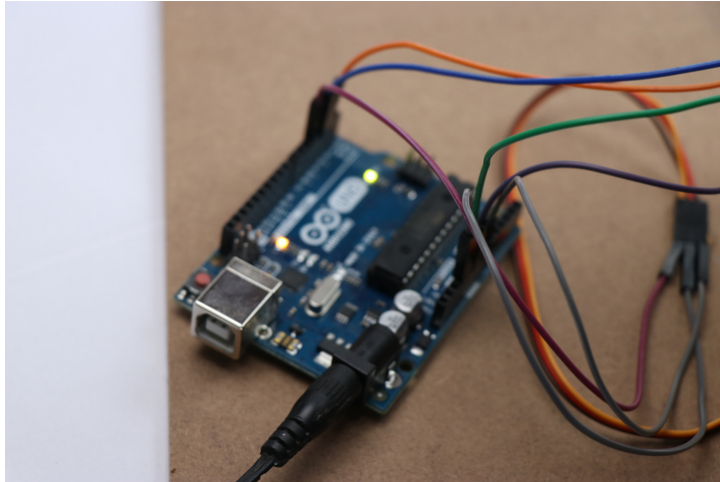




# Mechanical Amplifier for Energy Transducer Devices

TECHNOLOGY NUMBER: 5960



## Technology ID

5960

## Category

Hardware

Engineering & Physical Sciences

Semiconductor, MEMS, and

Electronics

## Inventor

Khalil Najafi

Iman Shahosseini

Rebecca L. Peterson

## Further information

Joohee Kim

[jooheek@umich.edu](mailto:jooheek@umich.edu)

## OVERVIEW

Energy harvesting and sensing using concentric frame electromagnetic transducer

- Efficiently harnesses ambient vibration energy and monitors system health with multifunctional capabilities
- Car suspensions, helicopter dampers, rail tracks, bridges, electromechanical actuators

## BACKGROUND

Traditional mechanical systems for energy harvesting from ambient vibrations faced limitations in converting kinetic energy to electrical energy efficiently. Early approaches involved basic piezoelectric materials and simple electromagnetic systems failing to produce substantial power. Existing technologies often struggled with inefficiencies, limited functionality, and durability under varying environmental dynamics. The need for a multifunctional transducer that simultaneously captures energy and monitors host systems becomes more apparent as modern infrastructures and vehicles demand energy-efficient and self-monitoring technologies. Such a transducer could significantly enhance the usability and maintenance of dynamic systems, reducing dependency on external power sources and improving overall system reliability.

## Learn more



## **INNOVATION**

Researchers at the University of Michigan have developed an electromagnetic transducer comprising two concentric frames, which is uniquely designed to move relative to each other along their central axis. One frame incorporates the magnetic structure of stacked permanent magnets, while the other contains the concentric conductor coil turns. By exploiting the relative movement induced by ambient kinetic energy, the transducer efficiently generates electrical potential or can provide mechanical displacement when used as an actuator. This flexible system can be configured as an energy harvester, a dual-mode energy harvester, and a sensor, or as an electromechanical actuator.

## **ADDITIONAL INFORMATION**

INTELLECTUAL PROPERTY:

[US10985633](#) "Vibrational energy harvester with amplifier having gear assembly"