Announcement: The Fundamental Role of Precision Measurement in Atomic, Molecular, and Optical Physics—a New Section Heading for *Physical Review A*

The purpose of this Announcement is to recognize the recently expanding interest in high-precision measurement and its importance to the broader physics community by including explicitly the topic *High-precision measurement* in the *Atomic and molecular structure and dynamics* section heading of *Physical Review A*. As of July 2018, the revised section heading reads *Atomic and molecular structure and dynamics; high-precision measurement*.

Precision measurement has been a hallmark of spectroscopy since the pioneering work of the spectroscopists of the nineteenth century. Their measurements of the Lyman and Balmer series of hydrogen laid the groundwork for the Bohr model of the atom. Spectroscopic measurements provided the first confirmation of wave mechanics in atoms more complicated than hydrogen, and the first evidence for electron spin. Measurements of the anomalous magnetic moment of the electron and the Lamb shift in hydrogen provided the first confirmation of the modern theory of quantum electrodynamics developed after 1947. The ever increasing accuracy of both theory and spectroscopic measurements has now established quantum electrodynamics as the most successful theory ever invented, and a corner stone of the standard model.

One might naively think that there is little left to learn of a fundamental nature from atomic and molecular spectroscopy, but the ever increasing power and versatility of lasers tells a different story. The advent of frequency combs and the techniques of cooling and trapping, atomic interferometry and quantum entanglement continue to push the limits of accuracy to ever higher levels, in parallel with Moore's law for computers. Frequency measurements now provide the fundamental definition of time, with the velocity of light as a defined physical constant. The accuracy of atomic clocks is becoming sensitive to a cosmological variation in the fundamental constants. Searches for particle electric dipole moments (EDM) in atoms and molecules, studies of parity nonconservation, searches for dark matter, exotic forces, violation of Lorentz invariance and Einstein equivalence principle for gravity are of fundamental importance, along with precision measurements of nuclear masses and radii. The recently announced spectroscopy of antihydrogen at CERN sets new limits on possible violations of CPT symmetry—a key ingredient of all quantum field theories. The ultimate triumph of precision measurement is the detection of gravitational waves using the techniques of laser interferometry on a grand scale.

Most significantly, such table-top experiments with atoms, molecules, and light are providing ever tighter constraints on new particles beyond the standard model, and thereby supplementing and even extending what can be learned from high-energy particle accelerators. The APS Topical Group on Precision Measurement and Fundamental Constants serves as a focus for research in these areas. For all these reasons, the inclusion of the topic *High-precision measurement* in the section heading provides a suitable recognition for the recent surge of interest in this field, and a natural place for the publication of Rapid Communications or full-length articles on these topics.

Gordon W. F. Drake
Editor
Physical Review A

Published 2 July 2018
DOI: [10.1103/PhysRevA.98.010001](https://doi.org/10.1103/PhysRevA.98.010001)