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# The free neutron lifetime experiment τSPECT

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The neutron storage experiment $\tau$SPECT aims to measure the free neutron lifetime, an essential input for precision tests of the Standard Model of particle physics and the Big-Bang nucleosynthesis, by confining ultracold neutrons (UCNs) in a three-dimensional magnetic trap. In contrast to material bottles, magnetic storage avoids interactions with the trap wall, eliminating systematic biases on the measured lifetime related to wall interactions. The magnetic bottle is generated using a cylindrical Halbach octupole array of permanent magnets combined with superconducting coils for axial confinement. A spin-flip based loading scheme is used to fill the trap. After a variable storage period, surviving UCNs are counted in-situ using a SiPM based detector capable of operating in high magnetic fields. This poster provides an overview of the $\tau$SPECT experiment, highlighting its most critical components and preliminary results from the 2024 measurement campaign at Paul Scherrer Institute.

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