

# Enhancing Optical Clock Performance with Multiple Atomic Ensembles

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The remarkable precision of optical atomic clocks enables new clock applications, and offers sensitivity to new and exotic physics. In this talk I will explain the motivation and operating principles of a multiplexed strontium optical lattice clock, which consists of two or more atomic clocks in one vacuum chamber. This miniature clock network enables us to bypass the primary limitations to typical atomic clock comparisons and achieve new levels of precision. I will present recent experimental results in which we performed a novel, blinded, precision test of the gravitational redshift with an array of atomic ensembles spanning a total height difference of 1 cm. Finally, I will present on recent experimental results in which we make use of multiple atomic ensembles to perform enhanced phase estimation in order to reduce the absolute instability of an optical lattice clock.