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A Sr clock with total uncertainty of 2×10^{-18} and development of the new apparatus[1] G. EDWARD MARTI, REES MCNALLY, TRAVIS NICHOLSON, SARA CAMPBELL, ROSS HUTSON, JILA, CU Boulder, JUN YE, JILA, NIST, CU Boulder — We report on improvements to the accuracy and stability of the JILA Sr clock, with a record total clock uncertainty of 2.1×10^{-18} and stability of $2.2 \times 10^{-16}/\sqrt{\text{Hz}}$. By choosing a lattice wavelength such that the scalar and tensor shifts cancel, we observe no measurable shift in the clock frequency with trap intensity. We reduce the blackbody radiation shift uncertainty with accurate in vacuum thermometry, traceable to the NIST ITS-90 temperature scale, and with an improved determination of the dynamical correction coefficient by measuring the $^3D_1$ lifetime to 0.5%. We also discuss progress on a new apparatus for fermionic quantum degenerate strontium in a three-dimensional magic-wavelength optical lattice. We will implement rapid evaporative cooling to achieve quantum degeneracy with a duty cycle compatible with clock measurements, shorter than the coherence time of the local oscillator. Loading the sample into the lowest band of a 3D lattice will enable high densities and atom numbers with minimal interaction shifts. The apparatus will be used to explore spin-orbit coupling, quantum magnetism, and improve the precision of future lattice clocks.

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