutron density accumulated in the trap depends on many factors: neutron bunch duration at the trap entrance, the effectiveness of transportation, absorption by the walls of the UCN trap itself, etc. The forced distance of the UCN trap from the neutron birthplace leads to the blurring of the UCN bunches during transportation. As a result, the pulsed structure of the beam disappears, which makes the idea of pulsed accumulation impossible without additional impact on the neutron flux.
The analysis [2] shows that in the case of a large neutron energy release by some local device, the flow of VCN which after deceleration are converted into UCN, has a pulsed structure. At the same time, the duration of neutron bunches may be significantly less than the period of their repetition. Accordingly, the density of the UCN flux in the bunch will significantly exceed its average value.
As a decelerating device it is proposed to use a gradient spin-flipper with a strong magnetic field about 18T. The report will present a design of a magnetic system forming a gradient stationary field of the flipper and its parameters. The analysis of neutron motion and spin dynamics in the flipper using Monte-Carlo simulation also will be presented.

1. Shapiro F.L., PEPAN 2 (4) (1971) 975–979.
2. Frank A.I., Kulin G.V., Zakharov M.A. "On a New Possibility of Pulsed Accumulation of Ultra Cold Neutrons in a Trap". Phys. Part. Nuclei Lett. 20, (2023) 664–667

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