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INSTRUMENTATION AT THE PAUL SCHERRER INSTITUTE'S ULTRA-COLD NEUTRON SOURCE

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The ultra-cold neutron (UCN) source at the Paul Scherrer Institute uses the full 1.3 MW proton beam on a spallation target in a heavy water moderation system including a deuterium crystal at a temperature of about 6 K as cold source and converter. The produced UCN will be confined in a storage volume and can be distributed to the experiments via 7-10 m long UCN guides.

We here report on the monitoring and surveillance systems of the source, with emphasis on sensors in the high radiation and cryogenic environment. A UCN detection system was developed to monitor the produced UCN density inside the intermediate storage volume and after ~3.5m of UCN guide while only negligibly influencing UCN density itself. The detector system was designed and tested to withstand 20 years of source operation which corresponds to a fluence of 10^{18} n/cm² for the scintillator and the first centimeters of the light guides. Energy resolution will be obtained by using several detectors with coatings of different material optical potential.

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