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Ultracold neutron production and extraction from the solid deuterium converter of the PSI UCN source

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Ultracold neutrons (UCN) with energies below 300 neV can be trapped for hundreds of seconds in containments made of materials with high optical potential. They are used in experiments that benefit greatly from long storage times, like the n2EDM experiment currently assembled at PSI, searching for a permanent electric dipole moment of the neutron. The PSI UCN source makes use of solid deuterium as superthermal converter to produce UCN. A reduction over time of the initial UCN output after preparation of the solid deuterium and a conditioning procedure to counter this effect and maximize the UCN output has been developed. Enhancing the UCN extraction from the converter is an ongoing effort. We study the impact of structural features in the deuterium and other parameters of the converter on UCN extraction by dedicated measurements and detailed simulations. This will provide important insights helping to further increase the UCN output of the PSI UCN source.

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