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Recent Progress on atom interferometers inside a hollow-core fiber[1] ZILONG CHEN, MINGJIE XIN, WUI SENG LEONG, SHAU-YU LAN, Nanyang Technological University — Light-pulse atom interferometers are commonly used to measure inertial forces at high precision. However, its sensitivity scales with the size of the setup and optical power due to the diffraction of free-space Raman/Bragg beams. To overcome diffraction, a waveguide such as a single mode hollow-core fiber (HCF) can be used to guide the atoms and light simultaneously, and perform atom interferometry in it. We present our experimental setup[2] where laser-cooled Rb^{85} atoms are loaded into a HCF while falling under gravity and guided by a 1mK deep intra-HCF dipole trap. Counter-propagating Raman laser pulses in the HCF coherently split, reflect and recombine atomic matter waves, implementing a Mach-Zehnder atom interferometer using the $\frac{\pi}{2}$-T-π-T-$\frac{\pi}{2}$ sequence. We measured the interferometer phase shift $k_{eff}gT^2$ to be consistent with local gravity. The interferometer time T is limited to 20μs due to inhomogeneous differential ac-Stark shifts from the dipole trap. Progress on improving coherence time by ac-Stark shift compensation will be reported.

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[2]Mingjie Xin, Wui Seng Leong, Zilong Chen, Shau-Yu Lan, **Science Advances, 4**, e1701723 (2018)

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