



Development of a Laser Interferometric Miniature Seismometer

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This paper details the development and initial testing of a new seismic sensing platform that could have broad impact on test ban treaty monitoring. Compact, low power and low cost sensors that maintain low noise model performance could substantially augment global monitoring capabilities by simplifying deployment and reducing maintenance costs.

Our prototype sensor design integrates laser optics with micromechanical structures and electronic components in a compact sensor capsule. The use of optical sensing enables a mechanical design that is not tightly coupled to the sensing modality, which leads to a smaller and more robust sensor system when compared with sensors that have competitive performance. Our prototype sensors achieved a noise floor of -150 dB/Hz, relative to $1 \text{ m}^2/\text{s}^4$, over a bandwidth from 2 Hz to 100 Hz, in a cylindrical form factor of less than 2 cm diameter by 2 cm length. Refinements to this design are continuing, with a target to achieve Low Noise Model (LNM) performance of -168 dB/Hz from 0.1 Hz to 100 Hz. This can be achieved with a part that is more than 40 times smaller than the existing state of the art.