

Abstract Submitted
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Precision position stabilization of acousto-optic modulator¹ JI-AMING LI, XIAO ZHANG, YANG LIU, LE LUO, Sun Yat-sen University, TAILAB TEAM — Cross-beam optical dipole trap is widely used to trap and cool atoms. The spatial overlapping and position play an important role during the evaporative process. However, the angular instability of acousto-optic modulator affects the overlapping and introduces a position noise, which heats up the cold atomic sample dramatically. Here, we analyze the angular instability with the changing refractive index, which is caused by the uneven temperature distribution of the crystal. It is found that the angular drift is very sensitivity to the temperature gradient. In this sense, we find this drift can be suppressed out by carefully designing the temperature distribution. With our water cooling AOM setup, the angular drift is successfully reduced over 100 times, reach to 5 μrad , during the thermal transient. We also find the angular noise is compressed to 1/3 of the non-cooled case, which is supposed to be good for some ultra-high precision experiments. Furthermore, the refractive index thermal coefficient of tellurium dioxide crystal at 1064 nm is determined to be $16 \times 10^{-6} K^{-1}$, *which is inconsistent with previous studies.* This work is supported by National Natural Science Foundation of China.*

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