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Sensing seismic platform relative motion using Digital Interferometry

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Gravitational-wave interferometric detectors have many internal seismic platforms to support the various suspended optics. For future detectors, the relative motion of these seismic platforms, via coupling to the auxiliary length controls of the suspended optics, are predicted to be the limiting noise source at low frequencies below 1 Hz. By measuring, then stabilizing the relative motion between the seismic platforms, the effective control feedback to the optics will be reduced and hence the noise coupling will be less, and potentially improve detector noise performance. The measurement of the relative motion with forms of suspension platform interferometry is an ongoing area of interest, research and development. Digitally-enhanced Interferometry is a decade-mature technique for sensing relative motion, by providing time-tagged pseudorandom phase modulation to isolate signals based on time-of-flight delay. The application of digitally-enhanced interferometry for suspension sensing is active area of development within the Newtonian Noise research program at the Australian National University, and offers another potential method for sensing relative platform motion. We present an overview of digitally-enhanced interferometry, recent developments for its application to suspension sensing, and potential prospectives for sensing seismic platform relative motion.

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