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Precision Laser Spectroscopy of Exotic Helium Isotopes P. MUELLER, I.A. SULAI, K. BAILEY, R.J. HOLT, R.V.F. JANSSENS, Z.-T. LU, T.P. O'CONNOR, Argonne National Laboratory, A.C.C. VILLARI, J.A. ALCANTARA-NUNEZ, R. ALVES-CONDE, M. DUBOIS, C. ELEON, G. GAUBERT, N. LECESNE, M.-G. SAINT-LAURENT, J.-C. THOMAS, GANIL, G.W.F. DRAKE, University of Windsor, L.-B. WANG, Los-Alamos National Laboratory — We have succeeded in laser trapping and cooling of the exotic helium isotopes ^{6}He ($t_{1/2} = 0.8$ sec) and ^{8}He ($t_{1/2} = 0.1$ sec), and have performed precision laser spectroscopy on individual trapped atoms. Based on the atomic isotope shifts measured along the isotope chain ^{3}He - ^{4}He - ^{6}He - ^{8}He, and on the precise theory of the atomic structure of helium, the nuclear charge radii of ^{6}He and ^{8}He are determined for the first time independent of nuclear models. The results are compared with the values predicted by nuclear structure calculations of light nuclei and test their ability to characterize these neutron rich, loosely bound halo nuclei. The ^{6}He measurement was performed at ATLAS of Argonne, and the ^{8}He measurement at GANIL, France. This work was supported by the U.S. Department of Energy, Office of Nuclear Physics, under Contract No. DE-AC02-06CH11357.

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