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UCN source with superfluid helium at WWR-M reactor

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The WWR-M reactor at PNPI is going to be equipped with a high density ultracold neutron source. Method of UCN production is based on their accumulation in the super fluid helium due to particular qualities of that quantum liquid. High density of UCN will be achieved by putting source directly into the thermal column of the WWR-M reactor, where the thermal neutron flux reaches 3.2 e 12 n/cmˆ2s. The cold neutron (9 Angstrom) flux will be dF/dlambda (9 Angstrom)= 3.2e10 n /cmˆ2sAngstrom. Neutron fluxes and heat load in UCN source were calculated by using MCNP program. The main technical problem here is the total heat load (P= 19 W) on superfluid helium. To solve this problem a full-scale model of the UCN source that simulates heat inflows from the reactor has been created and launched. Early experiments showed the possibility of removing 15W heat from 1.3 K superfluid helium. Our source aims at obtaining a density of UCN up to 10000 n/cmˆ3, 100 greater then in existing sources presently available in the world. Increase in the density of UCN will raise the accuracy of the measurement of the neutron electric dipole moment, neutron lifetime etc.

Primary author(s) : Mr. LYAMKIN, Vitaliy (PNPI NRC KI)

Presenter(s) : Mr. LYAMKIN, Vitaliy (PNPI NRC KI)

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