

Abstract Submitted
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^{87}Sr Optical Lattice Clock Comparison with 6×10^{-19} Precision in 1 Hour TOBIAS BOTHWELL, DHURUV KEDAR, ERIC OELKER, JILA, Univ of Colorado - Boulder, COLIN KENNEDY, JILA, Univ of Colorado - Boulder, NIST, JOHN ROBINSON, ROSS HUTSON, LINDSAY SONDERHOUSE, AKIHISA GOBAN, WILLIAM MILNER, CHRISTIAN SANNER, JILA, Univ of Colorado - Boulder, JUN YE, JILA, Univ of Colorado - Boulder, NIST — Utilizing a next generation ultrastable laser based on a cryogenic silicon cavity we perform an extensive comparison between JILAs 1D and 3D strontium clocks, achieving record independent clock stability of 4.8×10^{-17} at 1 s. Through synchronous measurement we determine record clock stability of 3.5×10^{-17} at 1 s and average to a precision of 6×10^{-19} in 1 hour of measurement. This state-of-the-art clock precision enables measurements for wide-ranging applications, from searches for dark matter to relativistic geodesy. Additionally, the combined accuracy of our fully evaluated 1D ^{87}Sr clock with the long-term stability of the silicon cavity paves a potential path to the realization of an all optical timescale, which promises to outperform current microwave timescales.

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