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The Sr optical lattice clock at JILA: A new record in atomic clock performance TRAVIS NICHOLSON, BENJAMIN BLOOM, JASON WILLIAMS, SARA CAMPBELL, MICHAEL BISHOF, XIBO ZHANG, WEI ZHANG, SARAH BROMLEY, ROSS HUTSON, REES MCNALLY, JUN YE, JILA — The exquisite control exhibited over quantum states of individual particles has revolutionized the field of precision measurement, as exemplified by highly accurate atomic clocks. Optical clocks have been the most accurate frequency standards for the better part of a decade, surpassing even the cesium microwave fountains upon which the SI second is based. Two classes of optical clocks have outperformed cesium: single-ion clocks and optical lattice clocks. Historically ion clocks have always been more accurate, and the precision of ion clocks and lattice clocks has been comparable. For years it has been unclear if lattice clocks can overcome key systematics and become more accurate than ion clocks. In this presentation I report the first lattice clock that has surpassed ion clocks in both precision and accuracy. These measurements represent a tenfold improvement in precision and a factor of 20 improvement in accuracy over the previous best lattice clock results. This work paves the way for a better realization of SI units, the development of more sophisticated quantum sensors, and precision tests of the fundamental laws of nature.

Travis Nicholson
JILA

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