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Quantitative Investigation of the Performance of Three-Component Optical Seismometer

This experimental study demonstrates the performance of a three-component optical seismometer. The seismometer components consist of a novel spring-suspended mass whose position is monitored by moiré technique. In this seismometer, two gratings are used, one attached to the suspended mass, and the other one fixed to the frame of the seismometer. Also, a laser diode, a light detector and a narrow slit have been used and fixed to the seismometer frame to illuminate fringes displacement due to the suspended mass movement. Due to a typical impulse, the moiré fringes oscillate in front of the light detector and the output voltage of detector can be used to measure the mass movement. So, the precise displacement can be determined by moiré detecting procedure. Also, the mechanical system of our instrument is modeled. As well as, we derive the mathematical formulation for the simulation of the response of the seismometer to an excitation function. The experimental result and theoretical simulation are compared. The results show close similarity between simulation and experiment. We also compared the performance of our optical seismometer and a common seismometer (CMG-6TD) in equal conditions. Quantitative investigations and Comparisons show that, our seismometer is quite reliable.

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