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**Spin squeezing in optical lattice clocks through lattice based quantum non-demolition measurements** DOMINIC MEISER, MURRAY J. HOLLAND, JILA and University of Colorado, Boulder, CO 80309-0440, USA — Optical lattice clocks based on neutral earth alkaline atoms have made dramatic progress recently and are now competitive with the most stable frequency standards. In the current generation of experiments the short time stability of the clocks is within a factor of two of the spin projection noise limited stability. In this presentation we show that the atoms imprint information on the lattice beams that can be used to perform a quantum non-demolition measurement of the atomic state. Such a quantum non-demolition measurement can reduce the spin-projection noise below the standard quantum limit through measurement back-action induced spin squeezing thus enabling still better short time stability of the lattice clock. In addition to potentially leading to better clocks this work also opens up new areas of research at the interface of cavity QED, condensed matter physics and precision measurements.

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