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Systematic uncertainty evaluation of an ^{27}Al^{+} quantum-logic clock[1] SAMUEL BREWER, NIST, JWO-SY CHEN, NIST, Univerity of Colorado, DAVID HUME, AARON HANKIN, NIST, ETHAN CLEMENTS, NIST, Univerity of Colorado, CHIN-WEN CHOU, NIST, DAVID WINELAND, NIST, Univerity of Colorado, University of Oregon, DAVID LEIBRANDT, NIST, Univerity of Colorado — A previous optical atomic clock based on quantum-logic spectroscopy of the $^1S_0 \longleftrightarrow {}^3P_0$ transition of ^{27}Al^{+} reached a systematic uncertainty of $\delta\nu/\nu = 8.0 \times 10^{-18}$ [2],[3]. This uncertainty was dominated by environmental effects related to the traps used to confine the ions; i.e. time-dilation shifts due to motion of the ions in the trap and the blackbody radiation (BBR) shift due to elevated trap temperature. Improvements in a new trap have reduced excess micromotion and secular heating, making it possible to operate the clock near the three-dimensional motional ground state [4], and leading to a reduced time-dilation shift uncertainty. In addition, the operating temperature of the system has been lowered to reduce the BBR shift uncertainty. Here we present the systematic uncertainty evaluation of a new ^{27}Al^{+} quantum-logic clock based on this improved trap design.

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[2]C.-W. Chou,*et. al.*, PRL, **104**, 070802 (2010)
[3]C.-W. Chou, Private Communication
[4]J.-S. Chen, *et. al.*, PRL, **118**, 053002, (2017)

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