



WIRELESS PASSIVE MECHANICAL VIBRATION MONITOR SYSTEM

[View U.S. Patent Application Publication No. US-2025-0258033 in PDF format.](#)

WARF: P240131US01

Inventors: Chu Ma, Dajun Zhang, Bhuvana Krishnaswamy, Muhammad Shahid

Overview

Real-time vibration sensing is important in a variety of applications in industry, health care, and environmental monitoring. For example, vibration monitoring can assist in the prediction of natural disasters such as typhoons, earthquakes, and avalanche calamities, and for meteorological observations and geological surveys. Vibrations induced by human breathing and heartbeat are important vital signals for health monitoring. Vibration monitoring can also provide in-situ and non-destructive tools for diagnosing the structural health of vehicles, industrial equipment, buildings, and public infrastructures.

The Invention

UW-Madison researchers have developed a hybrid mechanical vibration monitoring system that is highly sensitive to non-contact systems. The system uses a passive vibration sender boosting the amplitude of the vibration and thus the ability of remote sensing systems employing cameras or changes in a radiofrequency field to detect the vibration. The passive design provides a much lower cost than active electronic sensors and eliminates the need for a source of power either locally or through external power connections. Generally, the sender provides a reflector associated with or part of a mass spring system having an eigenfrequency in a vibration frequency of interest. The sender boosts the amplitude of vibration at the reflector in a frequency of interest while reducing vibration at other frequencies, thereby increasing the signal-to-noise ratio in the remote sensing signal.

Additional Information

For More Information About the Inventors

- [Chu Ma](#)
- [Bhuvana Krishnaswamy](#)

Publications

- [Zhang, D., Polamarasetty, A., Shahid, M.O. et al. Metamaterial-based passive analog processor for wireless vibration sensing. *Commun Eng* 3, 44 \(2024\).](#)

Tech Fields

- [Analytical Instrumentation, Methods & Materials : Sensors](#)

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867