Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Towards suppression of light shifts in an optical frequency standard based on a two-photon transition in Rb JOSEPH CHRISTESEN, ZACHARY NEWMAN, VALERA YUDIN[1], JOHN KITCHING, MATTHEW HUMMON, National Institute of Standards and Technology Boulder — Low power and compact optical frequency standards based on atomic references are widely used in a number of different applications including length metrology, laser ranging, optical communication, and timing. These systems are now at levels of stability where a major limiting factor is the ac-Stark shift. While other atomic systems can use a Ramsey type scheme to eliminate the light shift, frequency standards which operate in a continuous wave (CW) mode need another method. To this end, we look to implement two new schemes, combined error signal (CES) and auto-compensation shift (ACS), based on a recent theoretical proposal to eliminate the ac-Stark shift in an optical frequency standard [1]. The CES scheme is a single loop scheme where a new error signal is generated which has its zero crossing at the frequency where the ac-Stark shift is zero, and the ACS scheme is a double loop scheme where the second loop produces an artificial anti-shift to compensate the ac-Stark shift. We investigate the experimental challenges in implementing the CES and ACS and show progress towards improving the long-term stability of an optical frequency standard based on the two-photon transition at 778 nm in ^{87}Rb through suppression of the ac-Stark shift. [1] V. I. Yudin, et al., arXiv: 1911.02935

[1]Novosibirsk State University, Novosibirsk State Technical University

Joseph Christesen
National Institute of Standards and Technology Boulder

Date submitted: 29 Jan 2020 Electronic form version 1.4