

Abstract Submitted
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Study of high SNR Ramsey-CPT spectrum with dispersion detection in Rb cell¹ XIAOLIN SUN, PENGFEI CHENG, CHI XU, Tsinghua University, LU ZHAO, Beihang University, JIANWEI ZHANG, LIJUN WANG, Tsinghua University — For the traditional circularly polarized pumping schemes in coherent population trapping (CPT), numerous atoms are trapped in the extreme Zeeman states that do not contribute to the magnetic insensitive 0-0 clock transition, thus resulting in small CPT signal amplitude. Here we report that the lin-par-lin Ramsey-CPT configuration with dispersion detection can obtain a high-contrast signal and keep the system compact. The dispersion detection method by orthogonal polarizers can effectively suppress background optical noise, which further improves the signal-to-noise ratio (SNR) of the Ramsey spectrum. We theoretically and experimentally investigate the SNR of the Ramsey spectrum signal by varying the relative angle of the polarizer and analyzer as well as the applied static magnetic field. The theoretical calculations agree with the experimental results very well, and the optimized working parameters of the relative angle and magnetic field are obtained. According to the optimized working parameters, the short-term frequency stability of the Rb clock is estimated to be $6.6\text{E-}13\tau^{-1/2}$. As we can see, this kind of atomic clock is very promising for the development of compact, high-performance vapor clock based on CPT.

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