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Comparison of Two Sr Optical Lattice Clocks with $10^{-17}/\sqrt{\tau}$ Level Stability ERIC OELKER, LINDSAY SONDERHOUSE, TOBIAS BOTHWELL, ROSS HUDSON, COLIN KENNEDY , EDWARD MARTI, DHRUV KEDAR, AKIHISA GOBAN, SARAH BROMLEY, SARA CAMPBELL, JOHN ROBINSON, WILLIAM MILNER, SHIMON KOLKOWITZ, CHRISTIAN SANNER, JILA-University of Colorado, DAN MATAI, THOMAS LEGERO, FRITZ RIEHLE, UWE STERR, Physikalisch-Technische Bundesanstalt (PTB), JUN YE, JILA-University of Colorado, JILA-UNIVERSITY OF COLORADO TEAM, PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB) TEAM — I report on the use of a state-of-the-art ultrastable laser to improve the stability of the JILA 1D and 3D ^{87}Sr lattice clocks. The ultrastable laser system utilizes a cryogenic Silicon reference cavity with a thermal noise limited instability of 4×10^{-17}. By performing an asynchronous comparison betweeen the two systems along with a self comparison of each clock individually we are able to rigorously determine the stability of both clocks. We infer a clock stability at the mid-$10^{-17}/\sqrt{\tau}$ level for our 1D system and high-$10^{-17}/\sqrt{\tau}$ level for our 3D system due to dead time associated with sample preparation. The 1D result represents a new record for a clock based on a single atomic ensemble.

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