

# Competition effects of multiple quantum paths in an atom interferometer

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We present an observation of competition effect among multiple quantum paths in an atom interferometer as shown in FIG. 1. By measuring the contrast of fringes, the competition among multiple interference paths is experimentally investigated. Due to the phase competition, the contrast periodically oscillates when modulating either the phase or the interrogation time between Raman pulses as shown in FIG. 2. The multiple quantum paths form because of the imperfect population transfer efficiency in stimulated Raman transitions and are verified by modulating the duration of Raman pulses, as well as explained by a theoretical model. We confirmed that, if the population transfer efficiency in stimulated Raman transitions is imperfect, the multiple quantum paths form and the fringe contrast is influenced by the phase competition among them.

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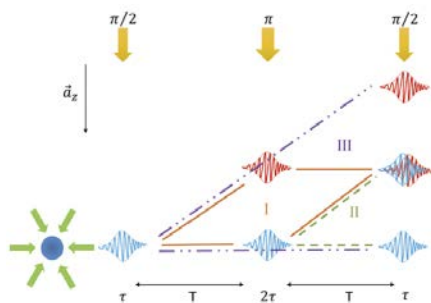


Fig. 1. Schematic diagram of multiple paths when the co-propagating Raman-pulse sequence is applied along the gravity direction.

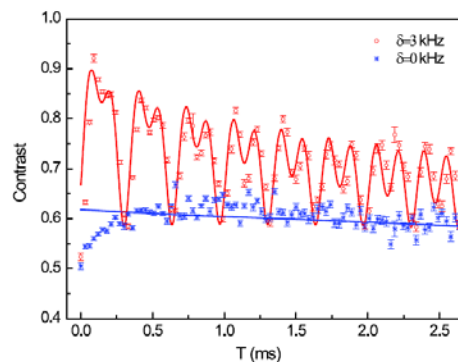


Fig. 2. The interference competition for different two-photon detuning.

**Keywords:** ATOM INTERFEROMETER, PHASE COMPETITION, MULTI-PATH INTERFERENCE

## References

- [1] Si-Bin Lu, Zhan-Wei Yao, Run-Bing Li, et. al., *Opt. Commun.* **429**, 158 (2018).