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Compact atom interferometer using single laser SHENG-WEY CHIOW, NAN YU, Jet Propulsion Laboratory — Atom interferometer (AI) based sensors exhibit precision and accuracy unattainable with classical sensors, thanks to the inherent stability of atomic properties. The complexity of required laser system and the size of vacuum chamber driven by optical access requirement limit the applicability of such technology in size, weight, and power (SWaP) challenging environments, such as in space. For instance, a typical physics package of AI includes six viewports for laser cooling and trapping, two for AI beams, and two more for detection and a vacuum pump. Similarly, a typical laser system for an AI includes two lasers for cooling and repumping, and two for Raman transitions as AI beam splitters. In this presentation, we report our efforts in developing a miniaturized atomic accelerometer for planetary exploration. We will describe a physics package configuration having minimum optical access (thus small volume), and a laser and optics system utilizing a single laser for the sensor operation. Preliminary results on acceleration sensitivity will be discussed. We will also illustrate a path for further packaging and integration based on the demonstrated concepts. This research was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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