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**Progress towards Precision Measurement of the Neutron Lifetime using Magnetically Trapped Ultracold Neutrons (UCN)** L. YANG, J.M. DOYLE, Harvard University, F.H. DUBOSE, E. KOROBKINA, R. GOLUB, C.M. O'SHAUGHNESSY, G.L. PALMQUIST, P.-N. SEO, P.R. HUFFMAN, North Carolina State University, K.J. COAKLEY, H.P. MUMM, A.K. THOMPSON, G.L. YANG, NIST, S.K. LAMOREAUX, LANL — Measuring the neutron lifetime using magnetically trapped ultracold neutrons promises to improve the current experimental limit by at least an order of magnitude. Such a trap can be loaded through inelastic scattering of 0.89 nm neutrons with phonons in superfluid Helium-4. Trapped neutrons are detected when they beta decay; energetic decay electrons ionize helium atoms in the superfluid resulting in efficient conversion of electron kinetic energy into light (scintillation). The primary advantages of this technique over previous bottle and beam experiments are continuous detection of scintillation light from decay electrons allowing direct determination of the decay curve, and the elimination of wall losses. Our recent measurement is limited by statistics to 40 seconds. We are currently upgrading our experiment with a larger and deeper magnetic trap. The new apparatus will trap 20 times more neutrons than the previous one, making it possible to reduce the statistical error to below 1 s. Recent experimental data, our studies of systematic uncertainties such as above-threshold neutrons, and the development of the new magnetic trap will be discussed.

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