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Probing the Higgs force with isotope shift spectroscopy ROEE OZERI, Department of Physics of Complex Systems, Weizmann Institute of Science, Rehovot 7610001, Israel, CEDRIC DELAUNAY, LAPTh, Universite Savoie Mont Blanc, CNRS B.P. 110, F-74941 Annecy-le-Vieux, France, GILAD PEREZ, Department of Particle Physics and Astrophysics, Weizmann Institute of Science, Rehovot 7610001, Israel, YOTAM SOREQ, Center for Theoretical Physics, Massachusetts Institute of Technology, Cambridge, MA 02139, U.S.A. — The Higgs boson, the last missing piece of the Standard Model (SM) of elementary particles, was recently observed by experiments in the Large Hadron Collider (LHC). To check whether this is indeed the SM Higgs, its coupling to other elementary particles should be experimentally measured. Current limits placed by LHC experiments on the coupling of the Higgs to the main building block of matter; the electron and the up and down quarks; are orders of magnitude larger than the SM predictions. Here, we propose to use the measurement of isotope shifts in optical atomic clock transitions to probe the Higgs boson coupling to electrons and nuclei. We show that the Higgs force between nuclei and bound electrons induces measurable nonlinearities to the King relation between isotope shifts [1]. With current state-of-the-art accuracy in frequency comparison, limits which compete with, or even surpass, the bounds provided by LHC experiments can be achieved. Improved knowledge of these couplings is an important test of the SM. Similarly, this measurement could lead to an improved sensitivity to the presence of new physics. [1] arXiv:1601.05087

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