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Integrated Silicon Nitride Optomechanical Accelerometer

An integrated optomechanical accelerometer utilizes a Silicon Nitride optical microring resonator for sub-microgram resolution and chip-scale integration in navigation, automotive, and consumer electronics applications.

The need for a precise and sensitive accelerometer is essential, as the application of this technology ranges from inertial navigation to consumer electronics. The technology uses sensitive displacement measurement, which can be performed in various ways such as piezo-electric, tunnel current, or optical techniques. The optical readout technique offers superior benefits of greater resolution as well as better resilience to electromagnetic interference. The technique, however, also faces some drawbacks that prevent its use for large scale production or chip-scale integration.

To address this challenge, researchers at Purdue have developed an integrated optomechanical accelerometer. This technology is based on a Silicon Nitride (Si_3N_4) optical microring resonator that can detect acceleration via the stress-optic effect. This integrated design offers an array of benefits such as serving diverse laser types in commercial applications and paves the way for chip-scale integration. Further, the potential integration with a self-injection locked (SIL) semiconductor laser expands the horizon for large-scale acceleration sensing networks.

Technology Validation:

Technology was characterized using a shaker table to provide sensitivity and resolution data.

Advantages:

-Higher signal to noise ratio and lower thermal instability

-Sub-microgram resolution, which is on par with the state-of-the-art optomechanical accelerometer

Applications:

Technology ID
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Category
Semiconductors/Devices & Components
Robotics & Automation/Perception & Sensing

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Intellectual Property:

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