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Large Momentum Transfer Clock Atom Interferometry on the 689 nm Intercombination Line of Strontium[1] THOMAS WILKASON, JAN RUDOLPH, MEGAN NANTEL, HUNTER SWAN, CONNOR M. HOLLAND, YIJUN JIANG, BENJAMIN E. GARBER, SAMUEL P. CARMAN, JASON M. HOGAN, Stanford Univ — We report the first realization of large momentum transfer (LMT) clock atom interferometry. Using single-photon interactions on the strontium $^1S_0 - {}^3P_1$ transition, we demonstrate Mach-Zehnder interferometers and gradiometers with state-of-the-art momentum separation. Moreover, we circumvent excited state decay limitations and extend the gradiometer duration to 50 times the excited state lifetime. Due to the broad velocity acceptance of the interferometry pulses, all experiments are performed with laser-cooled atoms at a temperature of $3\,\mu K$. We will discuss applications of this technique in state-of-the-art gravity gradiometry and in compact and mobile inertial sensors. This work paves the way towards pursuing LMT-enhanced clock atom interferometry on even narrower transitions, a key ingredient in proposals for gravitational wave detection and dark matter searches.

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