Abstract Submitted
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New forms of spin-orbit coupling in a strontium optical lattice clock[1] MICHAEL PERLIN, ARGHAVAN SAFAVI-NAINI, JILA, ROEE OZERI, Weizmann Institute of Science, ANA MARIA REY, JILA — Ultracold atomic systems allow for the simulation of a variety of condensed matter phenomena, including spin-orbit coupling (SOC), a key ingredient behind recently discovered topological insulators and a path for the realization of topological superfluids. While many experimental efforts have used alkali atoms to engineer SOC via Raman transitions, undesirable heating mechanisms have limited the observation of many-body phenomena manifest at long timescales. Alkaline earth atoms (AEA) have been recently shown to be a potentially better platform for the implementation of SOC due to their reduced sensitivity to spontaneous emission [1,2,3]. While previous work has used electronic clock states as a pseudo-spin degree of freedom, we consider the effects of clock side-band transitions. We discuss the richer SOC dynamics which emerges as a result of this extension, and present methods to probe these dynamics in current AEA optical lattice clocks. [1] Galitski, V. and Spielman, I.B., "Spin-orbit coupling in quantum gases." Nature 494.7435 (2013): 49-54. [2] Kolkowitz, S., et al. "Spinorbit-coupled fermions in an optical lattice clock." Nature (2016). [3] Wall, M.L., et al. "Synthetic spin-orbit coupling in an optical lattice clock." Physical review letters 116.3 (2016): 035301.

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