Quantum technologies for new physics discoveries in the laboratory and in space

Prof. Dr. Marianna Safronova

Department of Physics and Astronomy, University of Delaware, Newark, USA

The extraordinary advances in quantum control of matter and light have been transformative for atomic and molecular precision measurements enabling probes of the most basic laws of Nature to gain a fundamental understanding of the physical Universe. Exceptional versatility, inventiveness, and rapid development of precision experiments supported by continuous technological advances and improved atomic and molecular theory led to rapid development of many avenues to explore new physics. I will give an overview of atomic and molecular physics searches for physics beyond the standard model and focus of dark matter searches with atomic and nuclear clocks. Recent ideas on dark matter searches and tests of general relativity with clocks in space will be discussed. I will also briefly discuss new ideas and prototype experiments in gravitational wave detection with atomic quantum sensors.