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## Developing and testing compact displacement sensors using Deep-Frequency Modulation Interferometry

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Multi-fringe capable, compact laser interferometers are studied as sensors for displacement sensing of suspended test masses and inertial sensors in future ground-based detectors to improve their low-frequency noise. We are investigating such a sensor, or optical head, design that uses a quasi-monolithic component and deep-frequency modulation interferometry to enable sub-picometer level displacement sensing in a compact format while providing optimal readout noise floor. We discuss how we plan to suppress the coupling of ghost beams in our design using advanced signal processing schemes that are enabled by the unique properties of deep-frequency modulation interferometry. We also present our current plans to develop an inertial testbed with active seismic isolation and suspended test masses in vacuum to study the sensors under realistic conditions.

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