

Abstract Submitted
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Heisenberg Limited Two Species Ion Clock GARRY GOLDSTEIN, Harvard, PAOLA CAPPELLARO, MIT, ITAMP, LIANG JIANG, Caltech, ANDERS SORENSEN, QUANTOP, Neils Bohr Institute, MIKHAIL LUKIN, Harvard, ITAMP — Motivated by recent experiments [1, 2] we propose a new method that attains nearly Heisenberg limited precision clock measurement, exploiting new techniques for environment assisted metrology [3]. Our method makes use of two species of trapped ions in a linear Paul trap, a logic ion for coherent control and readout and multiple spectroscopy ions with stable clock transitions, to achieve Heisenberg limited sensing. It does not require individual addressability of the spectroscopy ions and uses only multi-chromatic (Sorensen-Molmer) gates for entangling operations between the ions, as opposed to the Cirac-Zoller gates used so far. This allows one to use multiple spectroscopy ions in a single Paul trap, improving on previous methods that could use only one ion at a time. Furthermore we find that many of the sources of noise that act as decoherence in regular multi-chromatic gates do not effect the sensitivity of the proposed metrology method.

- [1] T. Rosenband et al., Science 319, 1808 (2008)
- [2] P. O. Schmidt et al., Science 309, 749 (2005)
- [3] G. Goldstein et al., Arxiv 1001.0089

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