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Overview of recent efforts and results of the neutron lifetime measurements

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Measurement of free neutron decay to a proton, electron, and antineutrino provides information about the fundamental parameters of the charged weak current of the nucleon and constrains many extensions to the Standard Model at and above the TeV scale. Knowledge of the lifetime to an accuracy of better than 1 s is necessary to improve BBN predictions of elemental abundances and to search for physics beyond the Standard Model of nuclear and particle physics. The neutron lifetime has recently been measured by two different techniques: the "disappearance"method, counting the surviving ultracold neutrons after storage in magnetic or material-walled traps, with an average result of 879.3 ± 0.8 s; and the "appearance"method, counting the number of decay products emerging from a passing beam of cold neutrons, with a result of 888.0 ± 2.1 s. The results of these techniques disagree by 8.7 s, or 3.9 standard deviations. In this talk, we will review recent and upcoming efforts to measure the neutron lifetime using both the appearance and disappearance techniques and with independent systematic uncertainties, as well as look at future efforts to push the total uncertainty on the lifetime to the 10-4 level.

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