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Tau2: A next generation neutron lifetime experiment based on UCN τ ALEXANDER SAUNDERS, Los Alamos National Laboratory — The UCN τ experiment measures the free neutron lifetime by in situ counting of surviving ultracold neutrons (UCNs) after different storage times in an asymmetric magneto-gravitational storage volume. This experiment has acquired sufficient data for a measurement of the neutron lifetime with a statistical uncertainty of about 0.3 s and has demonstrated a systematic uncertainty of 0.28 s; it is expected to ultimately reach a total uncertainty of about 0.2 s, limited primarily by the efficiency with which UCN τ utilizes the neutrons supplied by the Los Alamos UCN facility. In this talk, we will describe the conceptual Tau2 experiment, which is intended to use the techniques learned during the UCN τ experiment to minimize systematic uncertainties while maximizing the statistical reach possible with UCNs supplied by the Los Alamos source. Replacing the permanent magnet-based trap of UCN τ with a larger volume superconducting trap is expected to enable improving the total uncertainty on the neutron lifetime to 0.1 s and beyond, permitting investigation of the weak nuclear force, when taken with precision beta decay correlation experiments, with physics reach comparable to LHC-based high energy experiments.

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