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**Optical Lattice Clocks Based on Neutral Yb Atoms**

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Designer optical lattices are used in a variety of AMO investigations due to their ability to confine atoms under highly controllable conditions. I will describe how we use such lattices (in one or more dimensions) to produce optical atomic clocks that might one day achieve a fractional frequency precision of one part in $10^{17}$ or better. We take advantage of the tight confinement and long interaction times provided by the lattice to perform high resolution spectroscopy on a narrow optical transition in neutral Yb (natural linewidth $\sim$ 10 mHz) to which we lock the frequency of our clock laser. By tuning the optical lattice to its magic wavelength (at which the induced light shifts are equal for the ground and excited states of the clock reference transition), we remove the effect of the lattice on the clock frequency to first order. To improve further our knowledge of the clock frequency, we evaluate potential shifts due to higher-order lattice effects, background blackbody radiation, and collision effects in over-filled lattices. Through the use of tens of thousands of trapped atoms, we have the potential to achieve high measurement precision in comparatively short averaging times. I will present results for one-dimensional lattice clocks at 578 nm based on two isotopes of Yb. The first uses Yb-171 (nuclear spin, I, =1/2) and has demonstrated an absolute fractional frequency uncertainty below one part in $10^{15}$. The second is based on Yb-174 (I = 0) and uses the technique of magnetic-field induced spectroscopy to excite the atoms. Included will be measurements of the Yb absolute clock frequency at the sub-Hz level, new stability results, and comparisons with other optical clocks. Finally, future directions will be considered including the use of multi-dimensional lattices to isolate the individual atoms.