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and Simulation of a Leaser-Interferometer Broadband Seismometer

In this study, we propose a design of a broad band seismometer for monitoring the vertical component of the ground velocity in the frequency band from 50 sec (25 mHz) up to 50 Hz with a sensitivity of 1500 V/m/sec. Our proposed seismometer uses a mass-leaf-spring suspension as a mechanical receiver to convert the variations in ground acceleration into displacements of the seismic mass relative to the seismometer body (ground). A Michelson laser interferometer is then used to convert these displacements into an analog signal representing the ground acceleration. A PID feedback loop is designed to shape the seismometer response to ground velocity. Both amplitude and phase responses as well as the frequency band of the proposed seismometer are compared to those of the Nanometrics seismometer Trillium-40 (the same sensitivity and bandwidth). As a final evaluation of the proposed seismometer, we tested its simulated response to both a local and a regional real earthquake which have different magnitudes and frequency contents, and recorded by Trillium-40. The simulated waveforms output from our simulated seismometer are almost identical to those recorded by Trillium-40.

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