ID: Type: **Poster**

A Novel Three Component Optical Seismometer Based on the Moiré Technique

We have built a new three components optical seismometer. The oscillation systems consist of a spring-suspended mass which its position is monitored by moiré technique. We use a pair of similar gratings that one of them is fixed to the suspended mass and another is fixed to the seismometer frame. The gratings are installed close to each other with no physical contact, which the planes of the gratings are parallel to each other and their lines making a small angle with one another; thus, moiré pattern is formed. A narrow beam of a laser diode passes through the moiré patterns and the beam power is detected by a light detector. Due to a typical impulse, the second grating is displaced with respect to the first grating, and as a result the moiré fringes are moved with a magnification of more than ten times. So, the detector output is a time series of the mass displacements. The response of the optical seismometer was validated through comparison of recorded waveforms with those obtained by CMG-6TD seismometer. Comparisons show that, in terms of both noise and signal fidelity, the optical approach is quite reliable.

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Track Classification: 3. Advances in sensors, networks and processing